

SAIFEDEAN AMMOUS

THE
FIAT
STANDARD

The DEBT SLAVERY ALTERNATIVE
to HUMAN CIVILIZATION



This first draft is made exclusively available to supporters
of the self-publication of The Fiat Standard

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I. Fiat Money

1. Introduction

On August 6, 1915, His Majesty's Government issued this appeal:

"In view of the importance of strengthening the gold reserves of the country for exchange purposes, the Treasury have instructed the Post Office and all public departments charged with the duty of making cash payments to use notes instead of gold coins whenever possible. The public generally are earnestly requested, in the national interest, to co-operate with the Treasury in this policy by (1) paying in gold to the Post Office and to the Banks; (2) asking for payment of cheques in notes rather than in gold; (3) using notes rather than gold for payment of wages and cash disbursements generally".

With this obscure and largely forgotten announcement, the Bank of England effectively began the global monetary system's move away from a gold standard, in which all government and bank obligations were redeemable in physical gold. At the time, gold coins and bars were still widely used worldwide, but they were of limited use for international trade,

which necessitated resorting to the clearance mechanisms of international banks. Chief among all banks at the time, the Bank of England's network spanned the globe, and its pound sterling had, for centuries, acquired the reputation of being as good as gold.

Instead of the predictable and reliable stability naturally provided by gold, the new global monetary standard was built around government rules, hence its name. The Latin word fiat means 'let it be done' and, in English, has been adopted to mean a formal decree, authorization, or rule. It is an apt term for the current monetary standard, as what distinguishes it most is that it substitutes government dictates for the judgment of the market. Value on fiat's base layer is not based on a freely traded physical commodity, but is instead dictated by authority, which can control its issuance, supply, clearance, and settlement, and even confiscate it at any time it sees fit.

With the move to fiat, peaceful exchange on the market no longer determined the value and choice of money. Instead, it was the victors of world wars and the gyrations of international geopolitics that would dictate the choice and value of the medium that constitutes one half of every market transaction. While the 1915 Bank of England announcement, and others like it at the time, were assumed to be temporary emergency measures necessary to fight the Great War, today, more than a century later, the Bank of England is yet to resume the promised redemption of its notes in gold. Temporary arrangements restricting note convertibility into gold have turned into the permanent financial infrastructure of the fiat system that took off over the next century. Never again would the world's predominant monetary systems be based on a currencies fully redeemable in gold.

The above decree might be considered the equivalent of Satoshi Nakamoto's email to the cryptography mailing list announcing Bitcoin, but unlike Nakamoto, His Majesty's Government provided no software, white paper, nor any kind of technical specification as to how such a monetary system could be made practical and workable. Unlike the cold precision of Satoshi's impersonal and dispassionate tone, His Majesty's Government

relied on appeal to authority, and emotional manipulation of its subjects' sense of patriotism. Whereas Satoshi was able to launch the Bitcoin network in operational form a few months after its initial announcement, it took two world wars, dozens of monetary conferences, multiple financial crises, and three generations of governments, bankers, and economists struggling to ultimately bring about a fully operable implementation of the fiat standard in 1971.

Fifty years after taking its final form, and one century after its genesis, an assessment of the fiat system is now both possible and necessary. Its longevity makes it unreasonable to keep dismissing the fiat system as an irredeemable fraud on the brink of collapse, as many of its detractors have done for decades. Many people at the end of their life today have never used anything but fiat money, and neither did their long-deceased parents. This cannot be written off as an unexplained fluke, and economists should be able to explain how this system functions and survives, despite its many obvious flaws. There are, after all, plenty of markets around the world that are massively distorted by government interventions, but they nonetheless continue to survive. It is no endorsement of these interventions to attempt to explain how they persist.

It is also not appropriate to judge fiat systems based on the marketing material of their promoters and beneficiaries in government-financed academia and the popular press. While the global fiat system so far avoided the complete collapse its detractors would predict, that cannot vindicate its promoters' advertising of it as a free-lunch-maker with no opportunity cost or consequence. More than fifty episodes of hyperinflation have taken place around the world using fiat monetary systems in the past century. Moreover, the global fiat system avoiding catastrophic collapse is hardly enough to make the case for it as a positive technological, economic, and social development.

Between the relentless propaganda of its enthusiasts and the rabid venom of its detractors, this book attempts to offer something new: an exploration of the fiat monetary system as a technology, from an engineering and functional perspective, outlining its purposes and

common failure modes, and deriving the wider economic, political, and social implications of its use. I believe that adopting this approach to writing *The Bitcoin Standard* contributed to making it the best-selling book on bitcoin to date, helping hundreds of thousands of readers across more than 20 languages understand the significance and implications of bitcoin. Rather than focus on the details of how bitcoin operates, I chose to focus on why it operates the way it does, and what the implications are.

If you have read *The Bitcoin Standard* and enjoyed my exploration of bitcoin, I hope you will enjoy this exploration of the operation of fiat. Perhaps counter-intuitively, I believe that by first understanding the operation of bitcoin, you can then better understand the equivalent operations in fiat. It is easier to explain an abacus to a computer user than it is to explain a computer to an abacus user. A more advanced technology performs its functions more productively and efficiently, allowing a clear exposition of the mechanisms of the simpler technology, and exposing its weaknesses. For the reader who has become familiar with the operation of bitcoin, a good way to understand the operation of fiat is by drawing analogy to the operation of bitcoin using concepts like mining, nodes, balances, and proof of work. My aim is to explain the operation and engineering structure of the fiat monetary system and how it operates, in reality, away from the naive romanticism of governments and banks who have benefited from this system for a century.

The first seven chapters of *The Bitcoin Standard* explained the history and function of money, and its importance to the economic order. With that foundation laid, the final three chapters introduced bitcoin, explained its operation, and elaborated on how its operation relates to the economic questions discussed in the earlier chapters. My motivation as an author was to allow readers to understand how bitcoin operates and its monetary significance without requiring them to have a previous background in economics or digital currencies. Had Bitcoin not been invented, the first seven chapters of *The Bitcoin Standard* could have served as an introduction to explaining the operation of the fiat monetary system. This book picks up where Chapter 7 of *The Bitcoin Standard* left off. The first

chapters of this book are modeled on the last three chapters of the Bitcoin Standard, except applied to fiat money.

How does the fiat system actually function, in an operational sense? The success of bitcoin in operating as a bare-bones and standalone free market monetary system helps elucidate the properties and functions necessary to make a monetary system function. Bitcoin was designed by a software engineer who boiled a monetary system down to its essentials. These choices were then validated by a free market of millions of people around the world who continue to use this system, and currently entrust it to hold more than \$300 billion of their wealth. The fiat monetary system, by contrast, has never been put on a free market for its users to pass the only judgment that matters on it. The all-too-frequent systemic collapses of the fiat monetary system are arguably the true market judgment emerging after suppression by governments. With bitcoin showing us how an advanced monetary system can function entirely independently of government control, we can see clearly the properties required for a monetary system to operate on the free market, and in the process, better understand fiat's modes of operation, and all-too-frequent modes of failure.

While fiat systems have not won acceptance on the free market, and though their failings and limitations are many, there is no denying the fact that many fiat systems have worked for large parts of the last century, and facilitated an unfathomably large number of transactions and trades all around the world. Its continued operation makes understanding it useful, particularly as we still live in a world that runs on fiat. Just because you may be done with fiat does not mean that fiat is done with you! Understanding how the fiat standard works, and how it frequently fails, is essential knowledge for being able to navigate it.

To begin, it's important to understand that the fiat system was not a carefully, consciously, or deliberately designed financial operating system like bitcoin; rather, it evolved through a complex process of compromise between political constraints and expedience. The next chapter illustrates this by examining newly-released historical documents on just how the fiat

standard was born, and how it replaced the gold standard, beginning in England in the early twentieth century, completing the transition in 1971 across the Atlantic. This is not a history book, however, and it will not attempt a full historical account of the development of the fiat standard over the past century, in the same way the Bitcoin Standard did not delve too deeply into the study of the historical development of the bitcoin software protocol. The focus of the first part of the book will be on the operation and function of the fiat monetary system, by making analogy to the operation of the bitcoin network, in what might be called a comparative study of the economics of different monetary engineering systems.

Chapter 3 examines the underlying technology behind the fiat standard. Contrary to what the name suggests, modern fiat money is not conjured out of thin air through government fiat. Government does not just print currency and hand it out to a society that accepts it as money. Modern fiat money is far more sophisticated and convoluted in its operation. The fundamental engineering feature of the fiat system is that it treats future promises of money as if they were as good as present money because the government guarantees these promises. While such an arrangement would not survive in the free market, the coercion of government can maintain it for a very long time. Government can meet any present financial obligations by diverting them onto future taxpayers or onto current fiat holders through taxes or inflation; and, further, through legal tender laws, government can prevent any alternatives to its money from gaining traction. By leveraging their monopoly on the legal use of violence to meet present financial obligations from potential future income, government fiat makes debt into money, forces its acceptance across society, and prevents it from collapsing.

Chapter 4 examines how the fiat network's native tokens come into existence, using fiat's antiquated and haphazard version of mining. As fiat money is credit, credit creation in a fiat currency results in the creation of new money, which means that lending is the fiat version of mining. Fiat miners are the financial institutions capable of generating fiat-based debt with guarantees from the government and/or central banks. Unlike with

bitcoin's difficulty adjustment, fiat has no mechanisms for controlling issuance. Credit money, instead, causes constant cycles of expansion and contraction in the money supply with eventual devastating consequences, as this chapter examines.

Chapter 5 explains the topography of the fiat network, which is centered around its only full node, the US Federal Reserve. The Fed is the only institution that can validate or refuse any transaction on any layer of the network. Another 200 or so central bank nodes are spread around the world, and these have geographic monopolies on financial and monetary services, where they regulate and manage tens of thousands of commercial bank nodes worldwide. Unlike with bitcoin, the incentive for running a fiat node is enormous. Chapter 6 then analyzes balances on the fiat network, and how fiat has the unique feature where many, if not most, users, have negative account balances. The enormous incentive to mine fiat by issuing debt means individuals, corporations, and governments all face a strong incentive to get into debt. The monetization and universalization of debt is also a war on savings, and one which governments have persecuted stealthily and mostly quite successfully against their citizens over the last century.

Based on this analysis, Chapter 7 concludes the first section of the book by discussing the uses of fiat, and the problems it solves. The two obvious uses of fiat are that it allows for government to easily finance itself, and that it allows banks to engage in maturity-mismatching and fractional reserve banking while largely protected from the inevitable downside. But the third use of fiat is the one that has been the most important to its survival: salability across space.

From the outset, I will make a confession to the reader. Attempting to think of the fiat monetary system in engineering terms and trying to understand the problem it solves have resulted in giving me an appreciation of its usefulness, and a less harsh assessment of the motives and circumstances which led to its emergence. Understanding the problem this fiat system solves makes the move from the gold standard to the fiat standard appear less outlandish and insane than it

had appeared to me while writing *The Bitcoin Standard*, as a hard money believer who could see nothing good or reasonable about the move to an easier money.

Seeing that the analytical framework of *The Bitcoin Standard* was built around the concept of salability across time, and the ability of money to hold its value into the future, and the implications of that to society, the fiat standard initially appears as a deliberate nefarious conspiracy to destroy human civilization. But writing this book, and thinking very hard about the operational reality of fiat, has brought into sharper focus the property of salability across space, and in the process, made the rationale for the emergence of the fiat standard clearer, and more comprehensible. For all its many failings, there is no escaping the conclusion that the fiat standard was indeed a solution to a real and debilitating problem with the gold standard, namely its low spatial salability. More than any conspiracy, the limited spatial salability of gold as global trade advanced allowed the survival of the fiat standard for so long, making its low temporal salability a tolerable problem, and allowing governments worldwide tremendous leeway to bribe their current citizens at the expense of their future citizens by creating the easy fiat tokens that operate their payment networks. As we take stock of a whole century of operation for this monetary system, a sober and nuanced assessment can appreciate the significance of this solution for facilitating global trade, while also understanding how it has allowed the inflation that benefited governments at the expense of their future citizens. Fiat may have been a huge step backward in terms of its salability across time, but it was a substantial leap forward in terms of salability across space.

Having laid out the mechanics for the operation of fiat in the first section, the book's second section, *Fiat Life*, examines the economic, societal, and political implications of a society utilizing such a form of money with uncertain and usually poor inter-temporal salability. This section focuses on analyzing the implications of two economic causal mechanisms of fiat money: the utilization of debt as money; and the ability of government to grant this debt at essentially no cost. Fiat increasingly divorces economic reward from economic productivity, and instead bases it on political

allegiance. This attempted suspension of the concept of opportunity cost makes fiat a revolt against the natural order of the world, in which humans, and all other animals, have to struggle against scarcity every day of their lives. Nature provides humans with reward only when their toil is successful, and similarly, markets only reward humans when they are able to produce something that others value subjectively. After a century of economic value being assigned at the point of a gun, these indisputable realities of life are unknown to, or denied by, huge swathes of the world's population who look to their government for their salvation and sustenance.

The suspension of the normal workings of scarcity through government dictat has enormous implications on individual time preference and decision-making, with important consequences to many facets of life. In the second section of the book, we explore the impacts of fiat to family, food, education, science, health, fuels, and security.

While the title of the book refers to fiat, this really is a book about bitcoin, and the first two sections build up the analytical foundation for the main course that is the third part of the book, examining the all-too-important question with which *The Bitcoin Standard* leaves the reader: what will the relationship between fiat and bitcoin be in the coming years? Chapter 16 examines the specific properties of bitcoin that make it a potential solution to the problems of fiat. While *The Bitcoin Standard* focused on bitcoin's intertemporal salability, *The Fiat Standard* examines how bitcoin's salability across space is the mechanism that makes it a more serious threat to fiat than gold and other physical monies with low spatial salability. Bitcoin's high salability across space allows us to monetize a hard asset itself, and not credit claims on it, as was the case with the gold standard. At its most basic, bitcoin increases humanity's capacity for long-distance international settlement by around 500,000 transactions a day, and completes that settlement in a few hours. This is an enormous upgrade over gold's capacity, and makes international settlement a far more open market, much harder to monopolize. This also helps us understand bitcoin's value proposition as not just in being harder than gold, but also in traveling much faster. Bitcoin effectively combines gold's

salability across time with fiat's salability across space in one apolitical immutable open source package.

By being a hard asset, bitcoin is also debt-free, and its creation does not incentivize the creation of debt. By offering finality of settlement every ten minutes, bitcoin also makes the use of credit money very difficult. At each block interval, the ownership of all bitcoins is confirmed by tens of thousands of nodes all over the world. There can be no authority whose fiat can make good a broken promise to deliver a bitcoin by a certain block time. Financial institutions that engage in fractional reserve banking in a bitcoin economy will always be under the threat of a bank run as long as no institution exists that can conjure present bitcoin at significantly lower than the market rate, as governments are able to do with their fiat.

Chapter 17 discusses bitcoin scaling in detail, and argues it will likely happen through second layer solutions which will be optimized for speed, high volume, and low cost, but involve trade-offs in security and liquidity. Chapter 18 builds on this analysis to discuss what banking would look like under a Bitcoin Standard, while chapter 19 discusses how savings would work under such a system. Chapter 20 studies bitcoin's energy consumption, how it is related to bitcoin's security, and how it can positively impact the market for energy worldwide.

With this foundation, the book can tackle the question: how can bitcoin rise in the world of fiat, and what are the implications for these two monetary standards coexisting? Chapter 21 analyzes different scenarios in which bitcoin continues to grow and thrive, while Chapter 22 examines scenarios where bitcoin fails.

2. The Neverending Bank Holiday

The Bank of England's troubles started at the dawn of the Great War. On July 31, 1914, large crowds stood outside the doors of the Bank's Threadneedle Street headquarters looking to convert their bank balances and bank notes into gold coins before the August Bank Holiday. The Austro-Hungarian Empire had just declared war against Serbia following a month of escalating tensions across Europe. All over the continent, investors rushed to convert financial instruments into gold, as they worried governments would resort to devaluing their currency to finance war. That fateful July, English newspapers referred to the coming war as the August Bank Holiday war, expecting it to be a swift victory for the British military. Yet the lines of depositors outside the world's most important financial institution foretold a different story: the bank holiday that would never end.

Had the Bank of England maintained full cover for its notes and bank accounts in gold, as they would have had to under a strict gold standard, war would not have posed a liquidity problem. All depositors could have had their banknotes and bank accounts redeemed in full in physical gold, and there would have been no need to queue outside the bank. However, the Bank of England had become accustomed to not backing all its notes with gold. Depositors had good reason to hold money in the form of bank notes and bank accounts rather than in physical gold. Compared to gold, bank notes were easier to carry and convert into either smaller or larger

denominations, and an account at an English bank allowed the depositor to make payments by checkbook anywhere in the world far faster than sending physical gold. Global capital sought the Bank's superior safety and clearance mechanisms, which provided the Bank a solid cushion to diverge from a strict 100% gold standard.

At the time, the Bank of England was the center of the financial universe, and its pound sterling was recognized worldwide for being as good as gold. The credit-worthiness of the British government, its powerful military, and its unrivaled global payment settlement network had given the Bank of England the supreme position in the global financial order, clearing approximately 60% of the world's financial transactions.

In the prewar period, the Bank of England had also offered its own currency as reserve for the central banks of its colonies under what was known as the gold exchange standard. Since the colonies used the Bank of England to settle their international payments, they were expected to hold onto significant amounts of these reserves and not seek redemption in gold. This allowed the Bank of England a certain inflationary margin, to the point that, by 1913, the ratio of official reserves to liabilities to foreign monetary authorities was only 31%¹. The Bank of England had exported its inflation to the colonies, financing its operations but placing itself in a precarious liquidity position. So long as most colonies, depositors, and paper holders did not ask to convert their bank accounts and notes to gold, liquidity would not be a problem. For a generation of bankers reared on the peace and prosperity of the Victorian era and the gold standard, there was little reason to worry about a liquidity crisis. There was also very little reason to worry about a world war, but both the war and the liquidity crisis materialized in the summer of 1914. While the Great War triggered the Bank's liquidity troubles, the deeper causes were self-inflicted, and typical of the fiat century: government monopoly over the payment network encouraged abuse of the currency.

1 Officer, Lawrence. "Gold Standard." *Economic History Organization*, edited by Robert Whaples, 26 Mar. 2008, eh.net/encyclopedia/gold-standard/.

As trouble brewed on the continent, many foreign depositors sought to withdraw their assets from Britain, and many Englishmen preferred to hold gold over the Bank's paper. In the last six working days of July, the Bank paid out £12.3m in gold coin from its £26.5m total reserves². The previously unthinkable prospect of the Bank of England defaulting on its promise to redeem its notes and accounts in gold suddenly appeared plausible. A devaluation of the pound at that stage would have allowed the Bank sufficient reserves to back the currency, but would have been unspeakably unpopular with the British public, permanently undermining faith in the Bank.

The Bank of England decided to continue on the gold standard, however, its dwindling stockpiles meant it had to figure out some way to stem the tide of redemptions. Their solution was to declare an unofficial war on gold. The fascinating details of this war can be found in *The Bank of England 1914-21 (Unpublished War History)*, an obscure but highly detailed study commissioned by Bank Governor Montagu Norman, authored by his personal secretary John Osborne, and completed in 1926. This study remained unpublished until the Bank uploaded it to its website in September of 2019.³

Treasury issued the appeal quoted at the beginning of this book, asking the public to pay the post office and banks in gold, take payment in notes rather than in gold, and use notes for payment of wages and cash disbursements. After this appeal, the Bank of England and the Treasury instructed banks to collect coins and hold them in reserve at the disposal of the Treasury throughout the war.

"In 1915, the sum of £20,823,000 was collected from the Bankers of the United Kingdom and, in order to furnish the Treasury with further credit,

2 <https://www.natwestgrouppremembers.com/banking-in-wartime/banking-business/gold-banknotes-and-money-supply-in-the-first-world-war.html>

3 Osborne, John. *The Bank of England 1914-21 (Unpublished War History)*. Bank of England, 1926, www.bankofengland.co.uk/archive/bank-of-england-1914-21-ww1

was exported to United States," Osborne wrote. "The Bank kept £2,423,000 sovereigns because their stock was seriously depleted," Osborne added in a footnote. "In November 1915 it became necessary for the Government to appoint a Committee - London Exchange Committee to advise on the subject of the Foreign Exchanges. In order to assist the Committee in their operations it was arranged that Bankers should cease to issue gold to their customers, whose requirements could of course be satisfied by Currency Notes." The custom of committees determining monetary arrangement was to also become very common in the fiat century.

Osborne continues:

During the following year it became evident that as a result of the appeal referred to and the action of the Bankers the public were becoming more accustomed to the use of paper money and more reconciled to the absence of gold.

In order to meet an obligation of the London Exchange Committee in connection with the loan of \$50,000,000 made to them by a group of United States Bankers in November 1915, the Clearing Bankers in June 1917 paid to the account of the Treasury the sum of £10,000,000 in gold coin, which was "set aside" on behalf of the Federal Reserve Bank of New York.

A further appeal to the Banks was made in a letter dated the 25th July 1917 from the Chancellor of the Exchequer. Bankers were asked to hold their stocks of gold coin at the disposal of the Government, in view of the existing state of the American exchange. The Chancellor urged the Banks, in the interests of general credit, to hand over their gold by private arrangement and so obviate the necessity for a compulsory order which could be issued under the Defence of the Realm Regulations. As a result of this appeal Bankers throughout the country agreed to hold 90% of their gold at the disposal of the Treasury.

On the 1st April 1919 the export of gold coin was prohibited by Order in Council and on the same date, at a meeting of Bankers, it was agreed that all gold coin and bullion then held and thereafter acquired by them (excepting only such gold as might be imported by the Banks themselves) should be held at the absolute disposal of the Treasury, and that delivery of it should be made to the Bank of England and when required. Furthermore, agreed that all gold already earmarked for foreign account should, if released, be paid in to the Bank of England at once. Details of all holdings of gold were to be furnished to the Bank once a month and the Bankers agreed to discourage by every means in their power withdrawals of gold from the Bank of England.

It was realised that it was absolutely essential both to Bankers generally and to the whole country that the available supplies of gold should be ready at hand, if necessary, for use centrally to meet any threatening developments in foreign exchanges, and particularly in the American exchange. At the end of the year the Treasury requested the Bank to collect the entire stocks of gold coin held by Bankers throughout the Kingdom.⁴

The Bank would periodically purchase gold coins from banks using bank notes. In December 1919, the Treasury requested the Bank collect all the gold coins held by bankers in the United Kingdom. Private bankers surrendered £41,793,000 of gold coins by June of 1920, practically all of their gold holdings, in exchange for paper notes. The entire operation cost £5,516, at a rate of a little over £1 per £10,000 collected. The discipline of Proof of Work mining was conspicuously absent at fiat's genesis, and throughout its century. Most the gold was shipped to the United States, in exchange of credit for fighting war.

From the beginning of August 1914 to the end of August 1921, the Bank's net gain totaled £62,411,000 of gold. The British government confiscated 14,684,941 ounces of gold, or around 455.2 metric tons. Today, that gold would be worth around £20billion, roughly 300 times what they were worth in 1914. At the time of writing in 2021, the Bank of England's gold reserves stand at only 310.3 metric tons of gold.

The war which caused this demand for gold had also given the Bank a welcome reprieve by suspending most aviation, relieving it from shipping gold to its foreign depositors. In April 1919, as the war ended and navigation resumed, the export of gold coins was prohibited.

Economic historian Lawrence Officer summarized this period:

With the outbreak of war, a run on sterling led Britain to impose extreme exchange control — a postponement of both domestic and international payments — that made the international gold standard non-operational. Convertibility was not legally suspended; but moral suasion, legalistic action, and regulation had the same effect. Gold exports were restricted by extralegal means (and by Trading with the Enemy legislation), with the Bank of England commandeering all gold imports and applying moral suasion to bankers and bullion brokers.⁵

With less gold in the hands of the people and more notes, the Bank had succeeded in protecting the official exchange value at the same price set in 1717 by Master of the Royal Mint, Sir Isaac Newton, £4.25 per troy ounce of gold. The Bank of England's reliable record in redeeming its notes at this rate for two centuries, interrupted only by the Napoleonic

5 Officer, Lawrence. "Gold Standard." *Economic History Organization*, edited by Robert Whaples, 26 Mar. 2008, eh.net/encyclopedia/gold-standard/.

Wars, was a matter of national pride and global renown which not only gave the sterling pound its legendary reputation of being as good as gold, but also turned the phrase 'gold standard' into the proverbial benchmark and paradigm for excellence, predictability, and reliability--a linguistic truth that has survived a century of the fiat standard.

By using the war to suspend redeemability abroad and discourage it at home, the Bank had successfully used its fiat, regulations, and monopoly control over the most important financial infrastructure in the world to finance the war effort without officially coming off the gold standard, announcing a suspension of gold redemption, or devaluing the pound. Thus was born a new science of government-sponsored financial alchemy. By controlling banks and confiscating gold, central banks could create money by fiat. By making the pound as good as gold, the new paper alchemists succeeded where Newton and the old alchemists failed. Gold could be produced at will after all; the printing press and the checking account were the alchemists' long sought philosopher's stone.

In the immediate aftermath of the war, there seemed to be no downside to the world's central bank and its main currency diverging from the sound gold anchor. As time went by, the costs of these monetary shenanigans became apparent, increased markedly, and ultimately became a permanent feature of the coming fiat century--a century of surreptitiously trading long-term prosperity and stability for the illusion of short-term stability. The economic consequences of the inflation would weigh on the British economy for decades. The pound would be devalued significantly next to gold and the US dollar, and global military and economic leadership would follow the gold in its trans-Atlantic journey.

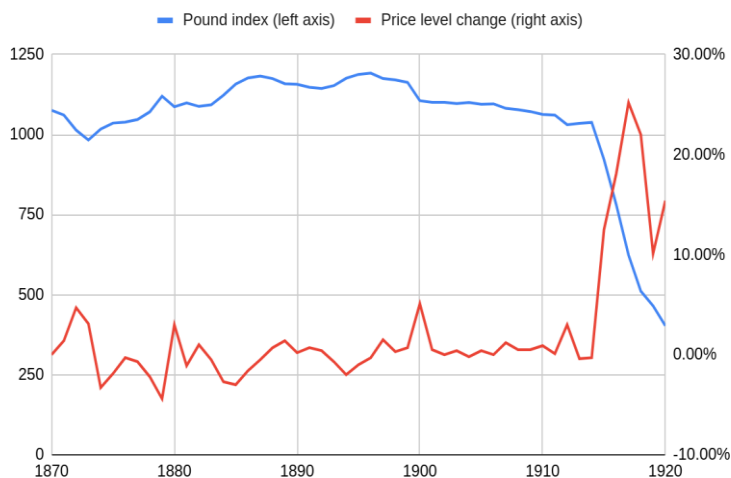


Figure 1: The impact of the war on sterling. Source: Inflation: the Value of the Pound 1750-1998⁶.

By maintaining the pound sterling at the prewar gold rate, the Bank of England sowed the seeds of several problems that became common in later implementations of the fiat standard. The Bank maintained the nominal exchange rate between notes and gold, but in reality the prices of normal goods and services increased sharply. According to recent research by the Economic Policy and Statistics Section of the House of Commons Library, the annual change in prices from 1915-1920 was 12.5%, 18.1%, 25.2%, 22%, and 10.1%, for a cumulative rise of 229.2% over the five years. Price increases made life difficult for the average Englishman, spurring the rise of organized labor and popular demands for price and wage controls. Inevitably, rationing and shortages followed, as well as mass unemployment. The War's end brought millions of military servicemen home, but the price and wage controls made it very difficult

6 Twigger, Robert. Inflation: the Value of the Pound 1750-1998. Research Paper 99/20, House of Commons Library, 23 Feb. 1999, commonslibrary.parliament.uk/research-briefings/rp99-20/.

for the British economy to accommodate their return to the workforce. Revaluing the pound sterling to accommodate the inflation would have meant the devaluation of the population's savings, however; prices of goods and labor would have readjusted on the market. By foregoing this revaluation, maintaining an overvalued exchange rate, and discouraging redemption into gold, the Bank delayed the necessary economic adjustment and prolonged the dislocations brought about by the inflation and price and wage controls. Pressure grew on the government to spend to support the unemployed and the poor. However, further spending and expansionary monetary policy caused even more price increases and put higher pressure on sterling internationally. A populist clamor grew for the Bank to bring gold coins back into circulation and return to the prewar gold standard.

Britain's problems were not just domestic. While all European countries effectively went off the gold standard in 1914, the US had only done so in 1917, attracting large quantities of gold fleeing Europe. With the credit it provided to the Bank of England, the US Federal Reserve also secured a large part of the British supply of gold. As goes gold, so goes power. The Bank of England was learning to readjust to a new global economic reality in which the United States and its Federal Reserve played a supremely important role. The alchemy of the UK's fiat standard continued to become more expensive as the US took on the global leadership role and sterling continued to face troubles throughout the coming century, losing three quarters of its value against the US dollar, and more than 90% of its value against gold.

All major European economies engaged in large scale inflation to finance the War, after which their currencies were devalued against gold and were no longer redeemable at the prewar rate. At this point, the prudent step would have been to acknowledge that the fiat standard had served its purpose as a temporary measure to finance the War, and return to the gold standard. Governments had repeatedly promised this, and it was expected by the European peoples. However, returning to the gold

standard at the prewar parity would mean an inevitable end to the inflationary boom started by the credit expansion that financed the war, and subsequently a painful recession. The US chose this path, resulting in a sharp but quick recession in 1920, after which the US economy began one of its longest expansions in history. US gold redemption was resumed in 1922 after a five-year suspension. Britain, on the other hand, tried to square the impossible circle of maintaining Treasury's high spending, the union's high wage requirements, the gold peg at its prewar rate, and sterling's role as a global reserve currency. Having experienced the sweet taste of paper alchemy, the Bank of England thought it could manage its way out of overt default on its gold redemption obligations through financial and political engineering.

Rather than formalize the reality of inflation and devalue the pound to get back on the gold standard, the Bank of England and the Treasury chose to kick the can down the road, and across the pond, where it would continue to be kicked into the next century. So began the habit of obtaining short-term relief at the expense of long-term solvency and stability.

As economist Murray Rothbard described it:

In short, Britain insisted on returning to gold at a valuation that was 10–20 percent higher than the going exchange rate, which reflected the results of war and postwar inflation. This meant that British prices would have had to decline by about 10 to 20 percent in order to remain competitive with foreign countries, and to maintain her all-important export business. But no such decline occurred, primarily because unions did not permit wage rates to be lowered. Real-wage rates rose, and chronic large-scale unemployment struck Great Britain. Credit was not allowed to contract, as was needed to bring about deflation, as unemployment would have grown even more menacing—an unemployment caused partly by the postwar establishment of

government unemployment insurance (which permitted trade unions to hold out against any wage cuts). As a result, Great Britain tended to lose gold. Instead of repealing unemployment insurance, contracting credit, and/or going back to gold at a more realistic parity, Great Britain inflated her money supply to offset the loss of gold and turned to the United States for help. For if the United States government were to inflate American money, Great Britain would no longer lose gold to the United States. In short, the American public was nominated to suffer the burdens of inflation and subsequent collapse in order to maintain the British government and the British trade union movement in the style to which they insisted on becoming accustomed.⁷

As Benjamin Strong, chairman of the NY Fed, wrote in a letter quoted by Rothbard:

the burden of this readjustment must fall more largely upon us than upon them [Great Britain]. It will be difficult politically and socially for the British Government and the Bank of England to face a price liquidation in England . . . in face of the fact that their trade is poor and they have over a million unemployed people receiving government aid.

Britain sought to ease the pressure on its pound by convincing the US to engage in expansionary monetary policy, under the pretext of providing global liquidity. By devaluing the dollar next to gold, the US stopped the drain of gold from Britain to the US, and thus reduced the pressure on the pound. To further protect the pound, the Bank of England dumped some of its pound reserves on other countries that needed to use its clearance

⁷ Rothbard, Murray. *America's Great Depression*. 5th ed., Auburn, AL, Ludwig von Mises Institute, 2000, p. 143.

and settlement mechanisms. Britain and the US arranged for the Genoa Conference in 1922 to try to reestablish a global monetary order around their currencies and gold. "Gold is the only common standard which all European countries could at present agree to adopt"⁸ the conference recommendations wrote.

But returning to the gold standard was very difficult when the Bank of England, still the center of the financial universe, was yet to resume redemption of its notes into gold. Instead, the US and the UK attempted to introduce a gold exchange standard, modeled on the monetary arrangements that had prevailed in some Asian countries before the War, whose abuse was what had gotten the Bank of England into a gold shortage at the eve of the War.

In essence, global central banks would deposit gold at the BoE and Fed, and use their international settlement network to add salability across space to their gold. This gave the Bank of England and the US Federal Reserve significant leeway in going off the gold standard precisely because other countries needed their financial infrastructure for international trade settlement, as will be discussed in more details in Chapter 7.

As American inflation devalued the US dollar, the US also provided loans to Britain, and international central banks acquired large amounts of sterling reserves, it became feasible for the Bank of England to restore some form of gold redemption in 1925. There was no return to the gold standard, but instead, the introduction of a new variety of it: the gold bullion standard. Under this standard, the Bank of England only offered redemption of standard Good Delivery gold bars, of around 400 ounces of gold. Bank notes were no longer redeemable in gold, and the mint denied

8 Kemmerer, Edwin. *Gold and the Gold Standard: The Story of Gold Money, Past, Present and Future*. New York, McGraw-Hill, 1944, pp. 163-4.

access to the public. The Bank of England had effectively gone off the gold standard for the majority of the population, and the value of the pound was less tethered to its supposed gold backing than before the War.

But while people could no longer redeem their bank notes for gold, they could still sell their gold abroad for a premium over the rate they would have received from the Bank of England. Perversely, by devaluing gold, the Bank of England had subsidized the precious metal's exit from British shores. More inflation was needed to prevent the drain of gold from Britain, as detailed in *Rothbard's America's Great Depression*.

That inflation set in motion the familiar business cycle. As the inflation subsided in late 1928, the stock market crashed in late 1929, and the boom of the 1920s gave way for the bust of the 1930s. This pattern of bubbles and collapses, the endless cycles of boom and bust, became a regular feature of the fiat standard worldwide, to the point that modern economic textbooks began to treat this phenomenon as if it is an inherent part of a normal market economy, something as normal and inevitable as the cycles of the seasons.

The depression and the inflation to counter it made the pressure on the pound unbearable. The last pretense of maintaining the prewar gold parity was finally dropped in 1931, as the pound was devalued by 25%. One wonders just how different history would have been had the bank performed this devaluation in 1920, allowing the British market to return to the solid gold footing and full redemption with stricter limits on inflation.

Throughout the inflationary 1920s and during the crisis of the 1930s, the US government engaged in active fiscal and monetary expansionism to ward off the collapse of its banking system and economy. But such policies were not possible with the dollar redeemable for gold at the prevalent rate of \$20.67 per troy ounce. In 1934, President Roosevelt ordered the confiscation of Americans' gold in 1934, buying it from the public at \$35, effectively devaluing the dollar by 43%. Less than two

decades after Britain had set the fiat standard by taking hard money from the hands of its citizens and giving them fiat tokens instead, the US followed Britain's lead.

This was the fiat standard protocol installation, and the whole world copies it: confiscate or restrict the movement of gold, suspend redemption, increase the supply of paper notes, and try to get other countries to hold your currency as reserve. The US did it best.

The suspension of gold redemption and endless amounts of government-held fiat combined to extend the Great Depression while also giving rise to a bureaucratic monster that lived endlessly off inflation. The flow of gold from Europe to the US continued through the 1930s and 1940s, and after the second world war ended, the US was in a monetary league of its own, with gold reserves that dwarfed other nations, and the world's most important international payment network. The new monetary reality was enshrined into the architecture of the nascent global financial system in 1946 with the signing of the Bretton Woods agreement, which returned the world to a gold-exchange standard similar to the one Britain had deployed to its colonies, the same system Britain abused to leave itself in the precarious liquidity position that started this entire sordid history.

The new global monetary system was built around the US dollar, which only other central banks could redeem for gold. Americans were still prohibited from owning gold, and most other countries imposed restrictions on the metal's ownership and trade. With all the extra gold, and the ability to export dollars to the rest of the world, there was very little restraint on the capacity of the US government to spend in the post-war years. The military-industrial complex US President Dwight D. Eisenhower warned of in his farewell address secured itself a continuous trickle of global war to harvest profits from the fiat spigot. FDR's New Deal welfare programs grew in the 1950s and metastasized in 1960s under Lyndon B. Johnson's so-called "Great Society." The world still bought dollars

because they needed them, and there was no reason for Americans to suspect a liquidity problem. But, just like England in 1914, the late 1960s placed the US in a gold crunch. European central banks moved to redeem their increasingly inflated hoards of US dollars for hard gold.

On August 15, 1971, President Nixon delivered the “Nixon shock,” a series of government edicts nominally aimed at containing rising inflation and unemployment. Nixon said the following in a nationally televised broadcast:

The third indispensable element in building the new prosperity is closely related to creating new jobs and halting inflation. We must protect the position of the American dollar as a pillar of monetary stability around the world.

In the past 7 years, there has been an average of one international monetary crisis every year. Now who gains from these crises? Not the workingman; not the investor; not the real producers of wealth. The gainers are the international money speculators. Because they thrive on crises, they help to create them.

In recent weeks, the speculators have been waging an all-out war on the American dollar. The strength of a nation's currency is based on the strength of that nation's economy--and the American economy is by far the strongest in the world. Accordingly, I have directed the Secretary of the Treasury to take the action necessary to defend the dollar against the speculators.

I have directed Secretary Connally to suspend temporarily the convertibility of the dollar into gold or other reserve assets, except in amounts and conditions determined to be in the interest of monetary stability and in the best interests of the United States.

Now, what is this action--which is very technical--what does it mean for you?

Let me lay to rest the bugaboo of what is called devaluation.

If you want to buy a foreign car or take a trip abroad, market conditions may cause your dollar to buy slightly less. But if you are among the overwhelming majority of Americans who buy American-made products in America, your dollar will be worth just as much tomorrow as it is today.

The effect of this action, in other words, will be to stabilize the dollar.

Now, this action will not win us any friends among the international money traders. But our primary concern is with the American workers, and with fair competition around the world.⁹

Nixon's prognostications and guarantees were off the mark; prices skyrocketed over the coming decades. Instead of stabilizing, the dollar collapsed in value and the new system of international partial barter, unhinged from its golden anchor, would turn money trading into a lucrative career and gigantic industry. Even though the US Treasury suspended gold redemption, it committed to maintaining the US dollar peg to gold at a certain level. But that sound money mirage only lasted until 1973. It was at that point that the cost of living began to climb, and fast. Chapters 9 and 11 examine the long-term impacts of the increase in prices of food and energy.

In summation, the Bank of England effectively went off the gold standard in 1914, and only returned in 1925 on a gold bullion standard, which it

9 Nixon, Richard. "The Challenge of Peace." Address to the Nation Outlining a New Economic Policy, 15 August 1971.

abandoned in 1931. The US abandoned the gold standard in 1917 but restored it in 1922 and abandoned it again in 1934. Britain and the US adopted a gold-exchange standard starting in 1922 and abandoned it in 1971, to go on a fiat dollar standard. Since 1914, both currencies have lost more than 95% of their value next to gold. The fiat standard installation process has been a long one, but it has had these hallmarks: gold confiscation, price rises, price controls, central planning, inflationary credit expansion, booms and busts, and the aspiration to export inflation by trying to dump fractionally backed currency on foreign regimes.

The fiat standard was not the design of an engineer. It was instead the desperate solution which central banks found for their looming insolvency, the inevitable geopolitical outcome of a 60-year-long marriage of politics and money. The history of fiat is the history of government-run financial institutions managing defaults, not a technology that was consciously designed primarily to provide sound money or payment transfers. Central banks the world over would closely follow the prototype set by Britain and the US as they too would default on gold and force the use of their fiat.

The process that had started in 1914 had been practically completed by 1973. A century after its genesis, and half a century after it took on its final operational form, it is now possible to pass judgment on this monetary standard. The first section of this book explains the operation of the fiat monetary standard, while the second section examines the economic, political, and social consequences of the universal adoption of the fiat standard, while the third section examines what the rise of bitcoin means for fiat.

3. Fiat Technology

As concluded in chapter 2, between 1914 and 1971, the global monetary system gradually and haphazardly moved from the gold standard to the fiat standard. Governments effectively took over the banking sector everywhere, or depending on who you ask, the banking sector took over governments. Details of who wore the pants in this relationship are of no concern to this book, which analyzes the spawn of this marriage: fiat. Like *The Bitcoin Standard*, this book is focused on exploring the characteristics of its subject monetary system as demonstrated in practice, eschewing a detailed historical account of its development.

A good functional study of fiat allows us to posit this definition: Fiat is a compulsory implementation of debt-based centralized ledger technology monopolizing financial and monetary services worldwide. As illustrated in the previous chapter, the fiat standard was born out of the need for governments to manage their de facto default on their gold obligations. It was not consciously designed to optimize the user experience of currency, transactions, and banking. With this in mind, this chapter takes a closer look under the hood of the monetary technology powering most of the world's trade today.

Contrary to what the name suggests, modern fiat money is not conjured out of thin air through government fiat. Government does not just print currency and hand it out to a society that accepts it as good money. Modern fiat money is far more sophisticated and convoluted in its operation. The fundamental engineering feature of the fiat system is that it treats future promises of payment of money as if they were as good as present money, so long as they are issued by the government, or an entity guaranteed a lending license by the government.

In the bitcoin network, only coins that have already been mined can settle transactions. In a gold-based economy, only existing gold coins can be used to settle transactions. In both cases it is possible for a seller to hand over their present goods in exchange for a promise of future bitcoin or gold, but it is a risk they take personally, and if the buyer fails to provide the coins, the buyer gets to keep the good and the bitcoin. With fiat, government credit allows nonexistent tokens from the future to be brought to life when the loan is made, allowing the borrower and lender to both have access to the same financial resources.

Having been born out of government default, the essential characteristic of the fiat standard is that it uses the decree of government and its monetary proxies as the token of value on its monetary and payment network. Unlike with a pure gold standard or with bitcoin, the supply is not a set objective number of units being traded between network members. The units are ephemeral, constantly being created and destroyed, and their quantity is dependent on a subjective choice of which imperfect definition of money one uses, making it virtually impossible to obtain an objective agreed upon measure of the supply of money, or to audit the supply, as is the case with bitcoin. Since government can decree value on the network, it effectively makes its own credit money. As government backs the entire banking system, this makes all credit issued by the banking system effectively the government's credit, and so part of the money supply.

Blurring the line between money and credit makes measuring the supply practically impossible. In a payment system like gold or bitcoin, only mature money (or money of full maturity, meaning money that does not

have a future period of maturity at which it acquires its full liquid value) can be used to settle payments and debts. Under a fiat system, money that has not matured, and will only do so in the future, can be accepted as a payment, so long as it is guaranteed by a commercial entity that has a lending license.

At any given point in time, any financial institution with a lending license is able to bring new fiat tokens into existence and use them for meeting its financial obligations, or those of the borrower. When a client takes out a \$1,000,000 loan to buy a house, the bank does not take an already existing mature \$1,000,000 from its existing cash reserves, or from the balance of a depositor at the bank. It will simply issue the loan and create the dollars that are used to pay the seller of the house. These very dollars had not existed the moment before the loan was issued, and their existence is predicated on the borrower fulfilling their end of the bargain and making regular payments in the future.

The house buyer's promise to repay the bank the loan in the future allows the bank to issue fiat tokens which can be paid to the home seller in the present. No present goods are used in the home purchase; no saver had to set the tokens aside to give to the borrower to pay the house seller. The present good of the house is handed to the borrower without the borrower having to offer a present good in exchange. Nor is the house seller granting the credit to the borrower and taking the risk of default. The credit is granted by the bank, and the risk is ultimately borne by the central bank guaranteeing the bank, the loan, and the currency. Had the house seller granted the credit, he would be taking on the risk of default, and he would be giving up his present goods willingly, affecting nobody else. But by utilizing the fiat standard, the house seller receives his payment in full upfront, and the buyer receives the house in full upfront. Both parties walk away with present goods they can use in full, even though only one of these goods existed before the transaction takes place. New fiat tokens were created to allow this transaction, and to defer the risk of default onto all holders of the currency, and society at large.

If it were to be likened to bitcoin's operation, we could say that the fiat network creates or destroys an amount of new tokens with each block

equal to the amount of lending that has taken place, minus the amount of loans repaid and defaulted on. Rather than a set new number of coins being added with each block, as with bitcoin, the number that gets added in each fiat time period is the net result of newly issued debt, which can vary widely and could be of positive or negative value.

All three parties involved in this transaction are happy, so can such a system survive on the free market? This system appears favorable for the buyer, who is able to buy a home without having to pay the full price upfront. It appears favorable to the seller because it finances more potential buyers and bids up the price of their home. It also appears favorable to the bank, which can mine new fiat tokens at roughly zero marginal cost every time a new lender wants to buy a house. But it only works by externalizing the risk to society at large, protecting the buyer, seller, and bank from default by having the government currency holders effectively take the loss through the inflation of the money supply. The sacrifice of the present good that allows both to spend can only come at the expense of the currency being devalued.

Should a fiat system coexist with a hard money system in a free market, one would expect the rational investor would prefer to hold their wealth in the harder money which cannot be debased to finance credit. But even without the rational self-interest of the investor; the dynamics of inflation make it that a currency that is easily devalued will lose value over time next to the harder currency, and so, inevitably, in the long term, the majority of economic value will collect in the harder currency. But by monopolizing the payment networks necessary for the modern division of labor, governments can force currency holders to bear that cost that risk for significant periods.

Network Topography

The fiat network is comprised of around 190 central bank members of the International Monetary Fund, as well as tens of thousands of private banks, with many physical branches. At the time of writing, the fiat network has achieved almost universal adoption, and almost everyone on earth is either dealing with a fiat node, or handling fiat paper notes issued by such nodes. The fiat network is not voluntary and not optional; it can be best likened to mandatory malware. With the exception of a few primitive and isolated tribes yet to have fiat enforced upon them, every human on earth is assigned to a regional node where he or she must pay his or her taxes in their local fiatcoin. Failure to pay tax with the local fiatcoin can result in physical arrest, imprisonment, and even murder. This compulsion is an important driver for adoption which bitcoin and gold lack.

The fiat network is based on a layered settlement system for payment clearance. Individual banks handle transfers between their clients on their own balance sheets. National central banks oversee clearance and settlement between banks in their jurisdiction. Central banks, and a few hundred international correspondence banks oversee clearance across international borders on the SWIFT payments network. The fiat network utilizes a highly-efficient centralized ledger technology with only one full node required to validate and decide the full record of transactions and balances. The entity is the United States Federal Reserve, under the influence and supervision of the United States Government. "The Fed," as it is known to fiat enthusiasts, is the focal and central point of the fiat network topology. It is the only entity that can invalidate any transaction and confiscate any balance from any other fiat node. The Fed controls the SWIFT payment network and can prevent entire nations from joining this payments system and settling trades with other nations.

The fiat network's base layer operates using a native token of debt denominated in United States Dollars. While it is common for fiat enthusiasts to think and talk of the network as having a variety of tokens, each belonging to a different country or region, the reality is that all

secondary layer tokens are merely derivatives of the US dollar whose value depends on their backing in the US Dollar, and can best be approximated as the value of the US dollar with a discount equivalent to the country risk. For a variety of historical, monetary, fiscal, and geopolitical reasons, it has not been possible for any of the tokens to appreciate significantly against the US dollar in the long term. For all practical intents and purposes, national central banks managing their currency can either maintain its exchange rate with the dollar, or devalue it faster than the dollar.

The network's native token, fiatcoin, is mined through an arcane, centralized, manual, risky, and haphazard process called lending. Obtaining a lending license from a central bank allows a miner (a financial institution) to issue debt, which results in the creation of new fiat tokens on the miner's balance sheet. The difficulty of obtaining these lending licenses, and the difficulty of issuing new loans are determined through the complex web of rules and regulations generated by national governments, national central banks, the Bank of International Settlement, and the International Monetary Fund.

Unlike with bitcoin, there is no algorithmic adjustment to ensure the supply remains within known and clearly auditable parameters. With such a primitive mechanism and without the digital and energy assurances of Proof of Work mining, the supply of fiatcoins continues to expand and contract globally at haphazard rates, with disastrous consequences. While the total supply of fiatcoins is unknown and unknowable, Chapter 6 discusses the process of fiat mining in more detail.

As a centrally-planned system, the fiat standard does not allow for the emergence of a free market in capital and money, where the interest rate, the price of capital, is determined based on supply and demand. The supply is ultimately determined by the extent of lending, which is in turn shaped by the interest rate and lending policy set by the federal reserve. The Federal Reserve System's full fiat node holds periodic meetings for its central planning committee to decide the interest rate it charges the

nodes it deals with, and all other interest rates derive from this and rise as they get further away from the central node.

While a small percentage of fiatcoin is printed into paper bearer instruments with local insignia, the vast majority of fiatcoin is digital, stored on the central node's ledger, or on the ledgers of the peripheral nodes. The digital fiat network offers limited possibility for final settlement, as all balances are tentative at all times and partial nodes, or the full node itself can revoke or confiscate any balance on any ledger at any point in time. Withdrawing fiat in paper notes is one way to increase the finality of settlement, but that is also not final because the notes can be easily devalued by local fiat nodes, or the Fed's full node, and because individual paper notes can always be revoked by the central bank.

The Underlying Technology

The core functionality of the fiat standard lies in the functions of the network's nodes. Under the fiat protocol, each central bank has these four important functions:

1. A monopoly on providing the domestic fiatcoin and determining its supply and price
2. A monopoly on clearing international payments
3. A monopoly authority for licensing and regulating domestic banks, holding their reserves, and clearing payments between them.
4. Lending to the national government by buying government bonds

To perform these functions, each central bank has a cash balance, commonly referred to as the International Cash Reserve Account. This account is denominated in the base-layer fiat token, which has the highest spatial salability, as it can be used to perform settlement between national central banks. In what is arguably the most catastrophic engineering decision in all of human history, this cash balance is used to perform four

simultaneous functions, the intermingling of which is at the root of all financial and monetary crises of the past century. These functions are:

1. Backing the local currency with hard currencies
2. Settling international trade
3. Backing all bank deposits
4. Buying government bonds to finance government spending

Each of these tasks is discussed in more detail below, before the implications of their co-mingling are examined.

1- Backing the value of the national currency

There has never in history been an example of a form of money that emerged purely through government fiat. While statist economists like to speak of the state's ability to decree what money is, central bank reserves' existence strictly debunks that. No government is able to decree its own debt or its own paper as money without holding other assets it cannot print in reserve, and using them to make a market in its paper and debt obligations. Even if a government were to force its people to accept its paper at an artificial value, it would not be able to force foreigners to accept it, and so if its citizens want to trade with the world, the government must create a market in its currency in other currencies. Unless the government accepts foreign currencies in exchange for its own, then that market cannot emerge and its own currency is rendered worthless since nobody would want to hold it when they could hold other, harder currencies which have more salability across space.

Even through the century of fiat and supposed gold demonetization, central banks have massively increased their gold holdings, and they continue to add to them at an increasing pace. The fiat standard's main reserve currencies are used to settle trade between central banks, but evidently central banks themselves don't believe they have demonetized gold, and don't trust in their ability to hold value into the future, and so they continue to include increasing quantities of gold in their reserves. All monies that exist today are issued by central banks that hold gold in

reserve, or central banks that hold in reserve currencies issued by central banks that hold gold. This not only illustrates the absurdity of the state theory of money, it also illustrates the fundamentally unworkable nature of political money at an international level. If every government issues its own money, how can they trade next to one another, and at what value? Why would anyone accept the money of a foreign country?

All central banks back their currencies with international reserve currencies they cannot print. For most countries, this is the US dollar, and for the US, it is gold. At the end of the third financial quarter of 2020, the dollar constituted around 51% of global reserves, the Euro 17%, gold 16%, the British pound 4.8%, the Japanese Yen 3.8%, and the Chinese Yuan 1.7%, and other currencies had smaller shares. These currencies are used predominantly in international trade transactions, where the dominance of the dollar is even more pronounced. On the foreign exchange markets, the dollar is a part of 88.3% of all foreign exchange market daily trades¹⁰.

The dollar is the base layer token of the world fiat network, and national currencies are derivatives of it. There are in total 180 national currencies in the world today, and the market value of each can best be approximated as the value of the US dollar plus country risk. No country has had its currency appreciate next to the US dollar for any appreciable period of time. Other than the dollar and euro, all other national currencies are used mainly domestically, on the secondary national fiat banking layers.

10 "Triennial Central Bank Survey Foreign exchange turnover in April 2019"(PDF). Bank for International Settlements. 16 September 2019. p. 10. Retrieved 2019-09-16.

Composition of central bank reserves

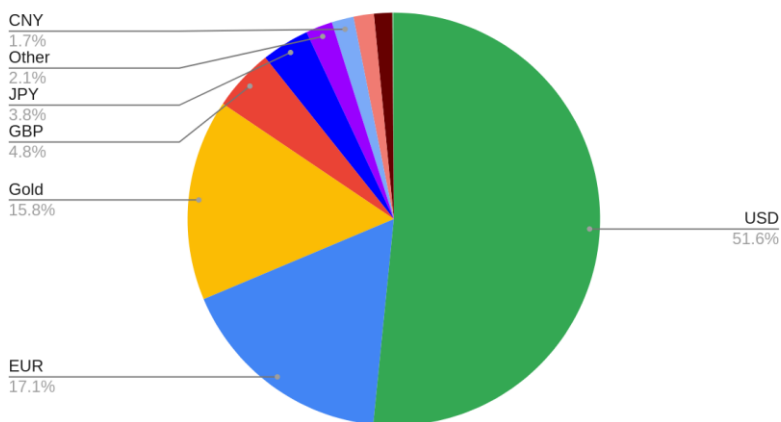


Figure 2: Central Bank and Foreign Reserves¹¹

2- The international cash account

Central bank reserves also settle the international current account (which includes international trade transactions) and the international capital account (which settles international movements of capital). All international payments to and from a country have to go through its central bank, allowing it a strong degree of control over all international trade and investment. Central bank reserves are enriched when foreign investment flows into the country or exports increase, but reserves are depleted when foreign investment leaves the country or imports increase. As individuals across national borders seek to transact with one another, they must necessarily resort to a system of partial barter, as Hoppe termed it, wherein they need to buy a foreign currency before buying the foreign good. This has led to the emergence of the enormous foreign exchange industry, which only exists as an artificial middleman to profit

11 Sources: Gold.org, and “Currency Composition of Official Foreign Exchange Reserves.” International Monetary Fund, 31 Mar. 2021, data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4&sId=1408243036575.

from the arbitrage opportunities generated by the ever-shifting values of national currencies. This also effectively makes the government and central bank a third party in every international transaction involving the citizens of the country with foreigners.

By having the national reserves of the country also used for the settlement of international trade, international trade is held hostage to the central bank's successful management of its currency. Should the creation of debt increase quickly, the value of the national currency declines next to international currencies. If it tries to stabilize the value of its currency, the central bank would have to start losing its international reserves, compromising its ability to settle trade for its citizens.

3- Bank reserves

Central bank reserves are what ultimately back the reserves of the private banking system. The essence of central banks was to be the entity where individual commercial banks would hold part of their reserves in order to settle with each other without having to move physical cash between their headquarters. With a fractional reserve banking system, the central bank also uses its reserves to provide liquidity to individual banks facing liquidity problems. This means that credit expansion by the banking system that leads to a boom and then an inevitable credit contraction will be remedied by the central bank using its reserves to support illiquid financial institutions, in effect increasing the money supply. Although the banking system in each country primarily deals with the local currency, the central bank nonetheless makes a market in its currency and foreign currencies, and when its own currency's supply increases from credit expansion while the foreign reserves remain unchanged, the currency would be expected to depreciate compared to foreign currencies.

4- Buying government bonds

The modern central bank and government song-and-dance routine adopted the world over involves the central bank using its reserves to

purchase government bonds, thus financing the government. Central banks are the main market maker in government bonds, and the extent of a central bank's purchase of government bonds is an important determinant of the value of that national currency. As a central bank buys larger quantities of its government's bonds the value of the currency declines, since it funds this purchase by inflating the money supply. As time has gone by and monetary continence has continued to erode, central banks today do not just buy government bonds but are also engaged in the monetization of all kinds of assets, from stocks to bonds to defaulted debt to housing and much more.

The intermingling of these four functions in the hands of one monopoly entity protected from all market competition is ultimately the root cause of the majority of economic crises afflicting the world. It is easy to see how these four functions can conflict with one another, and how a monopolist will have the perverse incentives to look out for their own interest at the expense of the long-term value of the currency and thus the wealth of the citizens.

Maintaining the value of the currency would arguably best be served by using hard assets as reserves, in particular gold. But the second goal, settling payments abroad, is only doable with the US dollar and a handful of government currencies used for international settlements. So central banks' first conflict is between choosing a monetary standard for future needs vs one for present needs. This dilemma of course would not exist in a global homogeneous monetary system such as a true gold standard, since gold would offer liquidity across the world today, as well as into the future.

As governments ultimately control central banks, in spite of the constant official protestations to the contrary, it is quite possible for them to lean on the central banks to purchase bonds, allowing for more government spending. As a result, the local currency's money supply is inflated, and

selling pressure for it increases compared to international currencies. Governments are also likely to lean on their central banks to engage in expansionary monetary policy to "stimulate the economy", which similarly inflates the money supply and brings its value down compared to international currencies. As governments attempt to centrally-plan their economies using inflation, they do so while endangering their foreign reserves: individuals start looking to sell the local currency for harder currencies, which creates more selling pressure on the local currency compared to the international currency; this forces the central bank to sell some of its international reserves. These individuals will also seek to send their newly purchased international currencies abroad to be invested in foreign countries, which could then lead their government to impose capital controls to stop that flow in order to maintain its foreign reserves.

Similarly, as these individuals expect the value of their national currency to decline, they are also more likely to purchase durable goods rather than hold on to cash balances. This can mean a lot of imports of expensive foreign goods, which also depletes the central bank's foreign reserves. Consequently, the government is likely to retaliate with trade barriers, tariffs, and subsidies. The rationale for trade barriers is to discourage the local population from converting their local currency to international currency and sending it abroad. The rationale for tariffs is to reduce the flow of foreign exchange abroad, and to force importers to hand over part of their foreign exchange to the government as they import. And the rationale for export subsidies is to promote local exporters to increase the inflow of foreign reserves. We can now understand how the collapse of the global inflationary bubble of the 1920s, and the presence of a global system of national reserves used along with gold, was ultimately one of the main drivers of protectionism in the 1930s, which worsened the depression, and fueled nationalism.

The last two points are extremely important for the developing world because they are enormously significant to the only three drivers of economic growth and transformation: capital accumulation, trade, and technological advancement. As governments restrict the ability of

individuals to accumulate or move capital and goods, it becomes harder and harder for individuals to engage in capital accumulation, trade and specialization, and to import advanced technologies.

The global monetary system built around government monopoly central banks effectively puts the entirety of the local capital markets and all imports and exports under government control. Government is thus able to dictate what can enter and exit the country, and who can accumulate how much capital, through its control over the banking sector. The fact that it can always squeeze import/exports and capital markets for foreign exchange revenue makes the government a very attractive borrower for international lending institutions. The entirety of the private economy can now be used as collateral for the government to borrow from the global capital markets.

At its essence, the fiat standard destroys savings and planning for the future in order to operate a payments network. As a thought experiment, imagine what would happen to a country that adopted a fiat standard before accumulating significant industrial capital. This is the developing world of today.

4. Fiat Mining

Chapter 4 of *The Bitcoin Standard* discussed government money from a quantitative perspective, looking at its supply growth rates over the previous decades to compare with commodities and bitcoin. As a measure of the salability across time, the supply growth rate of fiat money in the second half of the twentieth century was found to be far higher than that of gold and silver, on average. But *The Bitcoin Standard* did not delve too deeply into the details of the operation of the fiat monetary system, how it produces new monetary units, and how they are destroyed. This chapter will begin by explaining the dynamics of creation of fiat money through the process of lending, and how this process results in erratic and unpredictable supply growth. We will then examine how this supply translates to price increases, and what it means in the long-run.

Lending as mining

While a small percentage of a country's currency is in fact in the form of physical cash, the majority exists in digital form. That money is created wherever a financial institution backed by the central bank lends. New

money is not created when currency bills are printed, but rather whenever new debt is issued. Bill printing just turns some of the already existing currency reserves from digital to physical.

Anyone who finds a way to get other people into debt is not just profiting from a positive interest rate return. They are also bringing new money into existence. Getting others into debt is the fiat standard's version of gold or bitcoin mining, and the most important problems with the fiat standard ultimately result from the problem of restraining the generation of credit. Whereas gold's indestructibility and scarcity combine to give it a reliably high stock-to-flow ratio, and whereas bitcoin's consensus rules and difficulty adjustment have so far succeeded in reliably and predictably controlling its emission rate political restraints have only sporadically, temporarily, and unreliably succeeded in controlling debt creation underwritten by the central bank.

Rai stones had Captain O'Keefe bringing in superior foreign technology to flood the market with new supplies. Seashells had modern industrial boating inflate their supply and destroying their monetary role. Copper, silver, and gold have their miners constantly trying to increase their supply, with the natural and chemical properties of gold serving as the natural restraint on the ability to expand the supply. Bitcoin has its miners trying to mine as much bitcoin as possible, but they are successfully constrained by the difficulty adjustment and a network of thousands of nodes worldwide enforcing Nakamoto's consensus parameters. Government money, on the other hand, has politicians and bankers diligently finding new excuses for extending credit. Various political, constitutional, and intellectual safeguards against inflation have been mostly ineffective in restraining the growth of lending. The most effective restraint against growth in credit spiraling out of control has been credit money's inevitable deflationary recession and the attendant collapses in the money supply.

Inflation, Deflation, and Reflation

Since lending is the equivalent of mining new fiat tokens, everyone understandably has a strong economic incentive to issue debt. Financial institutions stand to make a profit from creating new money, and a lending license is very highly sought after. Politicians and bureaucrats also face strong incentives to encourage lending, as increased lending leads to increased investment and spending, and in the simplistic Keynesian economic model dominant at the highest levels of politics and academia, increasing these numbers in the short term is always good, and always the first solution to face any economic problem. The short-term economic boom from credit expansion is all that a politician cares about, as the long-term consequences will likely be for their successor to deal with, and can always be blamed on convenient present scapegoats rather than obscure credit policy decisions in the past.

In 1912, Ludwig von Mises published the *Theory of Money and Credit*, a foundational text in economics whose central conclusion Mises summarized as "expansion of credit cannot form a substitute for capital". Since 1912, all that the fiat standard has provided are object lessons for future economists to point to in support of Mises' contention. Capital consists of economic goods that can be used in the production of other economic goods. Money can be traded for capital goods, but it cannot substitute for or supplement them. The stock of capital that exists in any society at any point in time can only be increased by deferring the consumption of existing resources. It cannot be increased through the production of more claims for it.

Instead of accumulating capital from savers and lending it to borrowers, fiat banking just creates new claims on existing capital and hands them out to borrowers. There is no longer a need for people to save; and there is no longer any real scarcity of capital for people who are politically connected. There is also no capital for people who are not connected. Government fiat allows this form of banking to survive when it wouldn't on the market.

All that can be achieved from credit expansion is to increase the perception of wealth in the minds of entrepreneurs, whose ability to acquire financing drives them to think they are able to secure the capital resources they need. But since more credit is being produced without savings having deferred consumption, the capitalists are in fact beginning a bidding war for fewer capital resources. As the bidding war escalates, the profitability of many of the capitalists' projects evaporates, and their projects declare bankruptcy, defaulting on the credit they had received from the banks.

As these defaults pile-up at the bust stage of the business cycle, the money supply begins to contract, threatening the solvency of the financial system. Should the liquidation of insolvent businesses continue, many of the banks that lent to them would necessarily go bankrupt. But since banks have a monopoly on the vital economic functions discussed in Chapter 3, a collapse in banks is a catastrophe that politicians and the public would do anything to avoid.

Even perfectly solvent and profitable businesses will no longer be able to operate in such a situation because their financial counter-parties are compromised with liquidity crises. The profitable business will be unable to meet its own financial obligations when its money is held by an insolvent or illiquid institution. Given that all banks are operating under the same monetary policy set by the same central bank, there is no escape for healthy businesses who want to use banks for payments and have no interest in engaging in inflationary fiat shenanigans. It is not legal to set up a healthy bank with 100% reserves, as will be discussed in Chapter 6. You may only use the payment system of banks engaged in fraudulent inflation underwritten by the central bank.

Given the systemic and pervasive influence of the central bank over all banks allowed to operate in a country, the fiat standard leaves the entirety of society's wealth and monetary and financial system vulnerable to the central bank's reckless monetary central planning, and also vulnerable to the shenanigans of individual financial institutions. One bank engaging in fraud and facing a bank run will have repercussions not just on its own

clients, but also on other banks and their clients. The fact that everyone is forced to use the same inflationary monetary asset leaves everyone vulnerable to its failing, and makes the financial system as weak as its weakest link.

The result of the business cycle is that the fiat standard also has a deflation problem as well as the inflation problem. As bankruptcies increase, businesses default on their loans to bank. As these assets are erased from the bank's balance sheet, the money supply contracts, along with the ability of the bank to create new credit to increase the supply further. As these bankruptcies increase, liquidity dries up across the banking sector, causing even further collapses in the money supply and an inability to lend. As the money supply collapses, and the economic situation deteriorates, the result is a decline in prices, employment, consumption, and production; in other words, the deflationary recession stage of the business cycle. The money supply is evaporating, and individuals and firms' savings and cash balances are being wiped out even if they are perfectly solvent and profitable. This collapse leads to a clamor for the central bank and government to step in and inject liquidity into the financial system.

The reflationary logic is seemingly compelling. People's livelihoods are being destroyed through no fault of their own, just because their financial institutions and counter-parties in the financial system became insolvent. If the central bank already has reserves for the banks, and they are able to extend credit without causing a perceptible decline in the value of the currency, it would be cruel to just let these businesses and livelihoods get ruined. Since the central bank has the ability to create liquidity at will, by fiat, then relieving the liquidity crunch would prevent the destruction of the lives of many. It would not be entirely unfair for businesses, large and small, to lobby very hard for these kind of liquidity provisions, since it is the monetary policy of the monopolist central banks that is the ultimate cause, and none of these businesses had a choice in opting into it. The opposition to deflation and support for reflation is also a sure career-maker in politics and academia, because it naturally finds large supporting constituencies among citizens and businesses.

A significant number of the fiat economists have built entire careers and appointments at the Federal Reserve from emphasizing this point, which, as the reader can imagine, is exceptionally popular with the governments, banks, and central banks. Milton Friedman's *Monetary History of the United States*¹² was an elaborate labor of statistical huffing and puffing whose only piece of actionable advice was not to allow the money supply to contract during banking crises. The central conclusion was that the great depression was caused by the Federal Reserve not reflating the monetary system after the 1929 stock market crash. There is no mention of the causes of the crash in the expansionary monetary policy of the 1920s, or in the highly unstable nature of fractional reserve banking on top of an elastic currency not redeemable for gold. Former US Federal Reserve chair Ben Bernanke wrote his PhD on this episode as well, sharing Friedman's conclusion.

After 100 years of the fiat standard, a consensus has developed between academics and policy-makers on the importance of preventing monetary contraction at all costs. But this consensus is built on the conceptual quicksand of not considering how the credit inflation itself set the scene for the deflationary credit collapse. In other words, this consensus on the treatment has to ignore the possibility of prevention, and has to also ignore long-term impact of reflation: the fueling of future bubbles. And so the fiat credit money system trudges along from one cycle to another, inflationary bubble and deflationary collapse following each other like the seasons. Each cycle misallocates much of the capital stock of the society into unprofitable ventures that must be liquidated, with many lives upended in their wake.

While these deflationary episodes are widely-known for their terrible economic consequences, another oft-ignored implication of these recessions is that they are a significant check on the growth and expansion of the money supply. Without these episodes purging large chunks of the money supply periodically, the process of currency

12 Friedman, Milton, and Anna Schwartz. *A Monetary History of the United States, 1867—1960*. Princeton University Press, 1963.

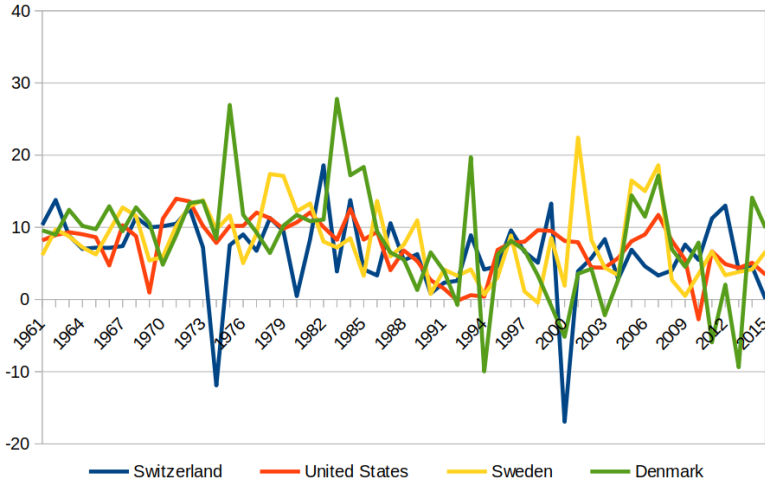
devaluation would arguably be proceeding at a much faster pace. These crises are a large reason why hyperinflation is not such a common occurrence in fiat monetary systems. Hyperinflation is not very likely in a fiat monetary system because the creation of credit is to a significant extent self-correcting. While there were around sixty hyperinflationary episodes in the past century, according to the work of Steve Hanke¹³, and these episodes are devastating, there is no denying that these episodes have been the exception rather than the norm of the past century. The norm throughout the fiat century has been persistent inflation varying between low and high, with hyperinflation appearing after significant government solvency problems and the resort to monetizing government debt through literal printing of large quantities of paper money.

Fiat issuance

In Chapter 4 of *The Bitcoin Standard*, I discussed the easy nature of national currencies. Looking at data for 167 countries shows the average annual growth rate of the money supply was 32% per year over the period of 1960-2015. Examining data for all countries shows that the lowest average annual growth rate for the entire period belonged to Switzerland, who effectively cheated by being on the gold standard for the first 14 years of data included in this dataset, and achieved an average annual monetary supply growth rate of 6.5% per year. The United States came second with 7.4% per year average annual supply growth. Sweden had the third lowest average annual growth rate at 7.9%, and Denmark the fourth at 8.2%. Of all the countries surveyed with full datasets, these four are the best poster children for low monetary inflation in the fiat standard. Looking closely at their monetary supply growth rate over the period studies, we can see what fiat monetary issuance looks like in the best case scenarios. Relative to other countries, these four not only had the

13 Hanke, Steve, and Charles Bushnell. "Venezuela Enters the Record Book: The 57th Entry in the Hanke-Krus World Hyperinflation Table." *Studies in Applied Economics*, no. 69, Dec. 2016.

lowest annual supply growth rate, but also little variability in the growth rates.



Unlike with bitcoin's perfectly predictable and auditable declining rate of supply growth, and unlike gold's steady growth rate that averages around 1-2% every year, fiat's annual growth rate is highly variable. Even in the four lowest countries, the supply can increase by more than 15% per year occasionally, and can increase at negative rates at times too. The large variability, and the much higher average growth rate than that of gold, is a very important fact with enormous implications.

The deflation phobia of modern economists and policy-makers has extended beyond just worrying about banking collapses, it has progressed to the pathological level where even the natural decline in prices caused by productivity increases is viewed as being economically concerning. There is a huge difference between the deflation caused by recessions, only possible with dysfunctional technologies like fiat, and the benevolent deflation caused by increases in productivity, a healthy, normal, and sustainable feature of a free functioning market system, where the good with the highest stock-to-flow, and the reliably lowest rate of growth is used as money. As the monetary medium grows at the lowest rate of any market asset or commodity, its market price will likely rise next to most

goods over long periods of time. As market participants engage in the production of more goods, the quantities available of all goods are likely to grow faster than those of the monetary metal, which emerged as money because of its hardness, and so appreciates in the long-run against everything else.

Money thus tends to become more valuable in terms of real goods and services, and savers are able to enjoy more goods if they are to defer consumption from today to tomorrow. The decline in prices is a natural market phenomenon resulting from the increase in the production of goods and services. Contrary to decades of fiat economists, this normal decline in prices does not have devastating consequences for society (although it does for their fiat jobs.) The ability of people to buy more goods in the future does not stop them from consuming in the present. Fiat economists are correct in understanding the direction of the effect of moving to harder money, but they betray their deep ignorance of the nature of marginal analysis when they conclude that the reduction in spending must somehow be total, or catastrophic, rather than marginal and beneficial. People will be more likely to hold on to their money if they expect its price to rise, but they will still need to spend in order to survive. Harder money will result in a reduction in present spending, all else equal, but it will lead to more spending in the future.

The best example to illustrate this point is the computer industry, which even under inflationary fiat money produces products which become cheaper very quickly. A 1 MB external hard drive was worth \$3,500 in 1980, but in 2020, it is worth a fraction of a cent. And yet, for forty years of hard drive expanding in capacity and becoming cheaper, people have in fact bought these drives, and they have benefited from them. Many people spent \$3,500 on that hard drive in 1980, but still benefited from its use, even as its price continued to decline into the future. When making a purchase, one does not compare the price of the good to its future expected price, but the price of the good to the entire benefit that can accrue from it. Even if the price of the good were to decline, it can be more profitable to buy it and use it. Every person who buys a phone or laptop does so today even though they would definitely get a much lower

price if they just wait one year. Yet billions the world over buy phones and laptops every year, because they need them in the present, and not just in the future. Life is finite, time preference is positive, people want to enjoy the benefits of production in the present. The harder the money available to them, the more they are likely to delay consumption at the margin, but it cannot eliminate the need or desire for consumption entirely.

We can understand human progress as being intertwined with the hardening of our monetary media. The harder a monetary medium, the less its supply will be inflated, and the more its owner can expect it to maintain its value, or even appreciate over time. The more the money can be expected to hold its value over time, the more reliably an individual can use it to provide for their future self. The more reliably one can provide for their future self, the more they are able to reduce their uncertainty about the future. The less the uncertainty about the future, the less a person discounts the future, and the more they are likely to plan and provide for it. In other words, hard money is itself a driver of lowering time preference. As our money becomes harder, our ability to save increases in its efficiency, allowing us to more easily provide for our future, and encouraging us to become more and more future-oriented.

Throughout human history, monetary competition between all monetary media has progressed to reduce the value of the easier money and increase the value of the harder money, slowly demonetizing the easier moneys, and moving humanity onto harder and harder alternatives. Seashells, glass beads, lime stones, and salt gave way to metals that were hard to produce, and among the metals, the easier to produce and inflate gave way to the harder metals. Iron was demonetized thousands of years ago, copper hundreds of years ago, and silver began to lose its monetary role in the nineteenth century, so that by the early twentieth century almost all of humanity was on a gold standard, able to store the value of its wealth in a money whose supply increases at around 2% per year, and whose value can be reliably expected to appreciate over time.

The introduction of fiat money stopped and reversed this seemingly-inexorable progress toward ever-harder money. The best money available

in the world now has its supply increase by around 7% per year. The ability to save value for the future is diminished, and along with it the certainty of the future. With higher uncertainty and security inevitably follows a rise in the discounting of the future, and higher time preference.

Inflation as a vector

Fiat money enthusiasts maintain a strange obsession with a metric produced by national governments named the Consumer Price Index, which purports to measure the increase in prices. Government-employed statisticians construct a representative basket of goods, and measure the change in the prices of these goods every year. There are countless problems with the criteria for inclusion in the basket, for the way that the prices are adjusted to account for technological improvements, and with the entire concept of a representative basket of goods. The main and fatal flaw of the CPI, however, is that it is to a large degree a mathematical tautology, where the results of the measurement must show little changes by the very nature of the measurement.

Like many metrics used in the pseudoscience that is macroeconomics, the CPI has no definable unit with which it can be measured, which makes measuring it a matter of subjective judgment, not numerical precision. Prices on the market are themselves the result of purchasing decisions, but purchasing decisions are in turn influenced by prices. Neither of these two metrics can vary too much from the other. The price of a basket of goods is not determined by some magical "price level" force, but by the spending decisions of individuals, who can only spend the income they have, regardless of the prices they are able to pay. Purchasing decisions themselves are a result of prices and will be adjusted to reflect changes in prices.

To illustrate the point: imagine you earn \$10 a day and spend them all on eating a delicious ribeye steak that gives you all the nutrients you need for the day. In this simple (and, many would argue, optimal) consumer basket of goods, the CPI is \$10. Now imagine one day hyperinflation strikes the

economy and the price of your ribeye increases to \$100 while your daily wage remains \$10. What happens to the price of your basket of goods? It cannot rise tenfold because you cannot afford the \$100 ribeye. Instead you make do with the chemical shitstorm that is a soy-burger for \$10. The CPI, magically, shows zero inflation. No matter what happens with monetary inflation, the CPI is destined to lag behind as a measure because it is based on consumer spending, which itself is determined by prices. Price rises do not elicit equivalent increases in consumer spending, they bring about reductions in quality of consumed goods. The change in the cost of living cannot be reflected in the price of the average basket of goods because the goods comprising that basket are in turn determined by the change in the price. This is how we can understand that prices continue to rise while the CPI registers at the politically-optimal 2-3% per year level. If you are happy to substitute industrial waste sludge for ribeyes, you will not experience much inflation!

The best treatment and analysis of the topic of inflation I have come across is that of Michael Saylor, CEO of Microstrategy and newly-converted enthusiastic bitcoiner. The key insight Saylor provides¹⁴ is that inflation cannot be measured as a metric, but it can be better understood as a vector. There is no universal inflation rate that measures the increases in prices of all goods and services, as inflation affects different goods differently. If you think of inflation as a vector wherein each good has its own price inflation rate, it becomes far easier to identify the impacts of inflation on individuals and their provision for the future.

Saylor's inflation vector allows us to see how inflation rates vary across goods depending on a few key properties, such as the variable cost of production and desirability. Goods that are abundant, not highly sought-after, and require a low variable cost of production are the goods that witness the least price inflation.

14 Saylor podcast discussion on Stephan Livera podcast, and his podcast discussion with me, TBS podcast 5 from August or so

With modern industrialization and automation driving costs down regularly, these goods are very good at resisting price rises, since their supplies can be increased at relatively little added marginal cost.

Thinking about goods in terms of the variable cost of production that goes into them can show the differences in price inflation across them. Digital and informational goods involve a variable cost of production that is close to zero. As Saylor puts it, if nobody turns up to work at Google tomorrow, their search engine would still continue to work, and the average user would only notice problems later, when they stop making upgrades. The digital goods of the economy are unlikely to experience price inflation, and will instead continue to decline in price as they always have. These are the goods that will have a negative price inflation rate.

Industrial goods which can be produced at scale involve more of a variable cost than digital and informational goods, but they still have a very large percentage of their cost in the original capital expenditure and not in the variable running cost. These goods will experience price inflation to some extent, but it would not be very high. Industrial food is the best example of this. Even through all of the monetary inflation of the past decades, the prices of a can of soda, a box of cereal, or processed foods have increased only very little. Such goods will have a low price inflation rate, in the range of 1-4% per year.

Goods that involve a significant variable cost, such as things involving extensive labor inputs will be more sensitive to price changes than industrial goods. Organically farmed produce will be more sensitive to inflation than industrial food. Fine dining will be more sensitive than automated fast food restaurants. Goods like this will witness higher levels of inflation than digital or industrial goods. As the level of skill involved increases, the scarcity of the labor element increases, and the rate of inflation rises. The cost of hiring highly skilled labor increases much faster than the usual rates quoted in the CPI.

Another gradient along which the inflation vector manifests is scarcity, and this is where the price inflation begins to appear more strongly. Goods which are inherently scarce are the ones where the price inflation is most

manifest. The price of houses will appreciate faster than the price of industrial products, and higher than CPI, particularly as the price of housing is not included in the CPI because of reasons too ridiculous to explicate and debunk. But within houses, it is the most desirable houses whose value will increase the fastest. Property in desirable areas increases at rates that far exceed official CPI measures, and that far exceed properties in less desirable areas. Tuition in the top-ranked universities increases at these rates, along with luxury goods and artwork. Anything that commands some scarcity premium becomes an attractive store of value under fiat, attracting increasing demand. Whereas industrial goods can easily respond to increased demand with increased supply, scarce goods, luxury goods, and status goods cannot increase the supply and end up continuously rising in price. The price inflation rate for scarce and highly desirable assets rise by more than 7% per year.

To add to Saylor's categories, one could also add durability as a metric along which the inflation vector varies. Durable goods are more likely to store value into the future, and thus are more likely to attract store of value demand, and thus appreciate. Perishable and consumable goods will likely have lower price inflation than durable goods.

The most brilliant insight of Saylor on this issue is to pinpoint that the inflation shows up in the cost of purchasing financial assets that yield income for the future. As interest rates have declined, the returns on bonds have declined and the ability of an individual to afford retirement has also declined. The market is effectively heavily discounting today's money in terms of tomorrow's real purchasing power as yields disappear. As the future becomes more uncertain, it is no wonder we witness a palpable rise in time preference.

5. Fiat balances: Universal debt slavery

The bitcoin monetary system has a neat and simple mechanism for managing user balances. Individual users can opt to run a full bitcoin node, which constantly keeps track of all bitcoins and their ownership among bitcoin public addresses. The network measures the exact number of coins at any point in time with impeccable precision, down to the last satoshi (100,000,000 satoshis = 1 bitcoin). Every 10minutes, all network nodes reach consensus on the distribution of coins among all addresses. An individual's ownership of a coin is entirely contingent on their command of the private keys of the address containing the coins, and cannot be revoked by any authority. In the fiat standard, balances are a far more complicated affair, with significant implications for the way users save and borrow.

Four unique characteristics of fiat balances, outlined below, that set it apart from all other monetary technologies. The fourth one will help us understand how the fiat monetary system leads to a preponderance of debt and the destruction of savings.

Unquantifiable

Nobody knows exactly how much fiat exists, and there is significant disagreement over the correct method for calculating the fiat supply. Central banks issue several statistics to measure their money supply according to different definitions, which vary over time and across countries. M0 usually gives the total number of fiat tokens that have been printed into physical paper notes and metal coins, and are in circulation. M1 is a measure of M0 and bank checking accounts, allowing for the calculation of all forms of money available to their owner on demand. M2 adds to M1 all savings deposits and certificates of deposits. This is money held by individuals but which has not reached maturity, meaning it is not liquid enough for individuals to spend in its current form but can be liquidated quickly. M3 adds to M2 money market mutual funds and other large forms of liquid assets.

There is no clear-cut answer on which measure actually constitutes money, as the nature of fiat is to conflate future fiat with present fiat. As discussed in Chapter 3, the essence of the fiat standard is that government-guaranteed entities can transform claims on future money into present money for the settlement of current trades, blurring the line between the two. So it is unclear where one should draw the line between the maturity of monetary instruments when counting them as part of the money supply.

To aid the comparison between metals and bitcoin, this book and *The Bitcoin Standard* utilize M2 as a measure of the money supply. M2 is the broadest consistent measure of money supply growth collected by the World Bank, meaning that it allows us to make international comparisons that are somewhat consistent. The exact quantities of different fiat currencies are not as important for us as their growth rates over the years, and the consistency of the M2 measurement across countries and time allows for better and more consistent comparisons.

Irreconcilable

Unlike with bitcoin, fiat assets cannot be reconciled with their full network issuance. It is simply not possible to run the numbers on fiat. There is no precise way of keeping track of all liabilities, assets, and issuance, which makes financial reconciliation of the overall system impossible. Mining by issuance of new debt is done by fiat, and does not require hard assets to be held as collateral, so there is no hard limit on how much lending takes place and no easy way of keeping track of all issuance taking place across all financial institutions in real time.

Tentative and revocable

Most fiat balances exist on the balance sheets of government-licensed financial institutions, making them at all times revocable by the local fiat node, or the global full node, the U.S. Federal Reserve. If ownership is understood as the ability to command and control something, then one never quite owns fiat in the sense of full sovereign control; one merely holds it tentatively, at the beneficence of the government, which effectively owns all the liquid wealth in its jurisdiction.

There is effectively no final clearance in the fiat monetary system. As monetary inflation has devalued fiat currencies, physical cash notes have declined in real value to the point where they have become extremely inconvenient to use for large value transactions, and holding significant wealth in paper fiat is impractical. Central and commercial banks continue to make it harder for individuals to cash large sums out of their accounts. But even when individuals can withdraw physical notes, they do not confer safe wealth to their holders, as governments can revoke these notes at any time.

Negative

Peculiarly, among all monetary systems known to the author, fiat is the only monetary system where the sum of all balances at any point in time is negative. Because of the enormous incentive to accumulate debt, and the fact that the native token is not physical or scarce in any real sense, financial institutions constantly generate negative balances for their clients. The total sum of all debts far exceeds the quantity of money available. All other media of exchange are present goods, and any debt must be lent by someone who owns it first, so the balances always add up to a positive number.

As explained in the previous chapters, the underlying technology behind the fiat standard is the ability to create monetary units through the process of lending. This monetization of debt has the same effect as the monetization of any market good: it incentivizes the creation of more monetary tokens. This means that the fiat economic system is highly geared toward the creation of more debt, and fiat users are incentivized to get into debt as much as possible.

Fiat is a tiered system. Low-level users are only able to access physical paper money. Higher-level users are able to open a bank account and secure debt, and the financially responsible ones will get into large amounts of it. For the bottom tier, which constitutes the majority of fiat users worldwide, balances are positive. But the balances of the top tier of users, who constitute the vast majority of global monetary wealth, are usually negative. Under the fiat standard, being rich does not usually mean having many fiat tokens. It rather signifies being in debt for a lot of fiat-denominated debt, which dwarfs the amount of physical fiat and fiat in savings and checking accounts.

Holders of present fiat tokens, whether in cash or bank accounts, are constantly subject to having the value of these tokens diluted by lenders who can create new present tokens by issuing credit based on future

receipts of fiat tokens. It therefore makes the most sense for individuals, corporations, and governments not to hold positive balances, as they will be burned through inflation, but to borrow. Users with negative balances, i.e., those in debt, lack security and risk catastrophic loss. Financial security, in the sense of having a stable amount of liquid wealth saved for the future, is no longer available in the current system. You will either witness your wealth dissipate through inflation, or you will borrow and live in the insecurity of losing your collateral if you miss a few payments. Fiat has effectively destroyed savings as a financial instrument, with enormously negative consequences.

Fiat Savings

Saving is the deferral of consumption from the present to the future. An individual forgoes the consumption of a good in the present time to have it, or its monetary equivalent, available at a later date. Holding durable goods was the first form of saving known to humans. With time, the development of money became the most efficient medium of saving, as it gave humanity the ability to save in a liquid and fungible asset that's easy to exchange for any other good. The suitability of money for saving increases with its hardness, as discussed in *The Bitcoin Standard*. Our civilization has progressed through holding ever-harder money, which has provided increasingly reliable mechanisms for transferring value to the future. The harder the money, the more difficult it is to produce new quantities of it in response to increases in demand, and the better the money will be at retaining its value. This has allowed individuals to lower their time preference and generate more future wealth. The larger the abundance of savings, the more individuals are likely to invest in capitalist ventures which carry the risk of loss, but result in increases in productivity. In short, hard money reduces uncertainty over the future and allows individuals to orient their actions toward a long-term perspective.

Saving in physical money has existed for thousands of years. Its pinnacle was the gold coin, which had superior salability across time and space,

was recognized the world over, and held its value across millennia. With the gold coin, absolutely anyone could save and expect their savings to hold their value relatively well over the long term. Children would start saving the day they are born, as friends and family traditionally gift them money via their parents. Children are then taught to save from an early age. They learn to work and save money, and, as they grow, they are incentivized to be more productive, to earn more and save more. At a certain level of savings, it becomes possible for an individual to invest in capital goods, which increases the productivity of their own labor, or to invest in someone else's business, which provides income. Once an individual has reached a level of savings that affords them independence, they marry, buy a house, and start a family. Saving continues throughout life, and savings are passed on to the next generation. Human progress consists of providing the next generation with a better life, and savings play an important role in that process. Only by saving were humans able to lower their time preference and provide for their future. Only by saving first can humans invest, and accumulate capital. The more a society saves, the better the lives of its future generations. The development of the concept of saving is a crucial part of the development of human civilization. As money progressively got harder, people started saving more and more and this became part of culture, religion, and tradition.

As humanity has advanced, we have always naturally evolved to use the hardest money, so that it can hold its value best. With hard money, children could save for adulthood, and adults could save for retirement; they could expect their money to maintain and even gain value. Saving did not require any expertise or effort. Anyone earning a gold coin could hold onto it and see it appreciate by around 1%-2% in value per year. Nobody had ever heard of the gold coin collapsing in value. Things claiming to be backed by gold would periodically fail, but the physical gold coin has never failed. It very rarely depreciated, and when it did, it did not depreciate much or for long.

This mode of thinking existed in most of the world until the 1980s and 1990s, by which point fiat money, and the central bank-led glut of fiat

mining, had made debt inevitable and savings pointless for most people. Rather than save for major expenses, people now get into debt to pay for them, accruing a larger negative balance of fiat. People are born to families in debt and spend their entire lives in debt. Success consists of being able to secure ever-growing quantities of debt as you pass through the stages of life: a big college loan that allows you to get into the best paying job, whose salary will allow you a much larger loan for a large house and another large loan for a fancy car. With more hard work at the company and dedication to its cause, you may succeed in getting an even larger negative balance of fiat for an even bigger home and fancier car. Should you succeed even more and start your own business, you do not do it with your own accumulated capital, but rather with a bigger loan. The larger and the more successful the business, the more you are able to borrow. In short, success in fiat means accumulating larger negative cash balances, and people live their entire lives stacking debt obligations upon themselves.

Once the ability for savers to redeem paper money for physical gold was suspended, and physical gold was removed from circulation, the fiat bank account replaced the gold coin's savings technology. Few held on to paper money for long-term savings: the paper itself could ruin or burn, and the central bank issuing it would usually be expected to engage in inflationary monetary policy, thus reducing its value. The bank account was supposed to offer a rate of interest that would overcome inflation and offer the saver a positive return.

Removing currency gold backing meant more monetary growth and devaluation of the currency, making the holding of savings have a negative expected value, incentivizing the search for yield. The desperate search for yield and monetary inflation create economic bubbles which are very tempting for the banks to engage in, as happened in the 1920s, resulting in the 1929 stock market crash and ensuing financial crisis, destroying plenty of people's savings.

In 1934, the U.S. Congress passed the Glass-Steagall Act. It mandated the separation of commercial banking from investment banking, with commercial banking deposits protected by the Federal Reserve. This provided individuals with something close to the old physical gold coin: a guaranteed savings account that offered interest rates intended to beat price inflation. Those who wanted to take on risk in search of profit could then invest in investment banking without government protection.

Arguably this arrangement was never workable in the long run, because it is not possible for banks to offer real positive riskless returns that can keep up with the government's devaluation of its currency. It did work in the immediate aftermath of World War II. However, that was a period in which the U.S. accrued a large influx of gold from all over the world, and in which the majority of the world's countries adopted the dollar standard, buying large quantities of the currency. Add to that the expiration of most of the New Deal's statutes and a large reduction in government spending, and it is understandable how this arrangement seemed to work for most Americans from the 1940s to the 1960s. However, with increasing government spending in the 1960s to finance the Vietnam War and the Great Society, and the monetization of government debt, price inflation began to rise noticeably, and savings accounts failed to keep up. When inflation made maintaining the U.S. dollar's gold peg untenable in 1971, fiat savings became unworkable. Savers now needed to invest if they were to avoid losing their monetary wealth to inflation. In the new world, retail banking increasingly centered around checking accounts and payment processing, while savings accounts became increasingly irrelevant. Those who wanted to save wealth into the future would have to speculate through the shadow banking system and set up an investment portfolio. The stock and bond markets emerged as the pseudo-savings technologies of choice to beat inflation.

From the 1970s until the 1990s, government bonds functioned as the world's savings account, offering inflation-beating returns. However, they are not a useful monetary asset and cannot work as a long-term store of value because there is no effective mechanism restricting their supply

from growing. As demand for bonds as a store of value increases, their prices rise and their yields drop, which means their returns eventually stop beating inflation, and that bond issuers can borrow on increasingly favorable terms, which encourages them to become less fiscally responsible. By banning the use of gold as money, governments created and amplified demand for their own debt far beyond what their creditworthiness would merit. Increasing demand for government bonds has driven the ever-growing government debt bubbles of the past few decades. By the late 2000s, bond yields in western economies could no longer beat inflation, and their role as a savings mechanism became less appealing. The stock index emerged as the new savings account in the post-2009 world.

It was no longer possible to save in a hard money expected to hold its value. Because of the inflationary nature of fiat money, everyone now had to take risks with their capital to generate a return or else see it melt away. While investment is an essential part of a market economy, it is distinct from and is not a substitute for saving. The two terms have become almost interchangeable in the modern lexicon, and the relationship between them is confused beyond any semblance of reason in modern macroeconomics.

The differences between saving and investment are extremely significant. Saving refers to accumulating money in cash balances to hedge against future uncertainty. From a basic accounting perspective, investing is a cash outflow, while savings are held on a balance sheet. Cash is acquired for its salability (the ease with which a money can be sold across time and space). However, the most important distinction between the two is that investment inherently involves more risk. There is no risk-free investment, and any investment can suffer a complete and catastrophic loss of capital. Savings, on the other hand, are kept in the most liquid and least risky assets. The decision to go from saving to investing is the decision to sacrifice liquidity and increase risk in exchange for a positive return.

One should not need to choose between saving and investment, and the two have their place in a portfolio. People would keep a cash balance they would like to have with certainty, and would risk their investment funds in search of returns. Under a hard money standard, such as gold, the hard money itself would be held as saving, as its relative scarcity makes it appreciate slightly every year. In a modern, easy money economy, cash is trash, as every investment manager knows. Instead of holding cash, people hold the equivalent of their savings in government bonds or low-risk investment stocks. Savers need to study financial assets in order to maintain the value they earned and protect it from inflation. This makes it harder to have a stable cash balance and limits the ability of savers to plan for their future.

One of the Keynesian rationalizations given for governments forcing the use of easy money is that devaluing currency encourages people to invest more than they otherwise would, which causes increases in employment and spending. However, this is inflationist logic because it confuses capital for credit. Mises summarized the most important conclusion of his book *The Theory of Money and Credit* in one sentence: "expansion of credit cannot form a substitute for capital." For investments to occur, consumers must defer consumption to direct their resources to production. The devaluation of money does not magically increase the amount of capital and resources available for production. However, it does lead to the perverse scenario in which projects earning even a negative return in real terms are profitable in nominal terms, making them better than holding cash. The devaluation of a fiat currency is usually also accompanied by credit expansion, which causes a boom and bust cycle. These bubbles, which are also very tempting for banks to engage in, lead to large amounts of capital destruction and cause many investors to lose their investment capital, which also functions as their savings.

A reliably liquid and low-risk financial asset as a form of saving would be highly valuable for people, as it would allow them to reduce future uncertainty. Being able to secure a specific amount of purchasing power

with a relatively high degree of certainty would be financially liberating, and it would allow people to make risky investments proportionately.

Ironically, it might actually be the case that there would be less demand for savings under a monetary system in which money was hard and held its value. If you knew with good certainty that you had 10 years' expenditures saved, and that you could reliably expect their value to be consistent over time, you would probably not feel compelled to add more savings and could then take more risks with the rest of your capital. However, when money is a bad store of value, and stocks and bonds involve higher risks, you are less certain about 10 years' expenditure stored in investable assets. This might well lead to risk aversion, insecurity, and requiring larger quantities of savings.

The problem with fiat is that simply maintaining the wealth you already own requires significant active management and expert decision making. You need to develop expertise in portfolio allocation, risk management, stock and bond valuation, real estate markets, credit markets, global macro trends, national and international monetary policy, commodity markets, geopolitics, and many other arcane and highly specialized fields in order to make informed investment decisions that allow you to maintain your wealth. The simple gold coin saved you from all of this before fiat. Why should a doctor, athlete, engineer, entrepreneur, or accountant who is successful in their field have to develop expertise in these many fields just to maintain the wealth they already produced and earned freely on the market?

This arrangement has been a big boon for the investment management industry. Arguably, most money in investment accounts is held by people who would rather not take risks with it by investing but would prefer to have a store of value for the future. Without such a store of value, individuals need to hire professionals to help them meet their financial goals. Arguably, given the rate of monetary inflation, and the high fees charged by the investment management industry, only a small minority of

investors can reliably beat inflation. The vast majority must continue to work harder and earn more to continue to have wealth.

While many have long believed that index investing or real estate provide reliable ways of beating inflation, this is becoming harder to maintain, particularly over the last year. As interest rates drop to negative territory, it is very difficult to find investments that can beat inflation. Even lending to highly incompetent governments now comes with a negative nominal return, effectively expropriating investors while also subjecting them to serious risks.

Fiat Debt

The correct and successful financial strategy under the fiat standard is to constantly take on as much debt as possible, be meticulous about making all payments on time, and use the debt to buy hard assets that generate future returns. Doing this successively improves your credit score and allows you to borrow at lower rates, while you store your wealth in goods that cannot be inflated as easily as fiat. The fiat system thus taxes savers and subsidizes responsible borrowers. The fiat standard encourages everyone to live fragile lives and take substantial financial risks, because the alternative is a slow, continuous bleeding of wealth.

The more irresponsible the risk, the greater your chances of financial success or failure. The path to success ends up necessitating irresponsible decisions along the way. Businesses that are more reckless in taking on debt are more likely to fail than those that do not, but they are also far more likely to grow and drive competitors out.

A business whose cash flows grow at a slower pace than the growth in the money supply is effectively witnessing its value decline in real terms. This is because its cash holdings, assets and future earnings are all being devalued by the monetary issuance. An individual whose income does not increase faster than the rate of monetary issuance sees their standard of living decline. Such companies and individuals need to grow their earnings constantly in order to maintain their economic status.

In the fiat standard, issuing new debt is the equivalent of mining tokens. Those who choose to hold a positive balance end up getting robbed economically, as the purchasing power of their fiat is eroded by all the debt others are creating. Those who are in debt, on the other hand, get to benefit from some of the seigniorage. Not taking on debt is reckless financial irresponsibility. Irish economist Richard Cantillon described the redistributive impact of inflation as benefiting the people who receive the newly-created money first at the expense of those who receive it later. In the modern fiat standard, the beneficiaries of the Cantillon effect are the borrowers and the victims are savers. Spending less than you earn and keeping savings on hand are simply no longer optimal financial strategies; they are expensive luxuries most cannot afford.

Under a hard monetary system, saving is available to anyone. All they need to do is acquire the hard money and hold it. Under a fiat standard, however, users have an incentive to accumulate hard and cash-generating assets instead of accumulating more fiat, which continuously loses value. Whatever wealth one saves in a liquid and internationally redeemable financial asset is continuously and systematically debased. Even saving in gold, the legacy hard money, carries significant transaction costs and spatial salability constraints. People are instead incentivized to invest, primarily in stocks, bonds, and housing, which always entails risk and requires significant financial know-how and active management. You effectively need to earn your money twice with fiat, once when you work for it, and once when you invest it to beat inflation.

The path to financial success under the fiat standard lies in acquiring hard assets instead of cash. A higher level of success comes from financing these acquisitions with debt, for two reasons. First, inflation is likely to devalue the loan for the asset more than it devalues the asset. Second, the issuing of the loan by a financial institution involves creating a new sum of fiat tokens, or fiat mining. As the lender and borrower are partaking in fiat mining, there is enough benefit in the mining seigniorage to make the purchase cheaper for the borrower.

The highest level of success, however, comes from being able to issue fiat and get others into debt. Among the most effective ways to issue debt is to build a business that pivots to providing banking services to its customers, which explains why so many businesses in so many fields offer credit products to their customers.

Under the fiat standard, every business model degenerates into interest rate arbitrage. The purpose behind setting up any business selling any good is not so much to make money from serving its customers, but to

establish a creditor relationship with them. Managing to secure debt at a lower interest rate becomes the most significant market advantage. Businesses live and die by their ability to turn over debt at a healthy arbitrage.

This phenomenon is apparent in many modern companies. Most businesses that provide credit will give their customers very good deals on their products if they use the company's credit card. The incentive for doing so is clear: large corporations can borrow at very low rates, but they can charge their customers interest rates in excess of 20% on their credit cards. Before it went bankrupt, the U.S. department store Macy's was generating around as much revenue from the credit cards it issued its customers as the clothes it sold them.

The consequence of fiat balances being negative is that everyone is constantly in debt. Your home-ownership is contingent on you fulfilling your financial obligations for decades. Your future depends on you and many others fulfilling financial obligations in a timely manner. Your uncertainty is higher than what it would be if you could place your wealth in a hard money, and that causes a rise in time preference. In short, everyone is less peaceful and more insecure.

In the fiat standard, money becomes a liability rather than future security. Rather than owning dollars that you can use to pay for your future needs, you owe large amounts of dollars, and you need to work for the rest of your life to pay them back. The age-old wisdom of every grandmother has been turned on its head. Instead of saving for the possibility of a rainy day, we are instead borrowing against all of our future sunny days.

In this absurd mountain of ever-growing debt, one must wonder what would happen if people had the option of placing their wealth in a low-risk store of value with limited upside, similar to a hard money cash balance. Such a hypothetical thought experiment recently became a reality with the failed attempt to build The Narrow Bank.

The Narrow Bank

In 2018 [The Narrow Bank applied for a banking license from the U.S. Federal Reserve.](#) It had a unique and very simple business model: It would take money from depositors and deposit it at the Fed, the least risky balance sheet in the world, where it would collect interest. It would simply pass on the interest rate it received from the Fed to its customers, minus a small fee.

The business model seemed like a great deal for all involved: depositors would get a small return without taking on significant risk, a trade that arguably many would have taken given the current uncertainty surrounding global capital markets. The bank would make a profit, and the Federal Reserve would have had little cause for concern regarding the bank's solvency and liquidity. Tellingly, the bank's license application was rejected.

The fundamental reason the bank was rejected was that its safety and reliability would have endangered the other banks in the financial system. If the safety of the Federal Reserve's balance sheet were easily available to investors, many would have chosen it over traditional financial assets as the bedrock of their portfolios. This is not to say everyone would have put all their wealth in it, but a lot of money, particularly institutional money, would have seen the value in a low-risk, liquid allocation in *savings*. In all likelihood, there is a large demand for a ~2% interest rate with very low counterparty risk. While the rate is not high, it is highly attractive as a savings instrument because of its low risk.

Such a bank would be even more appealing during times of crisis, when everyone is searching for wealth protection. The more people seeking out the safety of The Narrow Bank, the fewer there are investing in traditional financial institutions, and the more precarious the liquidity position of traditional financial institutions becomes. By preventing this bank from

operating, the Fed tacitly admitted that narrow banking would likely make much of the Fed's highly leveraged and risky financial system untenable. The Fed's refusal to grant The Narrow Bank a banking license shows that it recognized that in a free market, many investors would prefer the safety of guaranteed returns over the risky search for a few extra points of yield.

Fiat central banking is built on the fictional idea that devaluing currency will cause people to invest more, thus inducing more economic production. But like all coercive government interventions into markets, there is no free lunch, and the costs are paid in ways that may not appear very clear initially. The Fed's policy to encourage more investment leads to people engaging in riskier investing than their risk profiles would otherwise indicate, leading to financial bubbles and crises.

So what would happen if a large percentage of people placed large portions of their wealth in a financial instrument that offered liquidity and safety but low returns? Would this reduce the amount of economic production that takes place? Would this reduce the amount of actual capital for investors and entrepreneurs? Arguably, the opposite. Savings and investment are not competing for a set fixed pool of money. Saving must precede investment, and an increase in savings leads to an increase in investment. Both are driven by, and must be preceded by, lowering time preference and delaying gratification. When money is expected to appreciate (i.e., hard money), people are more likely to defer consumption and save. If savers can hold cash balances with a high degree of confidence in their value over time, they would have the freedom to take on more risks with their investments. When these savings increase in value, the opportunity for the savers to invest increases. In a world of hard money, the only investments that would make sense would be those that offer positive real rates of return. This is unlike under easy money, where investments are made that accrue positive nominal returns but negative real returns, leading to capital destruction in real terms. The lack of financial bubbles under a hard money system would prevent a lot of capital destruction.

The Fed did not stop The Narrow Bank from operating because it was dangerous, but because it would expose just how dangerous the rest of the banking system is, and how much demand exists for safe savings. In the third part of this book, the rise of bitcoin is understood in this context. It is a new savings technology that allows anyone in the world to store their wealth, and, unlike The Narrow Bank, it does not need a license from the Federal Reserve to operate.

6. What is fiat good for?

In assessing the technology of fiat, it is tempting for an economist who has seen the havoc and destruction it has brought the world to focus purely on its many drawbacks and predictable problems. But in writing this book, I chose instead to think long and hard about the technological advantages that fiat entails, and in the process, I admit to having acquired an appreciation of the technological improvement entailed with the use of fiat money. Rather than a nefarious conspiracy to impoverish the majority to benefit the few, there is an undeniable economic and technological rationale for fiat money, given the technological possibilities of the world at the early twentieth century.

The analytical lens of *The Bitcoin Standard* was that of salability across time, which can be understood as the degree to which a money holds its value over time. Based on Antal Fekete's work, I argue that the stock-to-flow ratio provides us with a good proxy for inter-temporal salability, as it provides an indication of how much the supply can be increased to match increasing demand. With historical examples pertaining to primitive moneys and national currencies, it is demonstrated how monetary goods with a higher stock-to-flow displace monetary goods with a lower stock-to-flow.

Yet the framework of intertemporal salability alone is not sufficient to explain why the world moved from the gold standard to government

moneys with significantly lower stock-to-flow ratios. This book uses the analytical lens of inter-spatial salability to explain the technological and economic driving forces behind this change. It is fiat's superior salability across space which gave it the economic and technological impetus for blanketing the planet in the twentieth century. There are two other use cases for fiat which have increased its adoption: its peerless ability to finance government spending, and the protection it provides banks engaging in fractional reserve banking, maturity mismatch, and rehypothecation. Understanding how this technology is naturally very conducive to the goals of governments and banks can go a long way toward explaining its mass adoption in the twentieth century.

Salability across space

Money is the economic solution to the problem of coincidence of wants, and examining this problem allows us to determine the desirable characteristics of its solution. If Alice wanted to buy something from Bob, but Bob did not want what Alice has to offer, the only solution for them is to engage in indirect exchange: Alice exchanges her good for another one which Bob desires, and then exchanges that good with Bob. The intermediary good was purchased by Alice purely for the purpose of exchanging it for another good, not for its own utility. As an economy grows in the variety of goods it produces, indirect exchange is the inevitable solution humans devise to facilitate exchange. Over time, it is inevitable that some goods will play this role better than others. The extent to which a good is suitable for performing the function of a medium of exchange, the more salable it is.

Carl Menger defines salability as the degree to which a good can be brought to market without significant loss in its market price. A highly salable good is one with significant market depth and liquidity, making it possible to get close to the prevailing market price whenever its holder wants to sell it. The prime example for a salable good today must be the

\$100 bill, accepted worldwide by merchants and currency exchange shops more than any other monetary medium. A holder of a \$100 bill looking to exchange it for goods and services will rarely ever need to sell it for something else to provide the seller, nor will they ever need to sell it at a discount. They will usually quickly find someone to take it at face value. By contrast, a good with low salability is one for whom demand on the market is intermittent and varied, making it difficult to sell the good quickly, and requiring its owner to offer a discount on it in order to be able to sell it. A good example is a house, car, or other forms of durable consumer goods. Selling a house is much harder than selling a \$100 bill, involving viewings and significant transaction costs, as well as waiting for the right buyer who values the house at the seller's asking price. The seller might need to offer a significant discount to sell the house quickly.

Central to Menger's analysis of salability is the measure of the spread between the bid and ask for commodities, where the bid is the maximum price that a buyer is willing to pay, while the ask is the minimum price that a seller is willing to take. Bringing large quantities of a good to market would cause the spread between the bid and ask to widen, as potential buyers begin to offer lower prices as the marginal utility of the good declines with increased quantities. The more that a good's marginal utility declines with rising quantities, the less suitable it is to play the role of money. The smaller the decline in the marginal utility of a good, the less the bid:ask spread will widen as larger quantities are brought to the market, the more salable the good is, and the more suitable it is for use as money. We can also understand this process from the perspective of traders buying goods to sell them on later. For them, growing stockpiles of a good reduce the chance of each marginal good being sold, and raise the risk of price changes negatively affecting the seller. Thus, they will bid at lower levels for increasing quantities of a good. The faster the spread between the bid and ask grows with increasing quantities, the less salable the good. Goods for which the spread rises slowly are more salable goods, and these goods are more likely to be hoarded by anyone looking to transfer wealth across space or time.

We can think of salability as existing across three axes: salability across time, space, and scales. Salability across time measures the ability of a good to maintain its market value into the future, and was the central discussion point of *The Bitcoin Standard*, which quantified it using the stock-to-flow ratio. As discussed in detail in *The Bitcoin Standard*, the emergence of gold as the world's money was no coincidence, but the result of gold having the highest stock-to-flow ratio of all metals, meaning gold's supply is the least elastic in response to demand and price shocks. As demand for gold as a store of value rises, there is very limited scope for gold miners to increase the existing stockpiles on the market. This is because annual mining production is always a tiny fraction of global stockpiles, because the latter have been accumulating over many thousands of years, thanks to gold's incorruptibility. The constant degradation of other metals means that the stockpiles of these metals that exist in global markets are no more than a few years' production. Should monetary demand raise the price of these metals, miners are able to increase production and significantly increase existing supplies. Gold is the only ancient metal with this property, and all the other indestructible rare metals, like platinum, palladium, and titanium have only been discovered in the last few centuries, meaning their accumulated stockpiles are much smaller than those of gold, making for a much lower stock-to-flow ratio. Silver, having the second highest stock-to-flow ratio, maintained a historical monetary role, particularly for smaller value transactions for which gold was unsuited. Silver complemented gold's limited salability across scales by being used for small exchanges.

Salability across space can be measured as the reduction in market price incurred by the seller due to the distance between them and the buyer. An immobile house is not salable across space at all, because moving it would destroy it. Any bulky good will have low space salability because of the heavy cost of transporting it resulting in a loss of revenue for the seller. Spatial salability helps us understand the success of monetary metals, and gold's monetary superiority to other metals. Metals have a relatively higher value per unit of weight and volume than cattle or agricultural commodities. Relatively high amounts of value could be minted into relatively small weights of uniform metal, standardizing and

making them recognizable to more people, whose purity is relatively easy to verify, allowing for wider geographic dissemination and superior salability across space. The Roman Empire's aureus, as discussed in *The Bitcoin Standard*, became the first world money because of its recognizable imprint and standard purity and weight.

Gold's high value per weight made moving value with it cheaper than using silver, which, in the nineteenth century, weighed around 15 times as much as gold for the same economic value, thus costing more to store and move around. Today that ratio is around 100:1 in favor of gold. Making a certain payment with gold would thus require transporting a far lighter load than silver, copper, or iron, and thus incur a lower cost. Gold's chemical stability and indestructible nature meant that moving it around was relatively safe. The lower cost of transportation of a more precious metal gives it a slighter loss in value as it is traded across space¹⁵.

But a gold coin's salability nonetheless declines with distance, as the cost of transporting it rises. Physicality means distance will always result in reduced salability across space. In the late nineteenth century, the steamship, car, and train spread worldwide, and they were soon to be followed by the airplane. With transportation costs declining significantly, the possibilities for mutually beneficial trade expanded everywhere. For the vast majority of the world, this meant the expansion to the extent of the market with which they traded. While gold's salability across space was still the best of all metals, it was not fast enough to allow for cash settlement of individual trade transactions across cities and national borders. Naturally, banks would work around this problem by resorting to a system of clearance and settlement among each other to save their clients the transaction costs of having to move physical gold with each transaction. When Alice would make a payment from her account at Bank A to Bob in Bank B, the two banks would not attempt to move the exact

15 While economic value is subjective, it is worth noting that gold's superior value per weight is arguably a function of its higher stock-to-flow ratio, which prevents its supply from increasing too quickly in response to increases in demand, ensuring it maintains its value and increases its market value.

sum of gold in response. Instead, Bank A would debit the sum from Alice's account, and send the clearance to Bank B confirming that Alice has the money to make the payment. Bank B would credit the sum into Bob's account. Hundreds or thousands of similar transactions can happen between banks before one final clearance.

Under the international gold standard, banks would hold gold for their clients, and offer them paper notes redeemable by the bearer in gold. Thus the papers were viewed as being as good as gold, and could be widely used for payment. Banks would also offer their customers checkbooks, bills of exchange, and other credit instruments which also drew on the gold in these banks' vaults. These instruments would be settled between banks, saving individuals significant cost and time in moving their gold around. The more capitalist division of labor and international trade expanded worldwide, the more compelling the cost savings of bank gold settlement became. Banking became a more centralized business to benefit from these cost savings. National central banks emerged to settle trade with foreign countries, allowing periodic and regular international settlement between central banks to reduce the cost of transfer as opposed to the prohibitively expensive international movement of physical gold.

In order to move as fast as modern transportation was moving goods, gold increasingly stayed put and claims to it were transferred between individuals and financial institutions. Rather than having the serene finality of gold as a method of payment, money was now increasingly a liability of a financial institution that allowed it to move when needed. The more efficient the system, the less gold movement it required, the less secure and auditable it became.

Even though banks could honor their promises to redeem for gold any of their obligations, they could still issue more gold liabilities than the gold they had on hand, thanks to gold's limited spatial salability. There was no easy and convenient place for bank clients to redeem their gold and still use it for settling the increasingly global trades they conducted. With only one monopoly bank in a town, or one central bank in a country, your gold

coin had very little spatial salability while it was in your physical possession. Thinking through the frame of salability across space makes one come to the understanding that the gold standard's monetary medium was not just the gold underlying it, but also the payment and settlement rails that allowed it sufficient spatial salability to move around the world. Gold in the bank effectively carried a spatial salability premium over gold in the physical possession of its owner. Rather than charge individuals a premium for holding their gold with high salability, banks kept gold redeemable at face value, but increased the amount of liabilities they issued backed by the gold. This was an unstable and self-defeating arrangement. The more money flowed into banks, the higher the premium for having gold in banks, the more banks could inflate their liabilities, fueling bubbles and business cycles, which would result in liquidity shortages and financial crises.

It was this limited salability across space that allowed government fiat money to replace gold. The Bank of England had little trouble coaxing gold out of the hands of the British people because without the Bank's infrastructure, physical gold coins had very low salability and could not offer their holders final settlement across long distances.

For all of gold's high salability across time, its salability across space is very low when compared to fiat. There is no reason why this should be viewed as a flaw different from having a low stock-to-flow ratio. Whereas a low stock-to-flow ratio leads to loss in value while trading the good across time, high cost of transportation results in significant loss of value when transacting across space. Hard money advocates can deride fiat money for losing its value across time, but they dismiss the reality that gold loses value when transferred across space in a very real sense: an ounce of gold sent across the world will arrive having lost a significant portion of its value to pay for its movement.

In a sane world in which an engineer was designing monetary systems, gold's salability across time would lead to it developing the best salability across space through the development of banking infrastructure around its settlement. But in the real world, where governments exist, it is no

longer reasonable to expect that political money can deliver high inter-spatial salability to hard money. A hard money that requires brick and mortar vaults and banks in order to clear it is always liable to being captured by government, or having government replace the hard money with its own fiat. Gold's low salability across space is what leaves it inevitably vulnerable to government predation. Being realistic about political and engineering possibilities means that the low spatial salability of gold and physical moneys need to be considered a feature, and not a bug. It is to no avail to expect governments to give hard money wings without resorting to inflation, one way or another.

Spatial salability also helps us understand why the US Dollar continues to garner increasing international demand while other national currencies struggle to maintain their value next to it. The dollar has by far the highest spatial salability of all national currencies, as it is the prime currency for international settlement, and there is a market in US dollars everywhere in the world. The \$100 is accepted for retail by a far larger percentage of global retailers than any other bill. Rarely will anyone have to sell a \$100 bill at a discount anywhere in the world; it will almost always be accepted at face value, if not at a premium. Other national currencies are rarely accepted outside their national borders, and will usually be heavily discounted if sold there.

Quantifying salability across space

The Bitcoin Standard quantified salability across time with the stock-to-flow ratio. For salability across space, the best metric I can think of is the costs of clearing and settling the monetary equivalent of a London Bullion Market Association good delivery gold bar across the Atlantic. The choice of the good delivery gold bar comes from the fact that this is the standard unit of settlement for international trade between financial institutions under the gold standard, and is still widely in use for gold settlement today by central banks, banks, and individuals. LBMA bars are the gold standard of gold bars under the gold standard. The good delivery bar

weighs around 400 troy ounces, or 12.5 Kgs, and has a market value around \$750,000. If the world ran on a gold standard, international financial settlement would likely happen with this unit. That it doesn't run on a gold standard is arguably a function of how expensive moving this bar really is. One can point to government restrictions on the free movement of gold as the reason for fiat's rise, but that misses the point: if gold had high salability across space, it would not need governments to ensure its salability across space. To assess salability across space, we compare the technologies involved in terms of their cost of transferring value, as they exist.

At the genesis of fiat, we can get an idea of the kind of cost involved in settling gold across the Atlantic from examining the transfer of gold from the Bank of England to the US and Canada we saw in chapter 2. One of the many gold shipments from the UK to the US was sent aboard the SS *Laurentic*, which sailed from Birkenhead, near Liverpool, to Quebec City in Canada, carrying a shipment of 3,211 gold bars, weighing around 40 tons, or 1,285,000 ounces, worth around £5m at the time, and around \$2.4billion in current fiat terms. The *Laurentic* and its enormous secret treasure were sunk after it struck German mines off the northern coast of Ireland.

The Admiralty ordered Captain Guybon Damant to lead a team of divers to salvage the gold. After seven years of diving, Damant's team were able to salvage 3,186 of the 3,211 bars, with only 25 left unaccounted for. Three more bars were to be recovered in the 1930's, but 22 bars remain unaccounted for more than a century after their sinking. The total cost of Damant's salvage operation came to £128,000, around 2-3% of the total value of the gold on board. The salvage operation remains the largest recovery of sunken gold by weight in history.

During the war, Britain shipped £94.4m of gold to the USA and £226m of gold to Canada (most of which was later transferred to the US), or a total of £259.3m, or around 70m ounces of gold, which today are worth around \$130b.

When examining the fiat standard, it is important here to distinguish between the costs of making a payment, and the final settlement of the payment. An international wire transfer over the fiat network is initiated between when the sender's bank account issues a payment order to the SWIFT network, a cooperative society based in Belgium owned by its member financial institutions around the world. SWIFT is a messaging platform, and not a platform for transferring funds. SWIFT sends the payment message to the recipient bank, but it does not send it any actual money, and the bank will credit the transfer recipient from its own money. The transfer of money from the sender's bank to the recipient's bank will be settled through correspondent accounts if the two banks have accounts with one another. Otherwise, the banks will have to settle the payment through intermediary correspondent banks and financial institutions.

The fee for a wire transfer across the Atlantic is usually in the range of \$10-\$50, and it takes 2-5 working days to be received by the recipient. But the final settlements of the funds from the two banks can take significantly longer to finalize, as it depends on the correspondence banking relationships that need to be utilized. Should the two banks have a correspondence bank account with one another, they can batch and settle all their transactions at the end of the day, week, or month. But should they need to resort to intermediaries, then the transaction will be settled sequentially between intermediaries according to their periodic schedule of settlement. The sending bank would credit the account of its correspondent bank, and once they receive the money, they would credit the account of the recipient bank, or the next intermediary in line. These intermediary correspondent banks will also charge some fees on currency conversion which will likely increase the cost of the wire transfer to the sender and recipient. In total, the final settlement of the transaction will occur several days, weeks, or months after the transfer has been initiated. Fiat payments over credit cards will have even more intermediaries involved, and while the initial payments will be cleared in a matter of seconds, at a fee around 1-3% of the transaction face value, the final settlement may take months to complete.

Looking at gold on the other hand shows us a different picture. Gold banking no longer exists in any meaningful sense anymore, as there are no banks holding accounts in gold and allowing international payments to be made with gold, which makes a comparison between gold and fiat for payment initiation impossible. But it is possible to compare the cost of final settlement through looking at the cost of shipping physical good deliver gold bars across the Atlantic. Shipping a good deliver gold bar from New York to Zurich currently costs around \$3000. As the price of a good delivery gold bar is currently around \$750,000, the bar would lose around 0.5% of its economic value when shipped across the Atlantic. The transfer would require about 2-3 days to complete.

This comparison helps us understand gold's limited salability across space. There is a significant and inescapable cost that must be paid to ship and insure a physical gold bar across the Atlantic, and this cost is around 0.5% of the total market value of the bar. There is no physical shipment involved in moving fiat money around, since the money itself is fundamentally made up of credit obligations, immaterial entries on balance sheets. The process of settling fiat money is the process of debiting and crediting ledger entries worldwide. Gold's inability to cross international borders in any significant quantity without the approval of government authorities rendered it increasingly expensive to the increasingly-distant economic transactions taking place, compared to the banks and settlement networks holding the gold and crediting the accounts of holders. As central banks were the only ones that could settle trades across distances and international borders, while gold couldn't, their fiat and political decrees came to play the role of money, allowing governments unprecedented power in shaping society.

The more one studies the history of the fiat standard, the more its emergence appears as a consequence of technological necessity, not a nefarious conspiracy. The limited salability of gold meant that gold payments would continuously centralize more and more into bank vaults, with settlement of physical gold only taking place rarely, compared to the frequency of individual payments. With gold's payments increasingly turning into credit payments, and not cash settlement, the payment rails of

banks and central banks became an increasingly important part of the monetary infrastructure making payments possible. From there, it seems inevitable that the operators of the rails would seek to undermine the role of the physical gold holding them in check in order to allow them more leeway for spending. Without the ability for cheap and fast gold settlement outside the banking system, there was little to deter them from this step. The Faustian bargain of fiat money appears inevitable this way. The technology of fiat strongly benefits governments and banks, as will be discussed below, but it was the spatial salability of fiat that allows them to take advantage of it to their own ends.

As spatial salability contains the key for understanding the fiat monetary system, it also constitutes the key criterion by which to assess Bitcoin's competitive threat to government central banks. Bitcoin's ability to settle hundreds of thousands of transactions worldwide regardless of the distances involved gives it a far superior spatial salability to gold, and its ability to cross borders and perform final settlement in the matter of hours without the need for recourse to the political and legal institutions of the countries involved mean its salability is not contingent on the fiat of political authority. as will be discussed in more detail in chapter 12.

Bank profitability

The second 'killer app' of the fiat standard is that it is a massive boon for banks since it allows them to engage in fractional reserve banking with a safety net of a lender of last resort able to conjure credit out of thin air to bail them out by injecting liquidity when the inevitable solvency crises begin. Under the gold standard, banks were kept on a tight leash in terms of their ability to generate financial obligations. Bank clients could at any time ask for the redemption of their bank notes and checking accounts in physical gold, and if the bank was short of gold, there was no authority that could print gold on demand to meet the bank's obligations.

In the United States, the Federal Reserve was created as a response to the crisis of 1907, in which overextended fractional reserve banks faced a liquidity crisis. The 1907 liquidity crisis was relieved by Wall Street's foremost banker at the time, J.P. Morgan, who acted as the lender of last resort for other banks. The episode was a strong motivation for banks to seek the establishment of the Federal Reserve Bank to alleviate liquidity crises. The two reasons given for the creation of central banks were: the protection of the banking system from bank runs or financial crises, and the stabilization of the Dollar's value. That these two goals were directly contradictory is the kind of blatantly obvious fact that was only noticed by economists like Friedrich Hayek, in his enormously important and widely unread [*Monetary Nationalism and International Stability*](#):

I would emphasize that bank deposits could never have assumed their present predominant role among the different media of circulation, that the balances held on current account by banks could never have grown to ten times and more of their cash reserves, unless some organ, be it a privileged central bank or be it a number of or all the banks, had been put in a position, to create in case of need a sufficient number of additional bank notes to satisfy any desire on the part of the public to convert a considerable part of their balances into hand-to-hand money.

...the fundamental dilemma of all central banking policy has hardly ever been really faced : the only effective means by which a central bank can control an expansion of the generally used media of circulation is by making it clear in advance that it will not provide the cash (in the narrower sense) which will be required in consequence of such expansion, but at the same time it is recognised as the paramount duty of a central bank to provide that cash once the expansion of bank deposits has actually occurred and the public begins to demand that they should be converted into notes or gold.

The ability of banks to expand the money supply through the creation of bank deposits rests entirely on the presence of a larger institution capable of converting the banks' deposits into banknotes or gold. Without the growth of central banking, individual banks were restricted in their ability to expand credit, as the increase in their supply would immediately devalue them compared to gold and note bills. The only way a bank can maintain the value of its expanded deposits on par with the fractional cash reserve backing them is if it had a central bank provide it with liquid cash reserves to meet the demands of depositors, but that would result in the devaluation of the media of circulation, or the exit of gold from the central bank's nation to other nations as it is used to settle global payments.

Inevitably, the goal of protecting the value of the "cash" was to conflict with the goal of protecting banks from bank runs, and central banks almost always favor the financial system at the expense of the currency's value. The fiat standard, and the moral hazard of a lender of last resort, has served as a giant boon for the banking industry around the world, which was given a license to create money, and a safety net to protect it from the consequences.

Is Fractional Reserve Banking Necessary for a Growing Economy?

The argument for the necessity of fractional reserve banking ultimately boils down to the same arguments that Keynesians, inflationists, and monetary cranks of all hues use for monetary expansionism in general: an increase in the supply of credit to ameliorate any shortage of financial media and instruments will lead to more economic activity and growth. By this logic, banks have the ability to create loans in excess of the capital they hold in reserve, they could mobilize more capital and finance more projects, resulting in less unemployment and increased prosperity. Conversely, if banks are prevented from engaging in fractional reserve banking, a shortage of credit would hamper economic activity, reduce

economic production, and reduce living standards. By decoupling available credit from the amount of savings, society overall benefits.

The problem with this logic is the same problem with all inflationist arguments. Money and credit, by themselves, are not productive assets. They merely represent receipts that allow their holders to purchase productive assets. An increase in the supply of money or credit will no more increase the stock of productive assets in an economy than an increase in printed football stadium tickets will increase the capacity of the stadium itself. The ticket is merely a proxy for a seat in the stadium, and money and credit are but claims on the final products and the capital goods used in their production. Should a football team wish to increase the maximum number of tickets it sells, it cannot do so by simply increasing the number of tickets it prints; instead, it would have to increase the stadium's capacity, which requires engineers, workers, and heavy capital equipment to complete. Printing tickets beyond the capacity of the stadium will result in more spectators than seats and conflict over these seats, but cannot, under any circumstance imaginable, cause the increase in the number of seats beyond the capacity of the stadium.

The premise on which fractional reserve banking is built is inherently flawed: There can be no such thing as a shortage of money or a shortage of credit. Whatever supply of money is utilized in an economy is always sufficient to supply all the needs of the economy, provided the money itself is divisible enough. The demand for money, of course, is always higher than the supply, because people desire more things than they produce, because desiring is far easier than producing. These desires appear like they can be satisfied with more money, but the creation of money to meet these desires does nothing to produce them, which can only be done through dedicating scarce resources to their production. In a hard money free market, people dedicate their time to production in order to make money, and as the quantity of goods and the amount of economic production increases, the supply of money need not increase, but its value will naturally rise.

Fractional reserve banking does not magically create more capital, labor or resources. It merely allows central banks to control the allocation of these resources, rather than the productive people who own them. It is a form of central planning that impoverishes society overall but enriches the banks and governments that engage in it. Without fractional reserve banking, capital and labor would flow to the highest bidder, the entrepreneur whose business plan utilizes them the most productively and pays them the highest return. With fractional reserve banking, it is no longer free market competition that drives this resource allocation decision, but rather the banker who gets to enjoy the upside while being protected from the downside. It's no wonder that subpar business plans and malinvestments get funded in such an environment, skin in the game matters.

Can Fractional Reserve Banking Survive in a Free Market?

But if a fractional reserve banking system is not necessary, how can we explain its prevalence everywhere in the world today? In particular, how can we explain that economies that have utilized it seem to prosper, and that the majority of banks employing it do not fail? The answer lies in the fact that central banks that act as a lender of last resort to banks. Fractional reserve banking is inherently unstable without a lender of last resort that can increase the money supply. This guarantee allows banks to create more liabilities for the monetary unit than they have assets. Historically, fractional reserve banking was unsustainable in a free market, and the creation of central banks was primarily due to banks seeking government protection from the inevitable bank runs of fractional reserve banking.

In a free market, a bank that engages in fractional reserve lending will find itself with a mismatch between its assets and liabilities. For instance, it may owe a depositor \$100 available to them on demand, but will simultaneously loan out a fraction of that money to a borrower. Should the

depositor request all their money when the borrower still has it, the bank has a problem. But since the bank of course has more than one borrower and depositor, it should be able to return the money back to the depositor by giving him some of the other depositors' cash. As the amount of lending increases (and the fraction of deposits lent out increases), the bank's position becomes increasingly precarious and vulnerable to a bank run. To make matters worse, once depositors and borrowers discover the increasing amount of unbacked credit issued by the bank, they become more concerned about the safety of their deposits and thus more likely to demand their withdrawal. If the amount of deposits suddenly demanded by depositors exceeds the bank's reserves on hand, the bank has a 'liquidity problem' (which is viewed as distinct from a solvency problem, because the bank does have enough assets to meet all the withdrawal demands of its depositors, but does not have them on hand). The liquidity problem is precipitated by a bank run: as depositors begin to realize their deposits might not be safe, they rush to the bank to demand them. But the bank can only satisfy a fraction of them.

There are a few different ways to address this problem: the bank can simply satisfy the withdrawal requests of the first depositors to demand it (until the bank runs out of reserves). Another way is for the bank to enact a percentage haircut on each depositor's balance until the bank's total reserves match the total of all depositors' newly adjusted balances; This method essentially transitions the bank to full-reserve banking, which then allows all depositors to withdraw their total (and newly reduced) balance simultaneously. Both options imply the bankruptcy of the bank, as its assets cannot meet its liabilities to depositors and lenders. While these options can be devastating for both the bank and its depositors, they are in fact the healthiest way to deal with this problem; at a bare minimum, both depositors and bankers learn not to engage in such activities again.

The alternative option introduced over the last century is the creation of a government-mandated central bank to 'inject liquidity' into the struggling bank and allow it to meet its obligations to depositors. Now, with a monopoly on the issuance of money, the central bank can effectively monetize the obligations of the bank and offload the risk of the banks' reckless actions onto all the holders of the nation's currency, not just the

bank's depositors. It's bad enough that the conscientious banks and individuals who did not engage in fractional reserve banking now have to subsidize the irresponsibility of the ones who did, but even worse is that these banks can continue to operate with an ongoing subsidy from society at large; Full reserve banks then become unprofitable in comparison, as they bear the burden of responsible risk management which limits their upside relative to their fractional reserve counterparts.

As [Guido Hulsmann put it](#):

[F]ractional reserve banking is not unrelated to central banking, fiat paper money, and international monetary institutions such as the International Monetary Fund. Ultimately, these institutions are abortive attempts to solve the problems of fractional reserve banking by centralizing cash reserves or by refusing redemption of money titles.

The emergence of modern central banking cannot be understood separately from the problems caused by fractional reserve banking. To a historically unprecedented extent, central banks allowed governments to take control of the monetary, financial, and economic systems of their countries. Eventually, this nationalization of money and credit snowballed into the nationalization of other parts of the economy, as the government had recourse to a money printer it could abuse.

Shadow Fractional Reserve Banking

Fractional reserve banking, in the institutional manner discussed in the old works of Mises and the Austrian economists, is no longer the serious problem it once was. As mentioned above, the tension between banking solvency and currency hardness was resolved in favor of the former. With time, the FDIC, and international equivalents came along to play the official role of lender last resort. Laws like Glass-Steagall act segregated

banking from investment banking, and protected only the former with the protections of a lender of last resort. Supposedly strict lending criteria were implemented to prevent too much credit expansion, and the central bank would set the interest rate. This highly complex edifice of central planning of course did not work too well: the currency continuously lost value, and business cycles were a constantly recurring phenomenon, but for many major economies it did succeed in averting major crises for many years through putting some tenuous limit on credit expansion. But this tenuous arrangement is deceptively unstable, for its own stability sows the seeds of its collapse.

By placing a lender of last resort facility at the service of the banks, it is unthinkable that such an exorbitant privilege would go unabused. The banking sector may have ring-fenced retail banking into a highly-regulated industry to prevent bank runs, but they still branched out into other models of banking and finance. These institutions are known as the *shadow banking system*: financial institutions that engage in fractional reserve banking without having a formal lender of last resort like the FDIC. They include investment banks, mortgage companies, money market funds, repurchase agreement markets, asset-backed commercial paper, and securitization vehicles.

The shadow banking system is effectively government-subsidized by the guarantee of the central bank as a lender of last resort, in various explicit and implicit forms. First, these financial institutions can secure funding at a lower rate than other businesses, which is why financial companies began acquiring larger and larger sectors of the economy, and even non-financial companies resort to a large degree of financial operations, as discussed in *The Bitcoin Standard*. This implicit subsidy is itself a privilege to these financial institutions that allows them to engage in mismatched-maturity lending, since they have access to a lower rate than any outsiders.

Second, repeated episodes of the Federal Reserve bailing out financial institutions deemed too systemic to fail reinforced the idea that financial risk-taking was unlikely to be allowed to fail. As far back as 2004, in *Too Big to Fail*, Stern and Feldman warned of the pervasiveness of a bail-out mentality in the financial system, arguing that “not enough has been done

to reduce creditors' expectations of [Too Big To Fail] protection." Stern and Feldman outline several episodes that have, over two decades, fostered creditor bail-out expectations. The first was the bailing out of creditors of Continental Illinois in 1984, which was summarily followed by the comptroller of the currency testifying to Congress that policymakers would also protect creditors of the eleven largest banks in the country, since they were too systemically connected to fail. This incentivized banks to become too big and interconnected to fail, and to take excessive risks. Several other banks and Savings and Loans Associations failed in the subsequent years, and federal protection seemed to become more generous towards creditors and depositors with time, going beyond legal requirements under the pretext of guarding against systemic effects. Stern and Feldman argue that the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) was insufficient to counter growing bail-out expectations. Further, increased bailing out of debtor countries, as well as the government-induced rescue of Long-Term Capital Management (LTCM) in 1998, all contributed to heightened expectations of creditor protection. In time, these warnings have proved prescient.

Third, Yet perhaps even more important was the growing deployment of monetary policy as a means of rescuing failed institutions and forestalling creative destruction. Under what came to be known as "Greenspan's Put", former Federal Reserve Board Chair Alan Greenspan repeatedly lowered official Fed funds rates in response to asset price falls and solvency problems for large firms, allowing them to borrow on favorable terms to save themselves. The 1987 stock market crash, Russia's debt default, the collapse of LTCM, and the bursting of the dot.com bubble were all followed by the Fed cutting rates. Investors and creditors had found a way of privatizing their gains while socializing their losses. Straightforward solvency problems—market losses—were now treated as liquidity problems which a lender of last resort could alleviate, and in the Federal Reserve, the shadow banking system came to increasingly believe they had a lender of last resort upon which they could rely.

Fourth, the increasing political influence of the banking industry which succeeded in formally repealing Glass-Steagall Act, allowing retail banks to enter into investment banking. Rather than being the main culprit of this

episode, the repeat of Glass-Steagall is more of a symbolic confirmation of the reality that had crept over decades of government-enforced control of banking: A giant shadow banking system was now responsible for creating far more of the US Dollar money supply than the government or the formally regulated retail banking system. The shadow banking system's ability to increase the supply of credit is hard to measure or understand, as its many organs move in many different ways, and harder to regulate, since no formal authority has control over these banks, as in narrow retail banking. Instead of regulating it or controlling it, the US Federal Reserve has chosen the wholly submissive position of bailing out virtually unconditionally.

All of this means that today, the inflationary money creation and business cycles are not mainly being generated in the traditional or retail banking system as was the case in the eras of most Austrian economists' analysts. The analysis of fractional reserve ratios, lending criteria, and interest rates for depository institutions are becoming an increasingly quaint irrelevancy in the modern economic system, where far more money is being created outside the traditional retail banking system than inside it. The layers and degrees to which maturity mismatching and fractional reserve banking can exist in the shadow financial system is not easy for anyone to survey.

Now, if you thought fractional reserve banking was complicated when done with bank reserves, then that is nothing compared to the complexity of performing the equivalent of fractional reserve banking with all financial assets and instruments that are held by the shadow financial system. Stocks, bonds, commodities, and all different kinds of debts are now part of maturity mismatched lending, which effectively means the claims for ownership of these assets are larger than the assets. The 2008 financial crisis was merely the collapse of this fractional reserve shadow banking system. By bailing out the majority of financial institutions directly, and by letting them borrow at lower rates, the central bank played the role of lender of last resort, allowing these banks to profit from mismatched maturity lending in the financial markets, and to continue doing it.

Government finance

Perhaps the most economically consequential technological advantage fiat offers is its ability to finance government spending with little restraint. Chapter 4 discussed the mechanisms of how the fiat standard places an entire country's savings, and all of its international trade, as collateral for government to borrow against. The reader is referred to chapters 6 and 7 of *The Bitcoin Standard* for an in-depth treatment of the question of fiat's financing of government spending.

7. Fiat Nodes

In chapter 2, we saw how the development of the global monetary system after World War I, the gold-exchange standard, largely mirrored the arrangement the British empire had with some of its colonies before the War. As the victors of the war, and the main financial heavyweights of the world economy, Great Britain and the US used the Treaty of Genoa to design a new global monetary system, a system that allowed these dominant regimes to export their inflation to other countries by causing these client states to rely on the dollar or the pound sterling.

The gold-exchange standard was nominally based on gold, and governments paid lip service to the stability of gold and the need to establish an international gold standard. Global central banks would hold pound and dollar reserves along with their gold reserves and use these government-backed currencies for international payment settlement as if they were gold. In theory, if the US and Great Britain had been on a strict gold standard, then the gold-exchange standard would have been no different from the gold standard. But because 32 foreign central banks needed to leave their gold with the two major central banks in order to give it salability across the planet, the latter had significant leeway in inflating their currencies beyond their gold reserves, effectively exporting their inflation abroad, and alleviating the pressure on their currencies, particularly the overvalued pound sterling. This habit, too, would take off

over the fiat century. The Treaty of Genoa, the international accord that erected this gold-exchange standard, was the prototype for the monetary arrangements that prevailed between the leading economies with reserve currencies and the neo-colonies.

Bank of France Governor Emile Moreau astutely described this arrangement as “veritable financial domination” and a separation of currencies into two classes:

England having been the first European country to reestablish a stable and secure money has used that advantage to establish a basis for putting Europe under a veritable financial domination. The Financial Committee [of the League of Nations] at Geneva has been the instrument of that policy. The method consists of forcing every country in monetary difficulty to subject itself to the Committee at Geneva, which the British control. The remedies prescribed always involve the installation in the central bank of a foreign supervisor who is British or designated by the Bank of England, and the deposit of a part of the reserve of the central bank at the Bank of England, which serves both to support the pound and to fortify British influence. To guarantee against possible failure they are careful to secure the cooperation of the Federal Reserve Bank of New York. Moreover, they pass on to America the task of making some of the foreign loans if they seem too heavy, always retaining the political advantage of these operations.

England is thus completely or partially entrenched in Austria, Hungary, Belgium, Norway, and Italy. She is in the process of entrenching herself in Greece and Portugal... The currencies [of Europe] will be divided into two classes. Those of the first class, the dollar and the pound sterling, based on gold, and those of the second class based on the pound and dollar—with a part of their gold reserves being

held by the Bank of England and the Federal Reserve Bank of New York, the latter moneys will have lost their independence.

Just as the gold-exchange standard established with its colonies had allowed the Bank of England to engage in inflation to finance the war effort, the post-war global expansion of this model allowed the bank to engage in even more inflation. The larger the pool of liquidity using a currency, the smaller the impact of any given amount of inflationary credit creation by the monetary authority. In an economy in which the total demand for monetary cash balances is \$10b, a central bank increasing the money supply by \$1b would cause a far bigger impact on prices and economic calculation than if the same increase had happened in an economy in which the total demand for monetary cash balances is \$100 billion. The larger the pool of liquidity using the Bank of England's and the Federal Reserve payment and clearance networks, the less US and British inflation would be felt at home.

From then on, the US and the British governments' prime imperative was to get as many central banks in the world to hold as much of their currencies as possible. This was money printing and inflationism on a global scale never seen before. As other governments, institutions, and private actors began settling trade in dollars and pounds, they needed larger quantities of these reserves. World politics has since been largely motivated by major governments' desire to get their inflationary currencies adopted as international reserves in order to allow them to engage in more politically expedient inflation.

National central banks were the nodes of the fiat network. The more nodes that could be set up worldwide, the more gold would pour into the British and American central banks. The more liquidity that existed on the network, the more inflation America and Britain could get away with. The dynamic created by the Treaty of Genoa and the gold-exchange standard might lead an observer to wonder whether British and American support

for national liberation movements was not purely altruistic but rather a self-interested move to create more fiat nodes in nascent countries.

The new global monetary system was termed a system of monetary nationalism by Friedrich Hayek:

By Monetary Nationalism I mean the doctrine that a country's share in the world's supply of money should not be left to be determined by the same principles and the same mechanism as those which determine the relative amounts of money in its different regions or localities. A truly International Monetary System would be one where the whole world possessed a homogeneous currency such as obtains within separate countries and where its flow between regions was left to be determined by the results of the action of all individuals.

It was only with the growth of centralized national banking systems that all the inhabitants of a country came in this sense to be dependent on the same amount of more liquid assets held for them collectively as a national reserve.

Hayek made it clear that the gold standard, as it existed in the late nineteenth century, did not conform to his truly international monetary system ideal because it was not based only on gold but also on bank deposits as base money. This arrangement undermined the uniformity of the monetary asset and allowed governments and banks a certain degree of inflationary credit expansion. But, since national currencies were redeemable in gold, credit expansion by banks would inflate the supply of the monetary media of exchange beyond the gold backing them, thus devaluing the currency compared to other international currencies. As the problems of this monetary expansion were magnified in the late

nineteenth and early twentieth century, the solutions proposed by banks and governments were to seek more centralization and nationalization of banking systems, not less. This exacerbated the problem and gave them more margin for inflation. Rather than nip the inflationism of the banking system in the bud, the early twentieth century central bankers indulged inflationism by erecting barriers to limit conversion between various national currencies. These limits allowed each nation even more leeway for inflationary credit expansion. The vicious cycle of increased centralization leading to more inflationism only intensified throughout the 20th century. As Hayek explained:

Ever since the British Government in 1694 sold the Bank of England a limited monopoly of the issue of bank notes, the chief concern of governments has been not to let slip from their hands the power over money, formerly based on the prerogative of coinage, to really independent banks. For a time the ascendancy of the gold standard and the consequent belief that to maintain it was an important matter of prestige, and to be driven off it a national disgrace, put an effective restraint on this power. It gave the world the one long period--200 years or more--of relative stability during which modern industrialism could develop, albeit suffering from periodic crises. But as soon as it was widely understood some 50 years ago that the convertibility into gold was merely a method of controlling the amount of a currency, which was the real factor determining its value, governments became only too anxious to escape that discipline, and money became more than ever before the plaything of politics. Only a few of the great powers preserved for a time tolerable monetary stability, and they brought it also their colonial empires. But Eastern Europe and South America never knew a prolonged period of monetary stability.

What came to be known as the “developing world” consists of countries that had not yet adopted modern industrial technologies by 1914, when an inflationary global monetary system began replacing a relatively sound one. This dysfunctional global monetary system continuously compromised these countries’ development by enabling local and foreign governments to expropriate the wealth produced by their people.

By 1914, the only nations that had achieved a considerable degree of industrialization and capital accumulation were those of Western Europe, as well as the US, Canada, and Australia. At the time, modern industrialization was beginning to spread into Eastern Europe, the north and south of Africa, and to many parts of Asia and South America. The more a country engaged in trade with industrialized economies, the more it imported the revolutionary technologies of the nineteenth century, chief among them the steam and internal combustion engines. The more technologically advanced a developing nation became, the more it accumulated capital, the more productive its workforce became, and the higher their living standards. World War I stunted this progress, and the global monetary system that emerged after (and consequently the Great Depression) undermined global economic development even further.

The abandonment of the gold standard allowed central banks to diminish the value of every country’s currency. As a result, international trade and finance became the release valve through which national inflationary economic distortions would correct themselves. A devaluing currency encouraged citizens to unload their local currency for foreign currencies, or for foreign goods. This in turn further reduced demand for the local currency and further decreased its value. This dynamic undermined the government of a developing nation’s ability to finance itself through inflation, necessitating even more inflation and taxation to finance spending. Governments could have tried reversing that trend by reducing inflation, of course, but the statist economists of the time sought to fix it by limiting the free movement of capital and goods. Trade barriers

proliferated during the Great Depression resulting in heightened international hostilities around trade.

The imposition of trade barriers in turn resulted in further deterioration of economic conditions in the countries imposing them, even as their own citizens suffered from these very policies. The governments imposing such barriers, and the economists advocating them, would of course never admit that inflation, increasing centralization, and protectionist policies caused the progressively worsening depression. Instead, political leaders blamed other countries and local ethnic minorities. Years of scapegoating and growing hostility toward foreigners and minorities came to a head in 1939. The world's totalitarian socialist regimes began to turn on each other and on their ethnic minorities. Hayek had identified this threat to global peace in his Monetary Nationalism and International Stability lectures in 1937. Alas, his warnings fell on deaf ears. The monetary standard was no longer a homogeneous money freely moving around the world wherever its owners found the best use for it, and so it became a tool for increasingly omnipotent governments worldwide to finance war and totalitarianism.

Government control of money allowed central planning of the economy in a way that was probably last seen in the western world during the last gasps of the Roman Empire. To fight the growing unemployment and inflation caused by their inflationist monetary policies, politicians imposed price controls, minimum wage laws, work-sharing laws, and various others brands of destructive statist economic policies. As the economy shrank further and people's lives suffered, they became more and more dependent on increasingly centralized governments that could conjure money from thin air. Such dependency upon the state served only to reinforce governments' power.

Government-approved history and economics textbooks are completely silent on the monetary origins of the Great Depression and World War II, as well as the role monetary nationalism played in fostering both. The

promoters of increased government centralization and control claimed this new alchemy allowed governments to build a bright future. In reality, government control of money destroyed the world's economies by the late-1930s, crippled global free trade, created omnipotent totalitarian governments with many reasons to be hostile to one another, and increasingly turned previously prosperous and civilized populations into serfs. Formerly free people transformed into government dependents and cannon fodder.

The following four paragraphs, taken from *The Bitcoin Standard*, summarize the contours of the international arrangement of the financial order following the end of World War II:

The United States was to be the center of the global monetary system, with its dollars being used as a global reserve currency by other central banks, whose currencies would be convertible to dollars at fixed exchange rates, while the dollar itself would be convertible to gold at a fixed exchange rate. To facilitate this system, the United States would take gold from other countries' central banks. Whereas the American people were still prohibited from owning gold, the US government promised to redeem dollars in gold to other countries' central banks at a fixed rate, opening what was known as the gold exchange window. In theory, the global monetary system was still based on gold, and if the US government had maintained convertibility to gold by not inflating the dollar supply beyond their gold reserves while other countries had not inflated their money supply beyond their dollar reserves, the monetary system would have effectively been close to the gold standard of the pre-World War I era. They did not, of course, and in practice, the exchange rates were anything but fixed and provisions were made for allowing governments to alter these rates to address a "fundamental disequilibrium."

In order to manage this global system of hopefully fixed exchange rates, and address any potential fundamental disequilibrium, the Bretton Woods conference established the International Monetary Fund, which acted as a global coordination body between central banks with the express aim of

achieving stability of exchange rates and financial flows. In essence, Bretton Woods attempted to achieve through central planning what the international gold standard of the nineteenth century had achieved spontaneously. Under the classical gold standard the monetary unit was gold while capital and goods flowed freely between countries, spontaneously adjusting flows without any need for central control or direction, and never resulting in balance of payment crises: whatever amount of money or goods moved across borders did so at the discretion of its owners and no macroeconomic problems could emerge.

In the Bretton Woods system, however, governments were dominated by Keynesian economists who viewed activist fiscal and monetary policy as a natural and important part of government policy. The constant monetary and fiscal management would naturally lead to the fluctuation of the value of national currencies, resulting in imbalances in trade and capital flows. When a country's currency is devalued, its products become cheaper to foreigners, leading to more goods leaving the country, while holders of the currency seek to purchase foreign currencies to protect themselves from devaluation. As devaluation is usually accompanied by artificially low interest rates, capital seeks exit from the country to go where it can be better rewarded, exacerbating the devaluation of the currency. On the other hand, countries which maintained their currency better than others would thus witness an influx of capital whenever their neighbors devalued, leading to their currency appreciating further. Devaluation would sow the seeds of more devaluation, whereas currency appreciation would lead to more appreciation, creating a problematic dynamic for the two governments. No such problems could exist with the gold standard, where the value of the currency in both countries was constant, because it was gold, and movements of goods and capital would not affect the value of the currency.

The automatic adjustment mechanisms of the gold standard had always provided a constant measuring rod against which all economic activity was measured, but the floating currencies gave the world economy imbalances. The International Monetary Fund's role was to perform an impossible balancing act between all the world's governments to attempt to find some form of stability or "equilibrium" in this mess, keeping

exchange rates within some arbitrary range of predetermined values while trade and capital flows were moving and altering them. But without a stable unit of account for the global economy, this was a task as hopeless as attempting to build a house with an elastic measuring tape whose own length varied every time it was used.

At the end of the second world war, the centralized and all-powerful model of government became standard operating procedure for governments the world over. Endless central bank financing supported this move toward more aggressive government intervention in the economy. The international financial institutions exporting and imposing this new standard did so thanks to infinite fiat credit lines from the U.S. Federal Reserve.

Government control of money and the economy had another important impact on society. By controlling the money, governments could extend their reach into the education system. In a matter of decades, universities transformed from places where citizens could learn and train into propaganda machines bent on indoctrinating young people. Toeing the statist line became more important than free inquiry, rational debate, and the exchange of ideas. A titan like Mises could no longer find a job at a university system dedicated to the dissemination of government propaganda and central planning. Tenured statisticians have shaped the understanding of economics and politics for generations of leaders and economists in developing countries. This intellectual and historical context is essential to understanding the economic catastrophes of the developing world in the latter half of the 20th century.

The number and influence of third world leaders who were educated in British and American universities from the 1930s onward is staggering. I have seen no systematic study or data on the topic, but any familiarity with the economic history of developing countries, particularly those that have made “development” a priority, will reveal the extent of this influence. Any perusal of common economic development textbooks, or

familiarity with the rhetoric of any development agency or ministry in a developing country, will clearly convey the distinct stench of Marxist and Keynesian notions of central planning. The entire framing of the question of economic development is driven ultimately by a highly socialist view of how an economy works. The alert reader will not miss the fascination with macroeconomic aggregates and the way in which the government and the development sector are viewed as the omniscient, omnipotent forces of justice working to achieve the holy goals of development.

The Misery Industry

The International Monetary Fund, World Bank, and World Trade Organization, as explained in *The Bitcoin Standard*, were the brainchild of a communist activist, Harry Dexter Brown. This fact obviously does not feature heavily in these organizations' voluminous and slick marketing material, but it nonetheless makes a lot of sense when one examines what these institutions actually do. The function of central banking itself is the essence of communist and socialist thought. Back in 1844 when Karl Marx and Friedrich Engels penned their Communist Manifesto, a central bank was one of the ten main pillars of a communist program they sought to implement. The IMF was an attempt at creating a global central bank to foster centralized socialist and communist regimes.

The IMF's main role was to act as a global lender of last resort. Since individual governments can suffer from foreign reserve payment problems, and since the currency on which this monetary system runs is an easy one, it was almost inevitable that expansionary monetary policy would be used to keep this system functioning. Thanks to financing from the US Federal Reserve, the IMF is able to issue large amounts of credit for central banks around the world and has performed this function continuously over the past seven decades. It is critical to realize that the existence of the IMF in this system is absolutely necessary for the US dollar to maintain its role as the global reserve currency. Without a global lender of last resort, every third world country would have run out of its

dollar reserves and their central banks would have gone bankrupt. Banks and individuals in these countries would then use other currencies or gold to engage in global trade. The IMF being there to constantly bailout these banks and give them more dollars whenever they run out is essential for the dollar to continue its global monetary role, but it is not essential for the people of that country, who could perform global trade using gold or other currencies. It is no coincidence that the IMF strictly forbids its members from tying their currencies to gold, after all, even though a global gold standard would spontaneously achieve all the goals the IMF's pretend goals. Because it does not involve allowing the US dollar to continue as the global reserve currency, however, the IMF is very hostile toward gold.

The problem with the IMF serving as the lender of last resort is the same problem that exists with a monopoly central bank. Its ability to bail out individual banks is a huge moral hazard that incentivizes banks to take on more risk, since they know there is a lender of last resort that can bail them out. As the IMF looks to maintain the role of the dollar as the global reserve currency, it encourages all governments to use it and lends to them when they run out of it. Under the gold standard, countries that ran out of gold and went bankrupt were effectively taken over by their creditors. Kings would abdicate if they were bankrupted and entire lands would be taken over by other countries. There were very serious consequences to government defaults and bankruptcies. But with the IMF able to bail out countries, the consequences are far less serious for government incompetence and mismanagement, as political leaders can always borrow from the IMF to foist the cost of insolvency onto future citizens.

The post-war order also gave rise to the International Bank for Reconstruction and Development, later to be renamed the World Bank, whose initial purpose was to finance the reconstruction of Europe and the development of the world's poor countries. Inspired by the terrible Keynesian and socialist ideas infesting British and American universities, the Americans decided that what was needed for the world's poor countries to develop was funding for massive government development efforts. From the perspective of the average US or UK bureaucrat and academic at the time, the Soviet Union was the exemplar of economic

success. The Soviet brand of central planning would provide, they believed, substantial economic growth and development for poor countries. Also, in order for the US to prevent countries from allying with the Soviets, all centrally planned global development efforts should be American-led.

The World Bank was also financed with a line of credit from the US Federal Reserve, and it was the main driver of development planning around the third world from the 1950s on. The bank's main business model is to issue development loans to poor countries and help them plan their growth around these loans. The "scholarship" of development economics in the past seventy years can best be understood as elaborate marketing material for these loans. When the World Bank planning inevitably fails and the debts cannot be repaid, the IMF comes in to shake down the deadbeat countries, pillage their resources, and take control of political institutions. It is a symbiotic relationship between the two parasitic organizations that generates a lot of work, income, and travel for the Misery Industry workers – all at the expense of the poor countries that have to pay for it all in loans.

The General Agreement on Trade and Tariffs, later to evolve into the World Trade Organization, has been the forum in which governments seek to reach agreements on trade. After the value of currencies became arbitrary and unconnected to a neutral free market commodity, and as capital controls limited the free movement of capital, trade became a significant pressure release valve for monetary distortions. The GATT/WTO was built on the insane premise that a central global authority could somehow regulate the flow of trade to prevent imbalances, as if the trade flows were the cause of the imbalances rather than a symptom of monetary manipulation. The GATT/WTO severely undermined the free movement of goods and services in the twentieth century, even though technological advancements allowed for faster and cheaper movement of goods than ever before. One of the most important functions of the WTO today is to stifle the free spread of technological innovations worldwide by forcing countries to accept US patent and copyright law. Forcing countries to apply US intellectual property laws domestically makes it much harder for developing country industries to build on new technologies, slows the

speed and spread of innovation, but it does benefit the large corporations that have enormous influence over the WTO.

In addition to these three main institutions, commonly referred to as the International Financial Institutions, there has been a large growth in international and national development organizations worldwide. These organizations are involved with all aspects of life in the average third world country and have grown into monopoly central planners with control over many sectors of developing economies.

Freedom from Accountability

The misery industry is so far removed from the free market that it operates in a complete vacuum of accountability and responsibility. As explained by William Easterly, these organizations have a fundamental and intractable principal-agent problem. The supposed beneficiaries of their services are not the ones paying for them, so the providers will never be accountable to them. They are instead accountable to their donors and funders in the rich countries. As such, their actions are always driven to satisfy the demands and interests of their employees first and their donors second and their beneficiaries last. The Misery Industry is full of stories of projects that sound great to the donors but are terrible for the recipients.

Since the donors are not the ones benefiting from the project, they will never have more than a passing interest in its outcomes (as opposed to the beneficiaries whose lives are dependent on it, despite not having the power to control the project). This asymmetry creates highly skewed incentives for the project's providers and ensures they do not face real accountability for their actions. The World Bank has for decades been the butt of many jokes because it alone is responsible for assessing the success of its own projects. Whereas in a free market the consumer is the beneficiary who decides which companies to 'finance', and in a government there at least is the pretense of political accountability to

democratic institutions, in the misery industry self-accountability is only kind of accountability.

The World Bank itself decides on which project to undertake and how much to fund it. Afterward, bureaucrats drawing a salary from the bank conduct internal reviews and issue assessments. As you would expect from any bureaucracy, it is not really possible for any real critical self-assessment to emerge, because it does not have to. The World Bank's funding is practically limitless. So long as the Federal Reserve's fiat credit is accessible, there is no market pressure to deliver goods and services. The Fed ensures that the World Bank can never go out of business regardless of whether its projects fail miserably. Without real consequences, there cannot be real accountability.

The misery industry is also notorious for retaining and rewarding the most incompetent of its staff members, an ideal and lucrative gig for anyone seeking to avoid accountability and responsibility. In free markets, any job entails significant responsibilities and accountability, but working in development organizations comes with even less accountability than working in the public sector. At least in the public sector the beneficiaries, or citizens, are also the ones funding (albeit involuntarily) the projects, and the government at least pretends to want to serve them. To manage a hospital in a developed economy, you will need extensive background in the job and you will face real accountability and consequences. In the misery industry, a bachelor's degree in human rights, conflict resolution, gender studies, or other vacuous nonsense from a liberal arts college is enough to land you in charge of large projects and multimillion dollar budgets. while staying in cushy five-star hotels, ordering local subordinates and servants around like a colonial administrator, never facing any real accountability.

The final component of the Misery Industry is the academic wing. This wing is comprised of thousands of academics studying development, and planning, executing, and assessing development projects and strategies

worldwide. 'Development economics' makes no sense whatsoever as an independent discipline of economics, since the realities of economics are equally true in developing and developed countries. Nothing is gained from isolating developing countries' economies and studying them as if they were different. No intellectual reason exists for this separation, nor is there market demand for this ridiculous field of study. The demand is purely manufactured by the misery industry and its many tentacles.

Readers who are unfamiliar with development economics literature should consider themselves lucky. In seven decades, thousands of scholars have produced endless heaps of reports, papers, studies, and books on development economics, all of which concludes essentially nothing. These academics' only real achievement is the creation of very rich case studies on central planning's myriad failures, in an endless tale of self-reinvention with ever more ridiculous feelgood buzzwords and corporate boilerplate that never questions one universally important tenet: development requires debt and financing, which require growing bureaucracy, and more funding. No matter what the latest global menace is, operationally, the solution is to convert a Federal Reserve line of easy money into third world debt to produce more jobs for misery industry bureaucrats and their foot soldiers.

Projects in the misery industry pay lip service to serving the population of the poor country, but their underlying motivations can be best summed up in one phrase: self-preservation. Like any bureaucracy isolated from the healthy feedback of the free market, the organization does not exist to serve its customers, but rather its insiders. Failed policies can continue for decades as long as they are financed. The International Financial Institutions' access to a line of credit from the Federal Reserve grants them immunity from failure on the market. It's worth remembering the crucial fact that they face no opportunity cost to their lending, since they do not incur a loss if their investments are unprofitable. After seven decades, their budgets and staff have continued to grow each year, irrespective of performance. This growth shows no sign of abating.

The nature of every bureaucracy is to behave in its own interest. In the case of the International Financial Institutions, this incentive is even more unchecked than in national bureaucracies because of the larger disconnect between the beneficiaries and the funders. National bureaucracies operate mostly within the countries funding them, but international bureaucracies operate on different continents than their funders.

The more one reads about it, the more one realizes how catastrophic it has been to hand this class of powerful yet unaccountable bureaucrats an endless line of Federal Reserve credit and unleash them on the world's poor. This arrangement allows unelected foreigners with nothing at stake to control and centrally plan entire nations' economies. These organizations can easily override domestic property rights and institutions under the guise of development. The World Bank can decide on a development project and have the local government work on implementing it regardless of the domestic impact. Indigenous populations are removed from their lands, private businesses are closed to protect monopoly rights, taxes are raised, and property confiscated to make the projects happen for the sake of development. Tax-free deals are provided to international corporations, under the auspices of the IFIs, while local producers pay ever-higher taxes and suffer from inflation to accommodate their governments' fiscal incontinence.

The utilitarian and totalitarian impulses of the socialist and Keynesian textbooks taught to these development planners come to the fore in their dealing with poor populations. These textbooks teach that welfare and human well-being can be judged through statistical aggregates which central planners need to manage and through measuring the impact of policies on society. The fact that economics is fundamentally subjective, as Austrian economists teach, and that welfare metrics cannot be meaningfully measured any more than feelings can be measured, is not something that has occurred to the many economists of the misery industry.

The misery industry never lets methodology or logic get in the way of a good third world loan, and so they have devised astonishingly ridiculous, and arguably criminal, ways of measuring the impact of their policies and loans on local welfare. Since the goals of development pertain to things like health, education, and general well-being, development planners will put prices on all these things and attempt to make economic plans to maximize national welfare, which would be a measure that includes GDP, years of schooling, life expectancy, and similar development metrics. This might sound innocuous at first, but its application is the best argument against the mathematization fetish in economics. By putting a price on human lives, it becomes possible for central planners to come up with projects that destroy human lives and go ahead with these deadly plans as long as the return financially is larger than the “cost” in monetary human terms. As all aspects of human life get a price on the central planners’ spreadsheets, everything and everyone is within the purchasing power of bureaucrats with a limitless credit line, entire countries become computer games for these bureaucrats. And since the numerical values placed on human lives, health, and education are a product of the fictions of these economists, they can always be manipulated in whichever way makes the project sound good. World Bank project projections always look great on paper but almost always fail in implementation. These failures are an inevitable outcome of planning based on fictitious numbers with no measurement units.

Take, for example, an industrial plant that would require the displacement of an entire village of indigenous peoples and that produces enough pollution to ruin the lives of thousands of people who live on a river downstream for it. Such a plant will look great according to the World Bank’s projections, because they will find that the extra benefits from tax revenue for the government and jobs created is more valuable than the lives ruined by the factory. This is simply the inevitable outcome of using the collectivist mathematics fetish of 20th century economists as the guiding light for planning people’s lives. In a free market, where individuals are free to make their own choices, no industrial plant is able to displace locals without compensating them enough to cause them to

willingly sell their property. But with World Bank loans, greedy governments can run roughshod over their people in the pursuit of self-serving ends. When people are able to decide

Proper economic analysis is methodologically individual because it recognizes there can be no rational or moral basis for central calculation to make collective decisions. Welfare is not comparable between individuals and it cannot be added or subtracted across people. All collectivist central planner calculations have no coherent basis in fact, and the economists who engage in them are no better than actors being paid by IFIs to play that role in front of third world governments to entice them to draw on their infinite zero opportunity cost credit line.

Development's ugly history

The main ideas driving international development in the early years were theories of Walt Rostow on linear stages of economic growth and modernization, the Harrod-Domar model on capital accumulation driving economic growth, and Rosenstein-Rodan's big push model. The Harrod-Domar model assumes and concludes (all of these models basically assume the conclusions they want) that growth is a direct function of the savings rate. The growth rate in an economy in this model is simply the saving rate multiplied by a made-up constant. The model argues that the reason developing countries do not have the desired economic growth is that they do not have enough savings. In order for them to have higher growth, they need higher savings. But since developing countries cannot save because they are poor, the model assures us, it is incumbent upon their governments to borrow to fill "the savings gap." In other words, debt must be acquired to ameliorate the deficiency in savings and thus achieve the growth desired. According to Rosenstein-Rodan, central planners in the government would spend capital on a big push to build out critical infrastructure and transform the economy from agrarian, rural, and isolated to educated, modern, urban, and industrial..

While any sane economist would agree that capital accumulation is key to growth, it does not follow that government borrowing capital would have the same effect as capital accumulation. Borrowing is the exact opposite of saving, and if investments are financed by loans, they will incur extra cost in interest; whereas investments financed with capital will have no interest to pay. But more importantly, when governments borrow to spend, they are simply centrally planning their economies and thereby gaining massive power over the productive members of their society who have to foot the bill. Diabolically, billions of people worldwide have been thrown into generations of debt slavery in order to finance their governments' magalomaniac plans.

One of the key insights from Austrian economics concerns the role of government in the allocation of capital. If the government owns capital goods, a market is not possible in these goods and the government will fail at allocating them in a way that meets the needs of the beneficiaries. As governments are handed large amounts of funds to spend, they are able to engage in all kinds of politically popular projects with little regard for opportunity cost, alternatives, or long-term consequences. Whereas in a free market capital is allocated by people who have generated it and is lost by those who do not use it productively, in a government-planned economy politicians who did not earn the money are able to do with it as they please without facing the consequences of their folly. Government can continue to tax and borrow to finance itself as it makes bad economic decisions, while private actors are not afforded such a luxury.

Capital allocation by governments cannot be compared to capital allocation by individuals. It makes little sense to think of the money that they spend as capital investment, as it really behaves more like consumption rather than investment. Governments face few restrictions on their spending and the ability to print money means there is no meaningful opportunity cost to their spending. Governments and politicians spend money more to buy votes and loyalty than to invest in

the future. The profligacy of government development projects and the conspicuous consumption by everyone involved only highlights this point.

Had development economists understood economics, they might have realized this point. But having been miseducated at Keynesian and socialist fiat universities, the conclusions they arrived at blamed everything and everyone except international lending and the World Bank. A new round of models, buzzwords, and development strategies were announced, and lending and central planning were to resume under their banner. This ritual would continue for seven decades of insanity and has proven highly rewarding for those who work in the misery industry yet highly destructive to the helpless victims of their relentless “help.” The misery industry constantly judges its failures and concludes the problem was in some of the cosmetic meaningless terms they use to impress each other (“more participatory planning is needed”, “stakeholder engagement needs to be improved.”, etc...). The solution is inevitably bigger budgets, more debt, and more central planning.

After the failure of the initial generation of development plans, development economists moved on to more convoluted models that viewed development as a more complex transformation of society. With lots of meaningless mathematical models, the misery industry started moving toward a more hands-on approach to central planning, getting into smaller projects, managing critical infrastructure, and targeting poverty alleviation directly. The results were not much better than before. By the 1970s the development failures piled high, and a lot of soul-searching within the Misery Industry would lead to more government control and more centralized economic planning. As the “dependency school” approach became more popular, government central planning became far more pervasive. The US government’s decision to suspend gold redeemability unleashed the Federal Reserve’s inflationary instincts, resulting in the artificial manipulation of interest rates downward, a massive increase of the money supply, and easy global lending worldwide. The combination of global easy money and governments and

international bureaucracies staffed with Keynesians and Marxists would prove disastrous.

Global banks had a flood of liquidity they wanted to lend, while Marxist and Keynesian governments had insatiable demand for more money to run their catastrophic centrally planned schemes. The misery industry was more than happy to be the matchmaker in this, as more and more developing countries were saddled with massive debt in the 1970s while interest rates continued to drop.

Toward the end of the 1970s, the inflationary pressures unleashed by the Keynesians at the US Federal Reserve had escalated wildly, leading to increasingly high prices, speculative bubbles, and as wealth holders worldwide started to dump their highly inflationary government monies in favor of gold, the price of gold had risen from \$38 an ounce in 1971 to \$800 in 1980, and there were serious concerns in Washington for the survival of the dollar.

As things got perilous for the dollar, it was time for the US government to change its inflationary course, and it did so by bringing in adult supervision to rein in the Keynesian children who had almost driven the dollar off a cliff. US President Jimmy Carter, sagging in popularity thanks to a broad economic malaise, nominated Austrian-leaning economist Paul Volcker to serve as the 12th Chairman of the Board of Governors of the Federal Reserve System in July of 1979. Volcker immediately set to work saving the dollar from destruction by reining in monetary policy and raising interest rates, which had enormous repercussions worldwide. Suddenly, all the governments that had an unsustainable but manageable debt burden on low interest rates were now unable to make the increasingly larger interest rate payments. The 1980s would be the decade of third world debt crises.

As a third world central bank's foreign reserves become insufficient to cover the government's debt obligations, the problem of the balance of

payment functions described above turns the government's own insolvency into a national catastrophe. Under the classical gold standard, life could continue normally for citizens of a country whose government went bankrupt. The king or government would be considered personally liable for the debts, and would have to sell lands or property or abdicate their rule to their creditors.

But under monetary nationalism, the first thing that sovereigns can do when facing repayment problems is to lean on the central bank to use its monopoly control over virtually all of a country's capital to finance the government. This can take many forms, of course, all of which have been tried by your favorite kleptocratic regimes of the twentieth century. The simplest is for the government to issue more local debt and have the central bank buy it, which in turn would increase the local currency supply, bringing its value down. Inflation is but the first and most inevitable outcome of the debt and central planning foisted on poor countries. Far more terrible consequences follow as governments attempt to fight this inflation.

Should the government try to prevent the exchange rate from declining by setting a fixed exchange rate, it would witness a collapse in its reserves as people redeem their local currency for global reserve currencies. As it seeks to stem the bleeding of reserves, it will start to compromise the other functions of the central bank, with devastating consequences. It could begin to restrict trade to prevent people from sending their foreign exchange abroad. It could forcefully prevent capital from exiting the country. It could confiscate bank accounts. In typical interventionist style, each of these interventions will result in the exact opposite of the intended consequence. As capital controls proliferate, the government may maintain the foreign reserves already in its possession, but it immediately scares away any kind of new foreign capital from entering the country for a very long time, snowballing to an even bigger problem for the balance of payment accounts. Trade protectionism can prevent the loss of foreign reserves in the short run, but its second and third order effects are highly destructive to the economy. Protectionist policies lead to a large increase

in the cost of crucial goods and put more downward pressure on the currency, driving people to hold more foreign reserve currencies instead. Such policies also lead to an increase in the costs of imported inputs for domestic industries, which are usually fairly significant for developing countries reliant on developed countries for their most advanced capital goods. As the cost of importing capital goods increases for local producers, the competitiveness of local industries in global markets is severely compromised and exports decline, which in turn hurts the balance of payments further. While confiscating bank accounts can prove a quick short-term fix, it destroys the trust people have in their banking system and makes them far less likely to save for the future, reducing the amount of capital that accumulates in banks.

As governments fell into debt servicing problems, their entire economic systems collapsed because their central banks allowed them to pillage productive capital to keep financing themselves, and to keep paying off the misery industry loan sharks. As the misery industry's *raison d'être* is to lend and create more development programs, it also had a vested interest in the continuation of the status quo, so it took steps to help governments avoid defaulting on their debts. Propping up states at risk of insolvency by having them borrow ever-larger quantities was the only way the circus of 'economic development financing' could continue.

The IMF shined in its role as global lender of last resort in the 1980s, with its famous stabilization policies and structural adjustment programs. As countries were close to default, the IMF would provide them emergency financing conditional on their compliance with the IMF's package of stabilization policies and policy reforms. These policies were marketed around the world as free market reforms, but in reality, they were nothing more than a continuation of debt-financed government central planning.

The IMF's privatization programs were immensely corrupt, replacing the government monopolies with private monopolies usually owned by the same people. As part of the debt relief deals signed with the misery

industry, governments were asked to sell some of their most prized assets. This includes government enterprises, but also natural resources and entire swaths of land. The IMF would usually auction these to multinational corporations, and negotiate special deals for them with governments for exemption from local taxes and laws. After decades of saturating the world with easy credit loans, the IFIs spent the 1980s acting as a repo man, going through the scrap heap of third world countries devastated by their policies and selling whatever is valuable to multinational corporations and giving them protection from the law in the scrap heaps in which they operate. This reverse Robin Hood redistribution is the inevitable consequence of the dynamics created when these organizations were endowed with easy money.

As part of these “free market reforms,” the IMF would recommend imposing more taxes to close the budget gaps, because the IMF uses “free markets” as a market cover to pass off its global fiat mining enterprise. The role of the IFIs as enablers for multinational corporations is something that has been repeated often by the IFIs leftist critics, such as John Perkins in his *Confessions of An Economic Hitman*. While there is some kernel of truth to Perkins’ sensationalist stories, there is of course much that is missing and much that is clueless, primarily due to the fact that the author himself is a clueless typical IFI fiat economist incapable of understanding the depth of the economic problems in which he partook for decades. Having worked for these organizations for decades, Perkins’ critique is typical of the fiat leftist insiders who critique these institutions while living off of their paychecks and conclude that the problem with them is that they are free market institutions, and the solution is more central planning. In my estimation, approximately 90% of the people who work for international financial institutions can be classified as ‘leftist critics’ of these institutions. American actor Joseph Stiglitz has made a lucrative career from these organizations by playing an economist who criticizes them demanding they shift toward more central planning and debt financing.

The work of Perkins and many others exposes clearly how much large multinational corporations benefit from the special arrangements that the IFIs negotiate for them with developing countries, but that cannot be understood as the root problem, but rather, as a symptom of it. That these organizations have the enormous power of a credit line from the US Federal Reserve is what gives them power over developing countries. This also makes them ripe for capture by multinational companies looking to do business in the developing world.

Fiat economists lash out at multinational corporations as if Coca-Cola and McDonald's are the most serious problems facing the third world, completely oblivious to the far more mendacious horror unleashed by the fiat debt that pays their salaries. This superficial ritual prevents them from coming to terms with harder questions they are incapable of even comprehending: Why is there a global lender of last resort in the first place? Why do all the world's governments have to get into debt? Why should the IFIs get to plan economic development when the history of central planning is the history of comprehensive failure? Contrary to Perkins' vision, the problem is not that the IFIs allow free trade or free capital movement. The problem is that they control and centrally plan trade and investment and that their loans are impossible to repay. These problems don't start when the country defaults and needs a bail-out; they start the moment that the first misery industry plutocrat sets foot in a country and begins to centrally plan its economy.

What happened in the 1970s and 1980s with third world debt is no different from standard business cycles as explained by Austrian business cycle theory: The manipulation of interest rates downward causes an unsustainable increase in credit, which can only then be sustained with even lower interest rates, and will implode as soon as these artificial rates normalize. The case of third world debt here was similar to the dotcom's in the 1990s, housing in the 2000s, or stocks in the 1920s.

In order to get an idea of how utterly destructive the misery industry is, one need only pick up any development economics textbook and read the laughable explanations of this third world debt crisis. It's astonishing to see the mental gymnastics required in order to pretend that the problem has nothing to do with the monetary policy of the central bank that bankrolls the misery industry, or with flooding the third world with debt, or with their central planning of their economies. In the misery industry, the reason developing countries took on a lot of debt is because Arab countries raised oil prices in the aftermath of the 1973 Yom Kippur War, which led to them having excess amounts of capital stored at banks, which banks then had to lend out. To the extent that the US Federal Reserve is ever blamed for this, it is only blamed for raising interest rates in 1980, not for the decade of low interest rates that had ensnared these countries in debt. Suddenly, central banks stop mattering when they do something bad, it's just "market failure." The masochistic reader is invited to read Chapter 13 of Michael P. Todaro and Stephen C. Smith's *Economic Development* and see for themselves a fine sample of these rationalizations.

Whereas the misery industry grew enormously while destroying the economies of the third world and bringing them to bankruptcy, it also thrived while "rescuing" them from the debt crises. The staff and budget of these organizations has continued to rise, before and after the debt crisis, irrespective of any success or failure metrics. IFI internal reports will forever bemoan their failures at achieving their macro goals and the individual failure of their projects, but organizations cannot survive for so long if they continue to fail at their objective. The only way to understand their continued survival is to realize that feelgood buzzwords (development, growth, sustainability, children's education, disease elimination, etc...) are not their actual objective. Their survival can only be understood as the result of their success in meeting their real objectives:

- 1- Providing lucrative careers for the insiders in these organizations;
- 2- Maintaining the dollar's role as the global reserve currency;
- 3- Allowing the US government an unprecedented degree of control over the economies of the world.

On all three counts, the IFIs have succeeded

remarkably. Any goal these organizations might have outside these three is rhetoric.

A Real Impact Assessment

The impact of the misery industry has been to constantly pillage the people of the world's poor countries to the benefit of their governments and to the benefit of the US government that issues the reserve currency they use. By ensuring the whole world stays on the US dollar as a standard, the IMF guarantees the US can continue to operate its inflationary monetary policy and export its inflation to the whole world. Only when one understands the grand larceny at the heart of the global monetary system can one understand the plight of developing countries. Fiat economists are completely silent on this, since their paycheck, and third world Raj status, are dependent on not understanding it.

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.Domestically, the impact of the misery industry has been mainly to allow governments to take on larger quantities of debt and the disruption of the flow of financial and human capital. Instead of allowing entrepreneurs and individuals to reap the rewards of their productive work and have the successful among them in charge of more capital allocation decisions, thus shaping the decisions of other producers to meet their demands, the average third world government confiscates the wealth of its productive and puts capital in the hands of clueless unaccountable misery industry central planners and their subordinates in local governments.

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.In the absence of a free market (thanks to the misery industry's central planning), the misery industry itself ends up being the most lucrative employer in developing countries. Instead of the brightest talents of developing countries seeking to work in a productive capacity and serve their fellow citizens, they are attracted to jobs in the misery industry, and they end up shuffling papers, writing reports, and conducting the studies nobody reads but that are necessary to keep the funding flowing.

.On top of destroying the market economies of poor countries and turning them into centrally planned failures, the large amounts of debt enable them to persist longer in failed policies, which conveniently gives the donor governments a great excuse to politically control these governments. The net result is that the third world is not just centrally planned, but also accountable to foreigners instead of locals. Without the misery industry to bail out every kleptocrat in the third world, the alternative would not be constant inflation and recession. On the contrary, it would only take one of these crises to completely destroy the government that engaged in it, thus allowing the country a new start. Had kleptocrats not constantly had recourse to the IFIs' endless credit line, they'd quickly bankrupt themselves until they are replaced by governments that behave responsibly and only spend less than they tax. A single hyperinflation that destroys a government and replaces it with a monetarily disciplined one is a far better outcome than the eternal purgatory of constantly high inflation, fiscal crises, capital controls, protectionism, and central planning that the IMF promotes.

.If you live in a poor country, you are witnessing the value of your money collapse through your government's own inflation and the inflation of the US dollar backing it. You are suffering from monetary central planning on a local and global level. You are witnessing the distortion of your local markets through the intervention of foreign central planners. The brightest minds in your country will be tempted to enter into parasitic careers in the misery industry rather than produce something of value. The argument of this book is not that the misery industry is responsible for making poor countries poor. Rather, in light of all the ways presented in which the misery industry disrupts and destroys the economic and political institutions in a poor country, it is very hard to argue that the misery industry has not hampered developing countries from developing, growing, and eliminating poverty. In sum, the sprawling bureaucracy that is the misery industry has achieved precisely the opposite of its stated goal.

Development successes

Within the development industry, there is an almost mystical air to the question of how development can happen. The time of simple answers is well past us at this point, and the gibberish reports produced by the international organizations of today offer nothing concrete in their meaning-free but grammatically and politically correct platitudes. These organizations cannot in any meaningful way claim to have succeeded in their original missions. Nevertheless, the world has witnessed significant improvements in standards of living, along with the steady elimination of poverty, absolute poverty, illiteracy, and many diseases.

The idea that these organizations are in any way to thank for this progress is a fiction that not even their own economists entertain too seriously. An examination of the history of economic development over the past seven decades shows very clearly how there is no mystery to it and that development conforms to the fundamental tenets of economics. All over the world, and not just in developing countries, societies that have secure property rights, free markets, relatively open international trade have prospered and eliminated poverty the most effectively. As nineteenth century industrial technology has spread to the rest of the world in the twentieth century, despite government restrictions and controls, it has brought the living standard improvements that it always brings. As modern telecommunication technology has also spread worldwide, it has helped people integrate into markets, learn skills, and make massive gains in their productivity.

The most important stories of growth and transformation have come in the countries that have escaped socialist regimes to more market-friendly political institutions. China is the most important example, of course. In the 1970s, China had little private property and almost complete central planning of its economy. After the death of Mao Zedong, the founding father of the Chinese Communist Party, the country shifted gradually toward a market economy, and living standards improved drastically.

Extreme poverty has almost been entirely eliminated in just four decades. India's move away from heavily socialist rule of British-educated Fabian socialists started in the 1980s, and with it has come a huge change in the living standards of many of the world's poorest. Neither of these countries had significant presence of World Bank or IMF lending and projects driving its development, nowhere near as much as African and Latin American countries still languishing in poverty today.

Within Africa and Latin America, the only two examples of undeveloped countries to successfully maintain economic growth for any appreciable period are Botswana and Chile, both of whom are the freest market economies in their continents. Regimes which borrowed heavily and central planned their economies invariably ended up with economic disaster and hyperinflation.

Among development economists, who subsist on "jobs" from the misery industry, the success of India and China is viewed as a testament to the good plans followed by their governments, and proof that active government management of the economy is necessary and good. But anyone without a paycheck from the misery industry can clearly see that the real driver of growth is the massive reduction government intervention in the economy, and that further limiting of the state and the misery industry will result in even faster growth and development. The policies of Chinese and Indian bureaucrats and politicians are not driving their economies forward because they are good policies, but because they are far less horrible than the much more statist policies of the past.

Achieving economic development is no mystery. It merely requires people to have peace, sound money, and the freedom to work, own property, accumulate capital, and trade freely. The mystery is purely in how to centrally plan economic development while taking on large amounts of loans from the international financial institutions. This is why development economists are ultimately mystified; their job is not to end poverty or bring about development Their job is to further their careers and sustain the

international monetary system that makes their jobs possible, and forestalls economic growth in numerous ways.

II. Fiat Life

8. Fiat Life



Fiat Against Nature

Nature offers man a reality he must learn to deal with if he is to survive. You must sow to reap, you must work to be rewarded, and you will suffer from want by not working. This is the nature of life for all living beings. Every creature needs to spend its day searching for food and trying to avoid becoming food. This is the natural survival instinct without which we would not have survived to be here today.

As a monetary system whose constituent units are easy to produce for governments, fiat disrupts this natural order, as it severs the connection between work and reward. Rather than the market offering individuals the reward for their work as valued by the others they serve, fiat money makes monetary reward highly dependent on political obedience and connections. When jobs are unproductive, then reward cannot be based on productivity, it is rather based on obedience and politics. Instead of learning to be productive, fiat teaches you to play politics. Instead of work being rewarded based on its productivity, it is instead rewarded based on artificial status games.

Not only does work and production fall apart, but humans suffer, too. When you start to think closely of the distortionary effect of a centrally-planned monetary system, you start to see them everywhere. Money, after all, is one half of every economic transaction. It is the main vehicle with which we can trade with our future self through the act of saving. The development of money allows humans to provide for the future, and to think of the long-term. The harder the money, the more reliably we can provide for the future, the less uncertain the future is, the more it is possible to think and plan for the future.

Money is the medium for the communication of information in a market economy. Profit and loss are the signals that ensure the most productive continues to profit and have more resources so as to produce more, while the unproductive loses their resources and has to stop wasting them. The only way for a business to survive is to produce something of value to others. At any point in time, all the businesses that are operational must

be productive, and the only exceptions would be the businesses on their way to shutting down.

When money is controlled by government, this market process is perverted. The profit and loss mechanism is severely restricted. The requirement for survival is no longer productivity, but political acceptability. Unproductive but politically favored firms can survive for decades, continuing to waste resources, while productive and politically unfavored firms can go out of business. At any point in time, the businesses that are operational will likely contain a large number of zombie parasites, draining resources away from productive members of society.

By devaluing the monopoly currency, government essentially forces everyone to raise their time preference. The flip side of this is that the devaluation allows government to meddle with all aspects of life. This chapter focuses on the impact of fiat money on time preference, architecture, capital, the environment, and the family. The next chapters will explore the impact of raised time preference combined with limitless government spending and intervention on a few very important aspects of modern fiat life: food, education, science, energy, and security. Other important consequences of fiat money were discussed in *The Bitcoin Standard*: government finance, war, tyranny, business cycles, and more on time preference.

After a century of *The Fiat Standard*, wherein government fiat mandated citizenry use debt as money, it is now possible to discern some clear societal and economic consequences from the widespread use of this technology. Money can be thought of as the operating system for society, as it is involved in every economic transaction, and so it will have a pervasive influence on the nature of economic choices that individuals make, and the values that motivate them. In this chapter, we dig into the effect of fiat on the moral fabric of society, and how morality is dictated by fiat, rather than emergent from human tradition.

Fiat Time Preference

Money as a technology is heavily intertwined with our time preference, the degree to which we discount the future. As humans develop the capacity to store economic goods for future use, their ability to provide for their future increases. Economically primitive man can provide for his future self by saving consumption goods for future use. As their degree of economic sophistication increases, humans can develop durable consumption goods which they maintain and use over time. As money develops as a mechanism for conducting trade and solving the problem of coincidence of wants, money itself can be saved to transfer economic value in the future, allowing more compact and reliable transfer of value across time. The better we are at providing for the future, the more we become aware of it.

The history of money as described in the early chapters of *The Bitcoin Standard* shows a natural progression of money from easier to harder media over time. Salt, cattle, glass beads, lime stones, seashells, iron, copper, and silver had all been used as money in various times and places, but by the end of the nineteenth century, the entire globe was practically on a gold standard. The use of an easier monetary medium would lead to its over-production, and thus a decline in its value, and the dissipation of its monetary premium. Throughout history, and through global trade, money would always tend to be the hardest good to produce. As money progresses from easier to harder media of exchange, individuals' time preference will naturally decline, as their discounting of the future declines. We can understand the process of human civilization as the process of lowering time preference, as Hans-Hermann Hoppe explains it. As people value the future more, they begin to invest in improving it. Their actions are carried out with regard to their consequences over a longer and longer time frame. As more and more people cooperate and trade within a market order, creating more economic value, and planning for the future, capital is accumulated, and productivity of work increases. Material living conditions improve over time, and successive generations have a better standard of living than their forebears. With time, humans are able to direct their attention and

labor away from the drudgery of basic survival to more elevated and elevating concerns.

The process of lowering of time preference is inextricably linked to money. Having money allows man to delay consumption in exchange for something that can hold value well, and can be exchanged easily. Without money, delaying consumption and saving would be more difficult, because the goods could lose their value over time. You could store grains to grow, but the chance of them ruining before next season are higher than the chance of a gold coin ruining. If you can sell the grain for gold, you are able to exchange it back to grain whenever you need to, and you can meanwhile use it for something else. This invention naturally increases the expected future value of deferring consumption, compared to a world with no money. This incentivizes future-provision. The better the money is at holding on to its value into the future, the more reliably individuals can use this money to provide for their future selves, and the less uncertainty exists about their future lives.

According to Austrian economists, and as discussed in more detail in my Principles of Economics textbook, time preference is the driver and determinant of interest rates. In *The History of Interest Rates*, Homer and Sylla show a 5,000-year process of decline in interest rates, intertwined with significant rises during periods of war, diseases and hardship. The move toward harder moneys with better salability across space and time can be viewed as a contributor to the epochal decline in time preference, by allowing humans better savings technology, making the future less uncertain for them, and thus making them discount it less.

With the gold standard of the late nineteenth century, the majority of the world had access to a form of money that could hold its value well into the future, while also being increasingly easy to transfer across space. Saving for the future became increasingly reliable for more and more of the world's population. With the ability to save in hard money, everyone is constantly being enticed to save, to lower their time preference, and to reap future rewards. They see it around them every day, in dropping prices, and in the increased wealth of savers. Economic reality is

constantly teaching everyone the high opportunity cost of present spending in terms of future happiness.

The twentieth century's shift to an easier monetary medium has arguably reversed this millennia-old process of progressively lowering time preference. Rather than a world in which almost everyone had access to a store of value whose supply could only be increased by around 2% a year, the twentieth century gave us a hodge-podge of government provided abominations of currencies growing at 6-7% in only the best of circumstances, usually achieving double digit percentage growth, and occasionally achieving triple digit percentage growth.

Rather than expect money to appreciate and thus have a reliable portal for sending value to the future, humans of the twentieth century were returned by fiat to far more primitive times, when sending value to the future was far less certain, and the value would be expected to arrive discounted, if at all. The future is becomes hazier with easy money, and the inability to provide for the future makes it less certain. The increased uncertainty leads to higher discounting of the future, and thus a higher time preference. Fiat money effectively taxes provision for the future, leading to a higher discounting of it, and an increase in basic present-oriented behavior among individuals.

The extreme of this process can be seen when observing the effects of hyperinflation, the move to a very easy and rapidly devaluing currency. A look at the modern economies of Lebanon, Zimbabwe, or Venezuela through their recent hyperinflationary provides a good case study, as do the dozens of examples of hyperinflation of the twentieth century. Adam Ferguson's *When Money Dies* provides a good overview of the effect of hyperinflation on inter-war Germany, a society that was one of the world's most advanced a few years earlier.

As the value of money was destroyed, along with it went concern for the future. Attention turns instead to the short-term quest for survival. Saving becomes unthinkable, and people seek to spend whatever money they have as soon as they secure it. People begin to discount all things which

have value for the long run, and capital is used for immediate consumption; fruit-bearing trees are chopped down for firewood in winter, businesses are liquidated to finance expenditure, and the proverbial seed corn is eaten. Human and physical capital leaves the country to go to places where savers can afford to maintain it and operate it productively. With the future so heavily discounted, there is less incentive to be civil, prudent, or law-abiding, and more incentive to be reckless, criminal, or dangerous. Crime and violence become exceedingly common as everyone feels robbed and seeks to take it out on whoever has anything. Families break down under financial strain. While more extreme in the cases of hyperinflation, these trends are nonetheless ever-present, in milder forms, under the yoke of the slow fiat inflationary bleed.

The most immediate effect of the decline in the ability of money to maintain its value over time is an increase in consumption and reduction in saving. To defer consumption and delay gratification requires one to give up on immediate pleasure in exchange for future reward. The less reliable the medium of exchange is for transforming value into future reward, the lower the expected value of the future reward, the more expensive the initial sacrifice becomes, and the less likely people are to defer consumption. The extreme of this phenomenon can be observed at the beginning of the month in supermarkets of countries witnessing very fast inflation. People who get their paycheck will rush to the supermarket to immediately convert it into groceries and essentials, knowing that the quantities they can acquire by the end of the month will be far smaller due to the destruction of the value of the currency. Fiat's usual inflation does something more subtle but similar.

The culture of conspicuous mass consumption that pervades our planet today cannot be understood except through the distorted incentives fiat provides to consume. With the money constantly losing value, deferring consumption and saving will likely have a negative expected value. Finding the right investments is difficult, requires active management and supervision, and entails risk. The path of least resistance, and the one permeating the entire culture of fiat society is to consume all your income.

When money is hard and can appreciate, individuals are likely to be very discerning about what they spend it on, as the opportunity cost appreciates over time. Why buy a shoddy table, shirt, or home when you can wait a little while and watch your savings appreciate to allow you to buy a better one. But with cash burning a hole in their pockets, consumers are less picky about the quality of what they buy. The shoddy table, home, or shirt becomes a reasonable proposition when the alternative is to hold a money that depreciates over time, allowing you to acquire an even lower quality product.

Fiat Architecture

Fiat's high time preference is perhaps most apparent by examining the longest lived consumption good humans have: buildings. It is astoundingly curious that as industrial technology made construction cheaper and easier than ever before, the quality of buildings worldwide has declined, along with their life expectancy. Changes in future discounting will likely have the most significant effects on goods that survive longer, as they offer the most scope for trading-off future for present day utility. As time preference rises, the discounting of the future increases, and the value of a house surviving for many decades declines markedly. As this happens, architecture has moved from optimizing for quality and longevity, to optimizing for present-day cost reduction.

Under the gold standard, homes were built to last. The owner would have saved since their childhood to build their home, and they usually built it with the intention of living in it for the rest of their life. But in the twentieth century, homes are built to reduce cost, with very little regard for the building's long-term prospects. It is simply not true that twentieth century architecture is uglier and less permanent than nineteenth century architecture because it is more economical. While it is likely cheaper to build in the short-run, it is far more expensive in the long-run, given the

regular maintenance costs needed to keep it operational, and the fact that it will need to be replaced far sooner than a nineteenth century building.

A stroll through any city that had parts built in the nineteenth and twentieth century shows a very marked difference in the architecture produced by each era. An entire book could be written contrasting nineteenth and twentieth century building styles and discerning all the ways in which rising time preference has influenced design and construction. This chapter will only use one illustrative example: The Boston Public Library's two buildings built almost a century apart. The first building, the magnificent McKim Building, was built between 1888 and 1895 in the classical tradition, at a cost of \$2,268,000 gold-backed dollars, equivalent to \$70,200,000 in 2020 fiat dollars. A century and a quarter after its construction, the building is still one of the most beautiful in Boston, and one of the most important landmarks of the city, attracting locals and tourists to enjoy its splendid interior. Its structure has needed little construction or maintenance to remain standing and beautiful over this time. The second building, the Johnson building, is a brutalist modernist abomination nicknamed the mausoleum by those unfortunate enough to have to experience the gloom of entering it. Built in 1971, the building had reached a degree of disrepair and dysfunction that it needed a complete overhaul in 2013, which cost \$78m and required three years to complete. The cost of maintaining the ugly Johnson building after only forty years of construction exceeded the cost of building the magnificent McKim building, which has not required major maintenance after 125 years of uninterrupted and reliably functional beauty. It is astonishing that nobody considered to just build a new building in the classical tradition for the cost of the renovation.

Our technology today is far superior to what existed in the late nineteenth century, and it is only natural that the cost of construction has gone down with technological improvements. It is not poverty that drove the city of Boston to switch from building beautiful monuments to ugly concrete boxes; it is the high time preference that heavily discounts the future costs of renovation implied with the modern quick-to-build and quick-to-decay construction. Modern architecture only appears cheaper in the short-term,

but its cost is deferred into the future through the need for renovation and rebuilding. The millennia-long tradition of classical architecture was not displaced with modern abominations because it is cheaper, but simply because it defers its costs to a future which the twentieth century taught us to discount heavily.

Fiat Capital Destruction

As individuals reduce their saving and increase their consumption, it becomes incumbent upon them to borrow to meet major life expenses. Further, the fiat system's strong incentives to engage in credit creation makes borrowing an attractive proposition for most people, as it allows their lenders to mine new fiat tokens into existence. The result is a society where everyone is indebted, and few have savings for the future. The wealthy can protect themselves in these situations by holding the majority of their wealth in hard assets, but a majority of the population will usually have a majority of its wealth in liquid assets which are constantly devalued, taking away from them the rationale that they can attain a better future.

The dissaving is not just reflected in the negative fiat balances everyone keeps. It pervades across all forms of capital. Temporally and cognitively, saving is the necessary predecessor to investment and capital accumulation. Individuals have to first decide to defer gratification and delay consumption, in other words, they have to save before they are able to accumulate any capital. Capital can only be obtained from utilizing economic goods which were not consumed first, i.e. savings. The reduction in the incentive to save will lead to the reduction in the availability of capital for investing.

Fiat enthusiasts will respond to this point by arguing that the inflation creates a stronger incentive to invest, and central bank credit expansion amplifies the incentive to engage in productive business rather than hoard cash unproductively. But if we understand saving as the necessary

prelude to investing, then the reduction in savings will lead to a reduction in real investments backed by real savings. The investments financed through credit expansion without requisite savings are not a free gift from government that allows us higher productivity without sacrifice; they are simply miscalculations that lead to business cycles and inflation.

As discussed in chapters 6 and 7 of *The Bitcoin Standard*, central bank manipulation of its monopoly currency leads to distorting the ability of entrepreneurs to perform economic calculation, leading to systematic errors in allocation of capital, which are exposed when credit expansion recedes, leading to the recessionary bust part of the business cycle. Each such business cycle causes large amounts of misallocation of capital into unprofitable and unproductive ventures that effectively consume capital rather than increase it. Credit unbacked by savings cannot generate new capital for investment, it can only misallocate existing capital to sectors where the action of self-interested individuals in a free market would not have allocated it.

Another way to understand the destructive impact of inflation on capital accumulation is that the threat of inflation encourages savers to invest in anything they expect will offer a better return than holding cash. When cash holds its value and appreciates, the acceptable investment will return a positive nominal return, which will necessarily also be a positive real return. Potential investors can hold on to their cash while they wait to find the best opportunity. But when money is being devalued, there is a strong impetus to invest to avoid devaluation of savings, and so investors are less discerning. Investments that offer a positive nominal return could nonetheless be yielding a negative real return. Business activities that destroy economic value and consume capital appear economical when measured against the debasing monetary unit, and can continue to subsist, find investors, and destroy capital. The destruction of wealth in savings does not magically create more productive opportunities in society, as childish Keynesian fantasists want to believe; it simply allows for the financing of destructive and failed business opportunities.

Fiat's consumptive and destructive impetus is also reflected on natural capital, and the environment in which humans live. As the possibility of providing for the future becomes less certain, because of the dysfunctional money's inability to maintain value, the long-term value of utility provided from goods is discounted more heavily. The future services provided by soil, rivers, forests, beaches, and water aquifers are discounted more heavily, making depleting these resources a more likely rational strategy. The desire to conserve these parts of nature wanes when individuals do not value their future services, and the inevitable outcome is depletion and overuse. The next chapter, on fiat food, discusses the impact this has on agriculture and food.

Related to the general rise in time preference and the heavy discounting of the future is the rise of interpersonal conflict between individuals and the degradation of the manners and mores that make human society possible. Trade, social cooperation, and the ability of humans to live in close-contact with one another in permanent settlements is dependent upon humans learning to control their base animal hostile instincts and responses, and substituting them with reason and a long-term orientation. Religion and civic and social norms all encourage people to moderate their immediate impulses in exchange for the long-term benefits of living in a society cooperating with others and enjoying the benefits of the division of labor. When these long-term benefits seem far away, the incentive to sacrifice for them becomes weaker. When individuals witness their wealth dissipate, they rightly feel robbed, and they question the utility of living in a society and respecting its mores. Rather than a way to ensure more prosperity for all, society appears as a mechanism for an elite few to rob the majority. Under inflation, more crime is committed and more conflict emerges. Those who feel robbed by the wealthy of society will find it relatively easier to justify aggressing against others' property. With little to look forward to in the future, the incentive to be civil and respectful of clients, employers, and acquaintances is weakened. As the ability to provide for the future is compromised, the desire to account for it declines. The less certain the future appears to an individual, the more likely they are to engage in reckless behavior that could reward them in the short-term while endangering them for the long-term. The long-term

downside risk of these activities, such as imprisonment, death, or mutilation, are discounted more heavily compared to the immediate reward of securing some much-needed essentials.

Fiat Family

The family itself is also a victim of the onslaught of fiat inflationism on time preference. In all cultures, people invest their youth and resources into building a family with a life partner, sacrificing present resources to provide a safe fostering environment for children, and in return, they get a family to care for them in their old age. Starting a family is a low time preference decision that requires the individual to highly value the future and sacrifice for it. With hard money, the burden of sacrifice is lightened by the ability to save a money which appreciates in real terms. But when monetary hardness was compromised in the twentieth century, the ability of family members to provide for one another was also compromised. With fiat's loose supply growth resulting in continuous price rises, and savings not effective, the financial pressures of fiat have resulted in a large increase in families with two wage-earners, resulting in far less time in which family spend time together. As the stored monetary savings of the individual are depleted to finance the state, along with it goes the ability to provide. The ability of the state to provide undermines the individual's incentive to sacrifice to start a family. As education, child care, health care, and retirement become the responsibility of the state, the need for a family decreases, and the sacrifices required for it become less compelling. All the bonds of family will weaken when the power of provision is appropriated by the state.

In a world in which fiat was not financing the welfare state, one's only hope for survival through childhood and old age was through family, and so everyone had a strong incentive to invest in familiar relationships. Children had little choice but to listen to their families, and adults had little choice but to be devoted to their families, as straying away from a family was far more consequential without a welfare state.

Planning for old age is part of our nature as human beings, through saving and having children. Most humans to ever live understood that if you spend your youth building a healthy family, you stood a good chance of having loving company in your latter years, and someone to take care of you. The urge to have children is instinctive for most people, and the happiness they provide makes many want them, but few think of getting children as a great way to prepare for old age. Saving is not easy and the government is supposed to provide. It is very common to see people extend their adolescence indefinitely and waste their youth on inconsequential nonsense offering fleeting pleasures, but little lasting security, satisfaction, or fulfillment.

Even if government will still be there to provide for you financially in your old age, it cannot caress and love you as you leave the world. Humans have needs beyond just the financial. The need for connection, love, and familiarity is very strong among individuals, and a long-term investment in family is the most reliable method known for obtaining this. Being relieved from having to provide for the long-term by the fiat credit machine, individuals end up investing less in the families that would give them joy and satisfaction in their latter years. Nothing in our psyche has changed over the past one hundred years to allow us to overcome this need and sacrifice family. What has changed is our ability to understand the long term and care for it.

Armed with the advanced and dangerous technologies of his ancestors from the golden age, fiat man finds himself approaching the world with a progressively shorter horizon, stumbling along from one short-term fix to another, depleting his capital stock, devaluing the age-long institutions, mores, and traditions that have allowed his modern existence, and descending back into the barbarism of his distant ancestors. By providing a monetary standard built on a hard money which resists debasement, bitcoin is allowing people worldwide to provide for their future selves more reliably, decreasing their uncertainty about the future, lowering their time preference and offering us the intriguing possibility of reversing the twentieth century's rise in time preference, and its many attendant catastrophes.

9. Fiat food

Money, being a part of every economic transaction, has a pervasive effect on most aspects of life. The mechanics of fiat money outlined in the first section of this book create several distortions significant to food markets. This chapter focuses on examining two particular distortions: how fiat's incentives for raising time preference impact farmland production and food consumption choices; and how fiat government financing facilitates an activist government role in the food market through farm policy, food subsidies, and dietary guidelines. The next section examines the most prevalent foods promoted by fiat, and the health impacts they have had. The chapter concludes with a discussion of non-fiat food. What would modern food and food science have looked like without the century of fiat? The fascinating work of Weston Price explains the meat of the matter.

Fiat farms

The closing of the gold exchange window in 1971, discussed in Chapter 2, had relieved the US government from the restraint of having to redeem its fiat in physical gold, and thus allowed it a larger margin of inflationary expansion. The inevitable result of the expansion in the quantity of money was the rise in the prices of goods and services, which was to be the hallmark of the world economy in the 1970s. As runaway inflation ensued, the US government did what every inflationist government in history did, and blamed it on a multitude of factors (the Arab oil embargo, evil speculators on the international capital markets, natural resources reaching their limits, etc...) none of which was the inflationary monetary policy of the government itself.

Each expansion of government credit and spending develops a group dependent on it, which uses its political influence to perpetuate the spending, and makes the job of any politician wanting to reverse it very difficult. The path to success in fiat politics lies in abusing the printing press, not reigning it in. As food prices became the pressing political question of the day, there was little chance of reigning the rise through the reversal of the inflationary policies which had led to the abandoning of the gold exchange window in the first place. The path of centrally-planning the food market was chosen, instead, with disastrous consequences that continue to unfold to this day.

President Nixon appointed Earl Butz, an agronomist who sat on the boards of various agribusiness companies, as secretary of the US Department of Agriculture. Butz's stated goal was to bring food prices down, and his methods were brutally direct: "get big or get out" he told farmers, as low-interest rates flooded farmers with capital to intensify their productivity. This was a boon to large-scale producers, and the death-knell for small farmers. It killed small-scale agriculture and forced small farmers to sell their plots to large corporations, consolidating the growth of industrial food production which would in due time destroy America's soil and its people's health. While the increased production did lead to lower

prices, they came at the expense of the nutritional content of the foods and the quality of the soil.

The large application of industrial machinery can bring down the price of industrial foods, and that was what Butz sought. Mass production leads to an increase in the size and quantity of the food and its sugar content, but it is much harder to increase its nutrient content, as the soil gets depleted of nutrients from repetitive intensive monocropping, requiring ever-larger quantities of artificial fertilizer to replenish it.

Along with the degradation of the quality of foods recommended by the government has come the degradation of the quality of food included in government's measure of inflation, the Consumer Price Index, an invalid mathematical measure which governments nonetheless track meticulously. The CPI pretends to measure and track across time the price of the average basket of consumer goods purchased by the average household. By tracking the price changes of this basket, government statisticians believe they can get a good sense of inflation levels. The only way to agree is to have no understanding of how math works.

As prices of highly nutritious foods rise, people are inevitably forced to replace them with cheaper alternatives. As the cheaper foods become a more prevalent part of the basket of goods, the effect of inflation is understated. To illustrate the point: imagine you earn \$10 a day and spend them all on eating a delicious ribeye steak that gives you all the nutrients you need for the day. In this simple ([and, many would argue, optimal](#)) consumer basket of goods, the CPI is \$10. Now imagine one day hyperinflation strikes the economy and the price of your ribeye increases to \$100 while your daily wage remains \$10. What happens to the price of your basket of goods? It cannot rise tenfold because you cannot afford the \$100 ribeye. Instead you make do with the chemical shitstorm that is a soy-burger for \$10. The CPI, magically, shows zero inflation. No matter what happens with monetary inflation, the CPI is destined to lag behind as a measure because it is based on consumer spending, which itself is determined by prices. Price rises do not elicit equivalent increases in consumer spending, they bring about reductions in quality of consumed

goods. The change in the cost of living cannot be reflected in the price of the average basket of goods because the goods comprising that basket are in turn determined by the change in the price. This is how we can understand that prices continue to rise while the CPI registers at the politically-optimal 2-3%/year level. If you are happy to substitute industrial waste sludge for ribeyes, you will not experience much inflation!

This move towards substituting industrial sludge for food has helped the US government understate and downplay the extent of the destruction in the value of the US dollar in statistical accounts like the Consumer Price Index (CPI). By simply subsidizing the production of the cheapest foods and recommending them to Americans as the optimal components of their diet the extent of price rises, and currency debasement is reduced. A closer look at the historical trend of the US government's suggested dietary guidelines since the 1970s shows a continuous decline in the recommendation of meat, and an increase in the recommendations of grains, pulses, and various other nutritionally poor foods that benefit from industrial economies of scale.

The industrialization of farming has created large conglomerates with significant political clout that have become a powerful part of the political landscape in the US, and they have continued to successfully lobby for increasing subsidies and for favorable dietary guidelines.

Fiat diets

The second link between nutrition and monetary economics pertains to the role that governments play in the production of food and the impact of their influential dietary guidelines. As discussed extensively in Chapter 7 of *The Bitcoin Standard*, the move from the gold standard to government money was pivotal in ending the classical liberal era of government and initiating the move toward more powerful government control over ever-increasing facets of an individual's life. It is hard to believe it but in *la belle époque*, the most transformative period of human history, governments

generally did not issue passports, interfere in food production, ban people from consuming specific substances, or engage in endless military conflict financed by currency debasement.

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.One of the many aspects of private individual life that governments have sought to manage for their citizens since the inception of government money is food. The rise of the modern nanny state, which role-plays as caretaker of its citizens and attempts to provide all the guidance they need to live their lives, could not have been possible under the gold standard simply because governments who start making centralized decisions for individual problems would quickly cause more economic harm than good, and run out of hard money to keep financing their operation. Easy government money, on the other hand, allows for government mistakes to accumulate and add up significantly before economic reality sets in through the destruction of the currency, which generally takes much longer. It is thus no coincidence that the US government began to issue dietary guidelines shortly after the Federal Reserve's creation had begun turning it into the nation's iron-fisted nanny. The first such guideline, focused on children, [was issued in 1916, and the next year they issued a general guideline.](#)

The short-comings of centrally-planning economic decisions have been thoroughly detailed by Mises and the Austrian school, primarily in the economic context, but the logic is equally applicable to nutrition decisions. Mises explained that what coordinates economic production, and what allows for the division of labor, is the ability of individuals to perform economic calculation over their own property. When the individual can weigh the costs and benefits of different courses of action they might undertake, according to their own preferences, they are able to decide the most productive course of action to meet their own ends. On the other hand, when decisions for the use of economic resources are taken by people who do not own them, there is no possibility of accurate calculation of the real alternatives and opportunity costs, particularly as they pertain to the preferences of the individuals utilizing and benefiting from the resources.

Humans, like all animals, have an instinct for eating, as anyone who has seen a baby approach food will know. Humans have developed traditions and cultures around food for thousands which help people know what to eat, and individuals can experiment themselves and study the work of others to decide what to eat to meet their goals. But in the century of fiat-powered omnipotent government, even the decision of eating is increasingly influenced by the choices of the government.

Government agents making decisions about food subsidies and dietary and medical guidelines are, like the economic central planners Mises critiqued, not making the decisions purely from the perspective of every individual eating in the country. They are, after all, employees with careers heavily influenced by the government fiat that pay their salary. It is only natural that their supposedly scientific decisions would be influenced by political and economic interests.

Arguably, there have been three main driving forces for government dietary guidelines: governments seeking to promote cheap industrial food substitutes as if they are food, a nineteenth century movement that sought to massively reduce meat consumption for religious reasons, and industrial agricultural interests trying to increase demand for the high-margin nutrient-lite industrial sludge they wanted to convince the world could pass for food.

In *The Great Inflation*, Robert Samuelson recounts the story of how desperately President Nixon had attempted to fight rising prices in many economic goods. Of the many hare-brained and economically destructive ideas he had, what was most striking was that he called the Surgeon General of the US in the spring of 1966 to issue a warning against the consumption of eggs when their prices had risen.

For some theological reasons I claim no understanding of, the Seventh Day Adventist church has for a century and a half been on a moral crusade against meat. Ellen G White, one of the founders of the church, had "visions" of the evils of meat-eating, and preached endlessly against it (while still eating meat secretly, a very common phenomenon among

anti-meat zealots until today). There is, of course, nothing ethically objectionable about religious groups following whatever dietary visions they prefer, but the problems arise when they seek to impose those visions on others. Under a fiat standard, influencing the political process allows for exercising enormous influence on national agricultural and dietary policies. Seventh Day Adventists are generally influential members of American society with significant political clout and many successful individuals in positions of power and authority.

The Soy Information Center [proudly proclaims on its website](#):

No single group in America has done more to pioneer the use of soyfoods than the Seventh-day Adventists, who advocate a healthful vegetarian diet. Their great contribution has been made both by individuals (such as Dr. J.H. Kellogg, Dr. Harry W. Miller, T.A. Van Gundy, Jethro Kloss, Dorothea Van Gundy Jones, Philip Chen) and by soyfoods-producing companies (including La Sierra Foods, Madison Foods, Loma Linda Foods, and Worthington Foods). All of their work can be traced back to the influence of one remarkable woman, Ellen G. White.

Another member of the Seventh Day Adventist Church, Lenna Cooper, went on to become one of the founders of the American Dietetics Association, an organization which to this day holds significant influence over government diet policy, and more importantly, is the body responsible for licensing practicing dietitians. In other words, anyone caught handing out dietary advice without a license from the ADA could find themselves thrown into jail and/or financially ruined. One cannot overstate the influence that such a catastrophic policy has had: a government-enforced monopoly granted to a religiously motivated agenda (based on very little science) to determine what is permissible diet advice has completely distorted many generations' understanding of what healthy food is. What's even worse is that the ADA is responsible for formulating the dietary guidelines taught at most nutrition and medical

schools worldwide, meaning it has for a century shaped the way nutritionists and doctors (mis)understand nutrition. The astonishing consequence is that the vast majority of people, nutritionists, and doctors today think that animal fat is harmful, while grains are healthy, necessary, and safe!

The reader should not be surprised that the ADA, like all other main institutions of progressive government control of the economy and citizens, was established in 1917, around the same time as the Federal Reserve. Another organization, The Adventist Health System, has been responsible for producing decades' worth of shoddy "research" used by advocates of industrial agriculture and meat reduction to push their religious visions on a species that demonstrably can only thrive by eating animal proteins and fatty acids.

The messianic anti-meat message might have been drowned out in a sane world, but it was highly palatable to the agricultural industrial complex. The crops which were to replace meat in the messianic visions of the Adventists were easy to produce cheaply at scale. It was a match made in heaven. Agroindustry would profit enormously from producing these cheap crops, governments would benefit from understating the extent of inflation as citizens replace nutritious meat with cheap sludge, and the Adventists' crusade against meat would provide the mystic romantic vision that would make this mass poisoning appear as if it were a spiritual step forward for humanity.

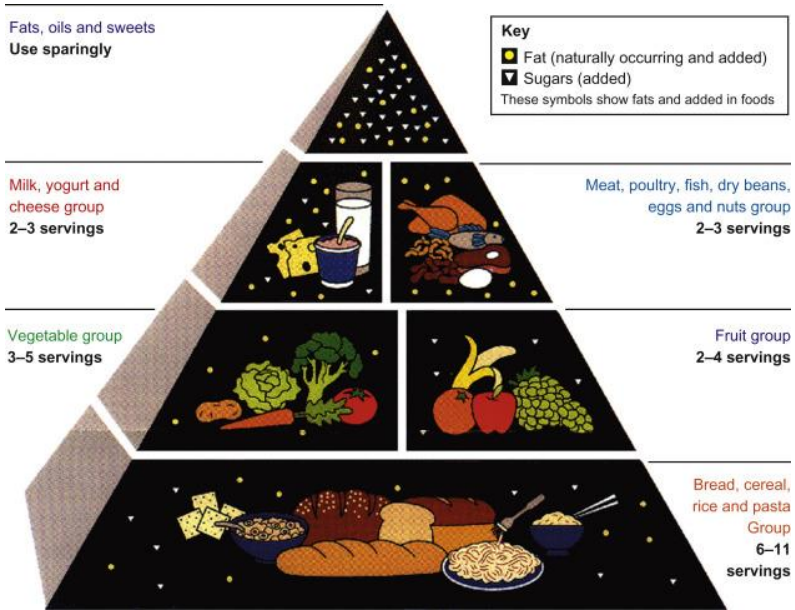
The confluence of interests around promoting industrial agriculture products is a great example of the 'Bootleggers and Baptists' nature of special interest politics, described by economist Bruce Yandle. While Baptist priests were evangelizing the evils of alcohol and priming the public to accept these restrictions, it was the alcohol bootleggers who lobbied and financed politicians to impose prohibition, as their profits from bootlegging would increase with the severity of the restrictions on alcohol sales. In so many matters of public policy, this pattern repeats: a sanctimonious quasi-religious moral crusade demands government

policies whose most important consequence is to benefit special interest groups. The dynamic is self-sustaining and self-reinforcing, and does not even require collusion between the bootleggers and baptists, as both push in the same direction, help each other, and sustain each other's efforts.

With fiat inflation causing both the rising cost of nutrient-rich food and the increased power of government to meddle in dietary affairs, with a religious group attempting to commandeer government diet policy for its own anti-meat messianic vision, and with an increasingly powerful agricultural industrial complex able to shape government food policy, the dietary Overton window was shifted considerably over the past century to include a long list of toxic industrial materials advertised as food. It is entirely inconceivable that the consumption of these "foods" would have been as popular without the distortions afforded by fiat money.

By the end of 1970s, the United States government, and most of its international vassals were recommending the modern food pyramid. The heavily-subsidized grains of the agricultural industrial complex feature heavily in this pyramid, which recommends to use them as the base of the diet, with 6-11 servings a day, making it essentially a recipe for metabolic disease, obesity, diabetes, and a plethora of health problems which have become increasingly common in the intervening decades, to the point most people think of them as a normal part of life.

The ridiculous science behind this shift is discussed in more detail in the next chapter on Fiat Science. The next section will focus on listing the most damaging industrial substances that have been marketed as food by fiat.



Fiat foods

Industrialization has made it possible to use plant foods to mass produce substances which humans had never digested before. But just because something can be produced does not mean it should be eaten. But since these foods are cheap There

These are either drugs or inedible industrial products which have been foisted upon the world through a century of heavy propaganda and government policy, financed by fiat money.

1- Polyunsaturated and hydrogenated “vegetable” and seed oils

A century ago, the majority of fats that were consumed consisted of healthy animal fats like butter, ghee, tallow, lard, and schmaltz, with smaller quantities of olive and coconut oils. Today, the majority of fat consumption comes in the form of toxic heavily-processed industrial chemicals which are misleadingly referred to as “vegetable oils”, mainly soy, rapeseed, sunflower, and corn, as well as the abomination that is margarine. The diet change that would likely cause the largest improvement in a person’s health with the least effort is the substitution of these horrific industrial chemicals for healthy animal fats.

Most of these chemicals did not exist 100 years ago, and those that did were mainly deployed in industrial uses, such as lubricants, away from the digestive systems of human beings. As industrialization spread and the government-stoked hysteria against animal fats increased, these toxic chemicals have been promoted worldwide by governments, doctors, nutritionists, and their corporate sponsors as the healthy alternative. The spread of this sludge across the world, replacing all the traditional fats used for millennia is an astounding testament to the power of government propaganda hiding under the veneer of science. The late Dr. Mary Enig of the Weston Price Foundation had spent her life warning of the dangers of these chemicals, with very little attention. Here [she lists the different kinds of fat available, while here she discusses their impact on health](#). These are extremely valuable reads I highly recommend.

2- Processed corn

In the 1970’s, and as government policy had pushed for the mass production of corn and made its price very cheap, there was a large surplus of corn crops looking for places to be used. This abundance of cheap corn led to the development of many creative ways to utilize it to benefit from its low price. The over-production of corn has become so excessive that the cheap inferior products of the corn plant are being

deployed in a myriad uses where other substances would be a far better option. From gasoline, to cow feed, sweeteners, and a myriad industrial uses all deploy corn.

One of the most destructive uses of corn is the production of High Fructose Corn Syrup, which has replaced sugar as a sweetener in the US because of how cheap it is. In 1983 the FDA blessed this new substance with the classification of “Generally Recognized As Safe” and the floodgates to its utilization opened in a barely believable manner. Since the US has very high tariffs on sugar, the price of sugar in the US is usually double or triple the global price. While the US has very high subsidies to corn, the price of corn is generally lower in the US than the global average. Once a sweetener was made from corn, it became more profitable to use it for sweetening products than sugar, and since then, American candy, industrial food, and soft drinks has become almost universally full of HFCS, which is arguably even more harmful than regular sugar, on top of being nowhere near as appetizing or desirable. If you’ve ever wondered why candy and soft drinks taste much better everywhere on the planet than in the US, now you know why: the rest of the world uses sugar while the US uses its digestive systems and cars to consume the corn destroying its soil.

[There are many problems with HFCS](#), but perhaps the most important is that it can only be metabolized in the liver, like toxic substances, and is responsible for causing a lot of liver damage worldwide.

3- Soy

Historically, soy was not an edible crop, used instead to fix nitrogen in the soil. The Chinese first figured out how to make it edible through extensive fermenting in products like tempeh, natto, and soy sauce. Famines and poverty later forced oriental populations to eat more of it, and it has arguably had a negative effect on the physical development of the populations that have depended on it for long.

Modern day soy products come from Soybean lecithin. The squeamish may want to skip this, but [here is how the Weston Price Foundation described the process by which this abomination is prepared](#):

Soybean lecithin comes from sludge left after crude soy oil goes through a “degumming” process. It is a waste product containing solvents and pesticides and has a consistency ranging from a gummy fluid to a plastic solid. Before being bleached to a more appealing light yellow, the color of lecithin ranges from a dirty tan to reddish brown. The hexane extraction process commonly used in soybean oil manufacture today yields less lecithin than the older ethanol-benzol process, but produces a more marketable lecithin with better color, reduced odor and less bitter flavor.

Historian William Shurtleff reports that the expansion of the soybean crushing and soy oil refining industries in Europe after 1908 led to a problem disposing the increasing amounts of fermenting, foul-smelling sludge. German companies then decided to vacuum dry the sludge, patent the process and sell it as “soybean lecithin.” Scientists hired to find some use for the substance cooked up more than a thousand new uses by 1939.

While there are many great uses of soy in industry, its use in food has largely been an unmitigated disaster as [this extensive discussion by The Weston Price Foundation explains](#). The overwhelming evidence for the destructive nature of soy foods is no match for the motivated reasoning of special interests, and the dietary guidelines continue to push such toxic plant matter as a substitute of meat.

4- Low fat foods

The notion that animal fats are harmful has spurred the creation of many substitutes to fatty foods that contain low or no fat. Without delicious animal fat, these products all become tasteless and unpalatable, and the best way to make them palatable was to introduce sugars. As a result of trying to avoid fat because of government hysteria discussed below, people have become very hungry and needing to binge on endless doses of sugary snacks all day, with lots of chemicals and artificial barely edible compounds thrown in. As the consumption of animal fat declines, the consumption of sweeteners, particularly HFCS, has increased to substitute for it. But the addictive nature of these substitutes means that people deprived of wholesome satiating animal fats end up being constantly hungry and likely to resort to eating large quantities of the cheap industrial substitutes.

One of the most destructive battles of the crusade against saturated fats has been the popularization of fat-free skim milk. In the early twentieth century, American farmers used the leftover from the production of butter to fatten their pigs. Combining the milk with corn would provide the quickest way for fattening pigs. Through the magic of the fiat scientific process, corn with skimmed milk ended up being the human breakfast recommended and promoted and subsidized by fiat authorities, with the same fattening result. John Kellogg, another devout Seventh Day Adventist and follower of Ellen White, viewed sex and masturbation as sinful, and his idea of a healthy diet was one that would stifle the sex drive. He was correct and astoundingly successful in marketing his favorite breakfast of industrial waste to billions worldwide.

5- Refined flour and sugar

Historically, whole grain flour and natural sugars have been consumed for thousands of years. Whole grain flour, being produced from the whole grain, would contain the germ and bran, which contain all the nutrients in the wheat. As Weston Price documented, elaborate rituals existed for

preparing whole wheat and it was eaten with ample animal fat. Industrialization changed things drastically for these two substances, effectively turning them into highly addictive drugs. [Wikipedia explains:](#)

An important problem of the industrial revolution was the preservation of flour. Transportation distances and a relatively slow distribution system collided with natural shelf life. The reason for the limited shelf life is the fatty acids of the germ, which react from the moment they are exposed to oxygen. This occurs when grain is milled; the fatty acids oxidize and flour starts to become rancid. Depending on climate and grain quality, this process takes six to nine months. In the late 19th century, this process was too short for an industrial production and distribution cycle. As vitamins, micronutrients and amino acids were completely or relatively unknown in the late 19th century, removing the germ was an effective solution. Without the germ, flour cannot become rancid. Degermed flour became standard. Degermation started in densely populated areas and took approximately one generation to reach the countryside. Heat-processed flour is flour where the germ is first separated from the endosperm and bran, then processed with steam, dry heat or microwave and blended into flour again.

In other words, industrialization solved the problem of flour perishing and ruining by industrially removing the nutrients from it, effectively turning it into a highly addictive drug.

Sugar, on the other hand, had existed naturally in many foods, but in its pure form was rare and expensive, since its processing required large amounts of energy, and its [production was almost universally done by slaves](#), because few would choose to work that exhausting job of their own volition. As industrialization and capital accumulation allowed for the replacement of slave labor with heavy machinery, people were able to

produce sugar in a pure white form, free of all the molasses and nutrients that accompany it, and at a much lower cost.

Refined sugar and flour can be better understood as drugs, not food. Sugar contains no essential nutrients, and flour only contains very little. The pleasure that people get from consuming them is the pleasure you get from a hit of an addictive substance; they do not offer nutrition to the body. In [*Bright Line Eating*](#), Susan Thompson explains how the refining of sugar and flour is similar to the refining process that has made cocaine and heroin such highly addictive substances. Whereas chewing on coca leaves or eating poppy plants will give someone a small high and little energy kick, it is nowhere near as addictive as consuming the purified cocaine and heroin drugs, as evidenced by the fact that many cultures had consumed these plants for thousands of years with little adverse effects, incomparable to the damage they do to modern consumers of these substances. The industrial processing of these plants into their modern highly potent drug form has made them extremely addictive, because it allows the person consuming them to ingest large quantities of the pure essence of the plant without any of the rest of the plant matter that comes with it. The high is magnified as is the withdrawal that follows it and the desire for more. Thompson makes a compelling case that the processing of these drugs is very similar to the processing of sugar and flour in how addictive it makes them. She even cites studies that show that sugar is eight times more addictive than cocaine.

The Harvest of Fiat

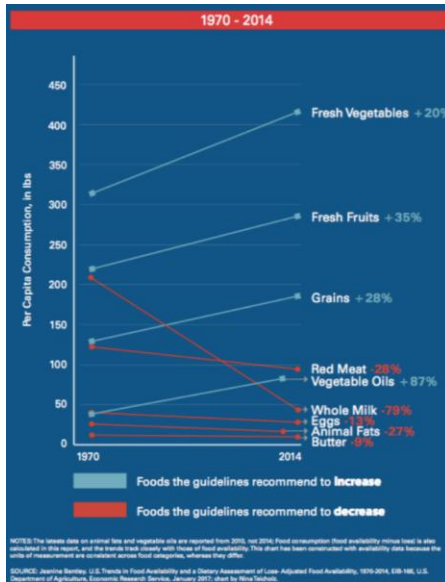
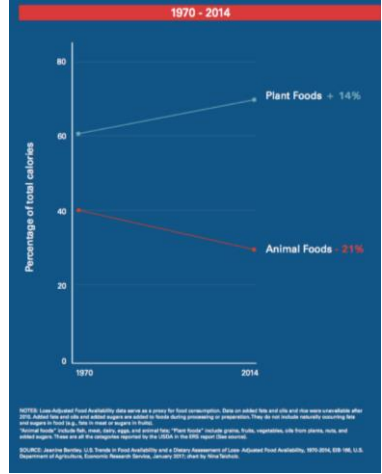
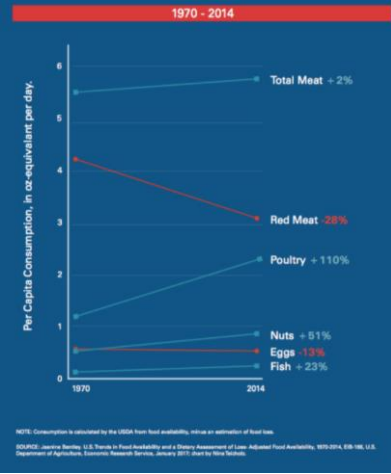
Seed oils and soy products have legitimate industrial uses, corn, soy, and low-fat milk are passable cattle feed, though not as good as letting cattle graze. Processed flour and sugar can be used as recreational drugs in tiny quantities, but none of these products have a place in a human diet, and must be avoided for a human to thrive and be healthy. Yet as technology and science continue to advance and make them cheaper,

and government subsidies to them increase, we find people consuming ever-increasing barely believable quantities of them. Faster and more powerful machines can reduce the cost of producing these materials very significantly, and as industrial technology has advanced producing these foods has become less and less expensive.

There is little that industrialization can do to improve the cost of producing nutritious red meat which needs to grow by walking on large areas of land, grazing, and getting sun, and which also perishes quickly. But the fiat foods of mono-crop agriculture have a stable shelf-life allowing them to remain on in storage and display for years, allowing them to spread far and wide. Worse, their shelf-stability allows them to be manufactured into highly-processed foods that are engineered to be highly palatable and addictive. The universal ubiquity of these cheap, heavily-subsidized, highly-palatable and toxic foods has been an unmitigated disaster for the health of the human race.

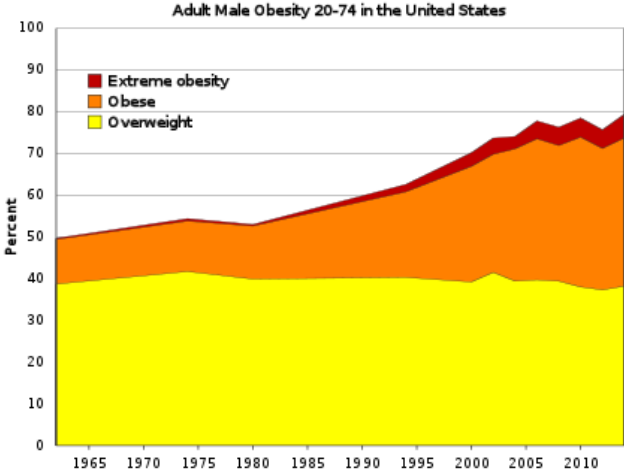
As time preference increases in the fiat era, individual decision-making around food would also be expected to lead to a larger amount of food consumption to be aimed at producing satisfaction in the present, rather than

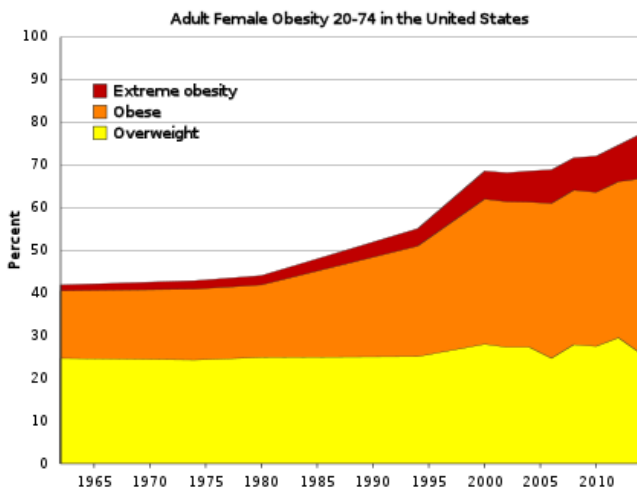
Another way of understanding the impact of rising time preference is in the decision-making of individuals when it comes to food choices. As depreciating money drives people to prioritize the present, they are more likely to indulge in foods that feel good in the moment at the expense of their health in the future. The shift toward short-term orientation in decision-making would invariably favor more consumption of the junk foods mentioned above. Modern fiat medicine is highly unlikely to mention the obvious dietary drivers of modern diseases, as prevention makes for bad business. While the prevalent religious faith in the power of modern medicine to correct all health problems further encourages individuals to believe industrial waste has no consequences.



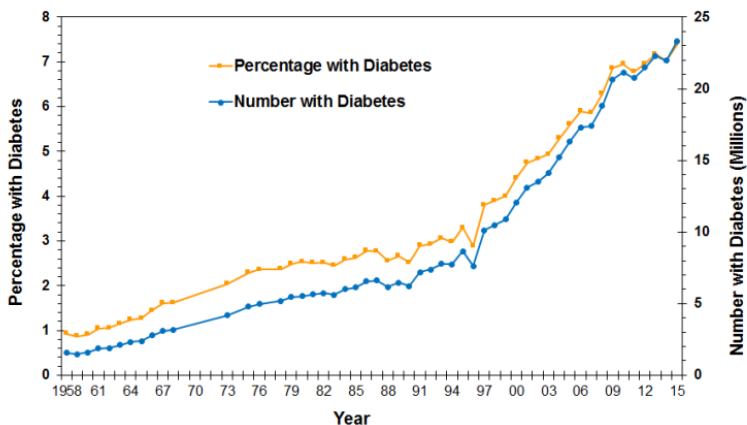
These policies have been extremely effective in altering Americans' food choices. In the years between 1970 and 2014, Americans' per capita consumption of red meat declined by 28%, whole milk by 79%, eggs by 13%, animal fats by 27%, and butter by 9%. By contrast, the consumption of toxic "vegetable" oils increased by 87%, and grains increased by 28%. Showing exemplary compliance with government guidelines, Americans have also significantly increased their consumption of fresh fruits and vegetables, which is an important indicator that the driver of obesity is not the absence of vegetables and fruits, but the decline in meat consumption, particularly red meat. Overall meat consumption stayed relatively constant, rising by 2%, but that happened by substituting inferior cheap mass produced poultry for highly nutritious essential red meat. Overall, Americans' calories from animal foods declined by 21%, while calories from plant foods increased by 14%.

The impacts of this dietary transition on Americans' health has been disastrous. Obesity has been increasing steadily since the 1970s, along with many chronic diseases which modern nutrition science and its corporate sponsors has done everything to pretend are unrelated to diet.





Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2015



CDC's Division of Diabetes Translation, United States Diabetes Surveillance System available at <http://www.cdc.gov/diabetes/data>

One cannot find a more apt representation of the impact of inflation and unsound money: the paper wealth of Americans is increasing, while the statistics show that their quality of life is going up. In reality however, the quality of their food is degrading because the quantity of nutrients they consume is declining, and their mental and physical health are deteriorating. Instead of nutrients, Americans are increasingly subsisting on drugs and toxic industrial crops. The ever-growing variety and quantity of flavored industrial sludge filling Americans' refrigerators cannot be claimed to be real food, and it is no substitute for it. Americans' increasing obesity is not a sign of affluence, but a symptom of deprivation. The level of spending and income in America may be increasing according to government statistics, but if Americans work longer hours than they ever did and their basic nutrition is deteriorating, there must be something seriously wrong with the money they are using, both as a store and measure of value. The Faustian bargain of fiat money did not deliver the free lunch its cheerleaders promised, but instead brought on industrial concoctions of soy and high fructose corn syrup, light on nutrients, high on empty calories, and extremely costly to the health and well-being of its consumers. The ever-increasing cost of medication and healthcare cannot be understood without reference to the deterioration of health, diet, and soil, and the economic and nutritional system that have promoted this calamity.

The modern world suffers from a crisis of obesity that's unprecedented in human history. Never before have so many people been so overweight. Modernity's tragically self-flattering misunderstanding of this crisis is to cast it as a crisis of abundance: it is a result of our affluence that our biggest problem is obesity rather than starvation. The flawed paradigm of nutrition—another field of academic inquiry thoroughly disfigured by government funding and direction—emphasizes the importance of obtaining a necessary quantity of calories, and that the best way to secure the needed calories is by eating a diverse and “balanced” diet that includes hefty portions of grains. Animal meat and fat are viewed as harmful and best consumed in moderation, if at all. From this perspective, obesity occurs when too many calories are consumed, and malnourishment occurs when too few calories are consumed. This view is

as overly simplistic as ridiculous Keynesian textbooks' insistence that the state of the economy is primarily determined by the level of aggregate spending, with too much spending the cause for inflation, and too little spend the cause for unemployment which was discussed thoroughly in *The Bitcoin Standard*.

In reality, nutrition is about far more than caloric intake, it's about securing sufficient quantities of essential nutrients for the body, which come in four categories: proteins, fats, vitamins, and minerals. The fats are primarily used for providing energy for the body, the proteins for building and rebuilding the human body and its tissues, and the vitamins and minerals are necessary for various vital processes that take place in the body. The other major food group, carbohydrates, is not essential to the human body but can be utilized to provide energy. In the absence of essential nutrients, the human body begins to suffer from deterioration and negative consequences manifesting in diseases. In particular, the absence of animal proteins and fatty acids causes the body to enter into starvation mode: energy expenditure is reduced, manifesting in physical and mental lethargy and inactivity, and the body begins to convert its intake of carbohydrates into fatty acid deposits for storage for future use (in other words, causing obesity). Rather than a sign of affluence and overfeeding, obesity is actually a sign of malnutrition. The ability to digest plants and convert them into stores of fatty acids is an extremely useful evolutionary strategy for dealing with hunger in the short-run, but when the deprivation of essential nutrients becomes a lifestyle, the fat storage turns into the debilitating sickness of obesity. Rather than being a sign of affluence and overfeeding, obesity is an unmistakable sign of malnourishment and nutritional poverty.

Sound Food

Many people worldwide, including me, have improved their health immeasurably by simply avoiding all fiat foods entirely. The exact diet plans people follow may differ, but the hallmark of successful diets is the elimination of processed fiat foods. As the internet has allowed people to share their experiences outside of the fiat scientific establishment's dogmas, what emerges from real human experience is markedly different from what is advertised by fiat authorities. While nutrition departments, medical schools and government guidelines continue to rationalize the consumption of toxic industrial sludge under the guise of "balance", online communities have helped millions worldwide regain their health by guiding them to avoiding these fiat foods and ignoring the fiat recommendations.

The state of nutrition research is analogous to the state of economic research: a fiat-financed mainstream heavily invested in arriving at the conclusions conducive to its fiat financing. Economics has its Austrian alternatives such as Mises, and nutrition has some equivalents. As the field has descended to the status of marketing of junk food, as will be discussed in the next chapter, some renegades have for long attempted to counter the prevailing narrative. John Yudkin's heroic but doomed struggle against sugar is particularly noteworthy. But perhaps the most comprehensive framework for studying nutrition comes from the work of Weston Price, a Canadian dentist working a century ago.

Price is mainly known today as both a dentist and a pioneer in the discovery and analysis of several vitamins, but his magnum opus, *Nutrition and Physical Degeneration* is largely ignored by the mainstream of academia and nutrition science, as his conclusions fly against the politically correct dogma taught in medical and nutrition schools in modern universities. Price provides a rigorous and clean exploration of the horrible damages caused by modern industrial foods whose producers are the main benefactors of nutrition schools everywhere today. On top of being methodologically thorough and well-documented, Price's research is

unique, and likely impossible to repeat. He spent many years traveling the world just as airplanes were invented and closely observed the diet and health of people from cultures across all continents, meticulously documenting their diets and their overall health, particularly their dental health. Since flight was so novel, he was able to visit many areas which were still largely isolated from world markets and thus reliant on their own local traditionally-prepared food items. All of these places have been far better integrated into global trade and their diets are quickly degenerating into the appropriately acronymed SAD-Standard American Diet. Price took thousands of pictures of the people he studied as well as countless samples of their foods, which he then sent to his laboratories in Ohio for analysis.

Across the world, Price compared the diets of populations that were genetically similar but one of whom was integrated into global trade markets with access to industrial foods, while the other population was isolated and eating its local traditionally-prepared foods. Price studied the Inuit in northern Canada and Alaska, Swiss villagers in isolated valleys, herdsmen in central Africa, Pacific Islanders, Scottish farmers, and many more populations. No matter where in the world you come from, Price visited your ancestors, or people not too far from them. The results were as stark as they are edifying and Price arrived at several important conclusions. While it is really impossible to do justice to this momentous work in a few paragraphs, some important conclusions are worth discussing. The book is available for free online, complete with the shocking pictures contrasting jaw development.

One of the purposes of Price's trip was to find "native dietaries consisting entirely of plant foods which were competent for providing all the factors needed for complete and normal physical development without the use of any animal tissues or product." But after scouring the globe, Price did not find a single culture that subsisted on plant foods exclusively. All healthy traditional populations relied heavily on animal products. The healthiest and strongest populations he found were the Inuit of the Arctic and African herders. Almost nothing about the environment and customs of those two populations is similar in any way, except for the fact that they both relied

almost exclusively on animal foods. Price came to see the sacred importance of animal fats across all societies, and analyzed the lengths to which populations went to secure it. Price found many nutrients that cannot be obtained from plants, and conclusively demonstrated that it is simply not possible to be healthy for any significant period of time without ingesting animal foods. To the extent that plant food was eaten, its role seemed primarily to be a vessel for ingesting precious fats.

Since Price's research, nobody has managed to produce evidence of a single human society anywhere whose diet excludes animal foods. All human societies, from the arctic to the tropics, on every continent, had based their diet around animal foods. As the internet allows dietary knowledge to escape the grip of fiat science, and more humans have learned of the work of Price and countless other scholars, doctors, dietitians, and physical trainers willing to counter the fiat dogma, we are beginning to see some very clear pattern of results emerge from people who shift their diets to being predominantly based around animal meats: a huge reduction in desire for junk and ultra-processed food. The need to constantly be eating junk food is not just a product of their engineered hyper-palatability and addictive property, it is also a result of deep malnutrition caused by not eating enough meat. This can help us understand why the messianic anti-meat message has been so popular among fiat food producers and the fiat universities and media outlets they sponsor. No wonder the anti-meat message is blared out relentlessly by mainstream media, academia, and other industrial food marketing outlets. One can only imagine how different modern nutrition science would be if its purpose was to inform humans of how to be healthy rather than manipulate them into eating profitable poisons.

Another important conclusion from Price's work is that the diseases of civilization that we've accepted as a normal part of life largely began to appear with the introduction of modern processed foods, in particular, grains, flours, and sugars. The book is full of stories and analysis that make this an inescapable conclusion. Here is but one of many examples to illustrate the point, drawn from Chapter 21:

"The responsibility of our modern processed foods of commerce as contributing factors in the cause of tooth decay is strikingly demonstrated by the rapid development of tooth decay among the growing children on the Pacific Islands during the time trader ships made calls for dried copra when its price was high for several months. This was paid for in 90 per cent white flour and refined sugar and not over 10 per cent in cloth and clothing. When the price of copra reduced from \$400 a ton to \$4 a ton, the trader ships stopped calling and tooth decay stopped when the people went back to their native diet. I saw many such individuals with teeth with open cavities in which the tooth decay had ceased to be active."

Price closely studied how various cultures prepared their plant foods and extensively documented the methods needed to make most grains and plants palatable and non-toxic. These heavily complex traditional rituals of soaking, sprouting, and fermenting are necessary to remove the many natural toxins that exist in plant foods, and they allow the body to absorb the nutrients in these foods. In the high time preference age of fiat, nobody has time for these rituals, and instead the majority prefers the industrial food processing methods which rely on maximizing the sugar and palatable ingredients at the expense of nutrients.

Price contributed massively to our understanding of nutrition and health, but like Menger and Mises in Economics, his teachings are largely ignored by the paper-pushing government-employed bureaucrats pretending to be modern scientists. Not coincidentally, listening to these government employees and ignoring Weston Price has come at a highly devastating cost to modern health.

Price's research shows that the trends most responsible for malnutrition, obesity, and some diseases of modern civilization can be directly related to the economic realities of the twentieth century. The nutritional decline Price documented happened around the turn of the twentieth century, which, coincidentally, was when the modern world economy moved away

from the hard money of the gold standard and toward the easy money of government.

It is unquestionable that a large part of the problem of modern industrial diets lies in the availability of modern high powered machinery capable of efficiently and quickly processing plants into hyperpalatable junk food. Yet, given everything discussed above, it is very difficult to argue that the fiat money experiment of the last century has not massively exacerbated the impact of modern industrial foods by heavily subsidizing them, and subsidizing the miseducation of generations of nutritionists and doctors to promote these foods. On a hard money standard, we would still have these industrial foods, but without fiat subsidies, they would not have been so ubiquitous in modern people's diets. Without fiat facilitating the growth of the managerial state and financing the production of mass propaganda research and dietary guidelines tailored to normalize the consumption of fiat foods and warn against the dangers of healthy wholesome unindustrial low-profit-margin foods like meat, most people's understanding of nutrition would be very different and far more similar to the traditions of their ancestors, which revolved heavily around animal foods.

Fiat soils

As discussed extensively in Chapter 5 of *The Bitcoin Standard*, the facet of the shift to easy money that I find most significant and fascinating is the effect it has on people's time preference. As the purchasing power of fiat money is expected to decline over time, and as interest rates are artificially manipulated downward, individuals begin to favor spending and borrowing over saving. While my book discussed this tendency in terms of its impact on consumer decisions and capital markets, it is also worth considering the impact on people's use of their natural environment and its soil, and on their personal health decisions.

As individuals' time preference rises and they start to discount the future more heavily, they're less likely to value the maintenance of a healthy future state of their natural environment and soil. Consider the effect this would have on farmers: the higher a farmer's time preference, the less likely they are to care about the returns their land will be able to offer after ten years, and the more likely they are to care about maximizing their short-term profits. This would incentivise short-term focused management of soil, which would prioritize a quick return over long-term soil health. Indeed, this is exactly what we find with the depletion of the soil leading up to the 1930's, at the time of Price's writing.

The introduction of modern industrial production methods, thanks to the utilization of hydrocarbon energy has allowed humans to increase the intensity with which they utilize land, and consequently the amount of crops they can get out of it. While the story of increasing agricultural productivity is often touted as one of the great successes of the modern world, the heavy cost it has imposed on the soil goes largely unmentioned. The vast majority of agricultural soil in the world today is largely unable to grow crops without the addition of artificial industrially-produced chemical fertilizers, steadily degrading the nutritional content of the food compared to food grown on rich soil.

Weston Price's *Nutrition and Physical Degeneration* begins with a discussion of the quality of the soil in modern societies, which he found to be quickly degrading, causing severe nutrient deficiencies in food. Price published his book in the 1930's, and he had pinpointed the few decades prior as a time of particular decline in the nutrient content of land. While Price does not explicitly draw a connection with fiat money, the development is perfectly consistent with the analysis of fiat and time preference discussed in the chapters 5 and 8. Soil, being the productive asset from which all food comes, is capital. And as fiat encourages the consumption of capital, it will encourage the consumption of soil. We can understand the drive of industrial agriculture as the high time preference stripping of productive capital from the environment. Heavily-plowed industrial agriculture is an object lesson in high time preference, as is well

understood by farmers worldwide, and well-articulated in the website of the Natural Resource Conservation Service of the US Department of Agriculture:

The plow is a potent tool of agriculture for the same reason that it has degraded productivity. Plowing turns over soil, mixes it with air, and stimulates the decomposition of organic matter. The rapid decomposition of organic matter releases a flush of nutrients that stimulates crop growth. But over time, plowing diminishes the supply of soil organic matter and associated soil properties, including water holding capacity, nutrient holding capacity, mellow tilth, resistance to erosion, and a diverse biological community.

The work of Alan Savory on the topic of soil depletion is very important here. [The Savory Institute](#) has been working on reforestation and soil regeneration across the world with spectacular success. Their secret? Unleashing large numbers of grazing animals on depleted soil to graze on whatever shrubs they can find, till the land with their hooves, and fertilize it with their manure. The results, [visible on their website](#), speak for themselves and clearly illustrate a strong case for keeping soil healthy by holistically managing the grazing of large mammals on it. Agricultural crop production, on the other hand, quickly depletes the soil of its vital nutrients, making it fallow and requiring extensive fertilizer input to be productive. This explains why pre-industrial societies worldwide usually rotated their land from farming to grazing. After a few years of farming a plot whose output had begun to decline, the land was abandoned to grazing animals, and farmers moved to another plot. After that one was exhausted, farmers moved on to another plot, or returned to the earlier one if it had recovered.

The implication here is very clear: a low time preference approach to managing land would prioritize the long-term health of the soil, and thus entail the management of cropping along with the grazing of animals. A high time preference approach, on the other hand, would prioritize an

immediate gain and exploit the soil to its fullest with little regard for long-term consequences. The mass production of crops, and their increased availability in our diet in the twentieth century, can also be seen as a consequence of rising time preference. The low time preference approach involves the production of a lot of meat, which usually has small profit margins, while the high time preference would favor the mass production of plant crops which can be optimized and scaled drastically with the introduction of industrial methods, allowing for significant profit margins.

Traditionally, plow farming was rotated with cattle grazing to replenish the soil. Grazing cattle are the secret to a healthy soil, as they till the land with their feet, and fertilize it with their excrement. Cattle grazing increases the ability of soil to absorb rainwater, allowing it to become rich with organic matter. After a few years of grazing, the land would be ready for crop farming.

As industrialization introduced heavy machinery to plow the soil, and as fiat money discounted the utility of the future, this traditional balance has been destroyed, and replaced with intensive agriculture that depletes the soil very quickly. Rather than regenerate the soil naturally with cattle manure, industrial fertilizers are applied in ever-increasing amounts.

Just because industrialization allows for the quick depletion of the soil does not mean that people are obliged to engage in it. Only understanding the distortion of time preference helps us understand why this style of agriculture has become so popular in spite of its massively detrimental effect on humans and their soil.

Industrial farming allows farmers to strip nutrients from their soil rapidly, maximizing output in the first few years, at the expense of the health of the soil in the long-run. By contrast, maintaining a healthy soil through rotating cattle grazing and crop farming will offer less reward in the short-run, but maintain the health of the soil in the long-run. A heavily-plowed field, producing heavily-subsidized fiat foods would allow the farmer a large short-term profit, while careful management of the soil would allow the farmer a lower but more sustainable income into the future.

As the ability of farmers to save for their future in a hard money is destroyed by fiat, the certainty of the future declines, and the discounting of the future increases. The value of nutrients kept in the soil for the future is discounted heavily, and the incentive to deplete the soil for a quick payday increases.

Industrialization allows for the extensive indulgence of people's high time preference in utilizing soils. With modern hydrocarbon-powered machinery and technology, nutrients can be extracted from the soil far more rapidly than before, allowing for quicker depletion of the soil and more short-term profits. Fertilizers allow this present-orientation to appear relatively costless in the future, since depleted soil can still be made fertile with industrial fertilizers. After a century of industrial farming, it is clear that this trade-off was very costly as the human toll of industrial farming grows larger and clearer.

It is remarkable to find that within the field of nutrition, without any reference to economic or monetary policy, Price had identified the first third of the twentieth century as having witnessed immense degradation of the soil, and a decline in the richness of nutrients in the food produced from it. The great cultural critic Jacques Barzun, in his seminal history of the west, *From Dawn to Decadence*, had precisely identified the year 1914 as the year in which the decadence and decline of the west had begun, when art began its shift toward the less sophisticated modern forms, and where political and social cultures went from liberalism to liberality. Like Price, Barzun makes no mention of the shift in monetary standards and the link it might have to the degradation he identifies. In the work of these two great men, prime experts in their respective fields, we find compelling evidence of a shift toward more present-orientation across the western world in the early twentieth century. Barzun's work illustrates this for culture and art, while Price illustrates it with the nutrient content of the soil, both of which are natural consequences of an upward shift in time preference.

As with his architecture, art, and family, fiat man's food quality is declining constantly, with the healthy nourishing traditional foods of his ancestors being replaced by well-marketed addictive and toxic industrial sludge marketed as food by fiat. The soil from which his civilization and all that lives within it springs continues to get depleted, and its essential nutrients are replaced by petroleum-derived chemical fertilizers marketed as soil by fiat.

10. Fiat Science

Whereas the last chapter examined the effect of fiat on the human body through its impact on food markets, this chapter examines the pervasive effect of fiat on the human mind, through its impact on the markets for education and science. Fiat money allows governments to play a pervasive role in these markets, at all levels, from primary education to cutting edge scientific research. By suspending the normal workings of the market economy in education and science, government can decree who gets to be a teacher and what passes for science. Education no longer needs to meet the needs and aspirations of the student, to help them succeed in life, it needs to meet the political goals of the source of fiat. Science as a process of open inquiry is suspended, and scientific truth no longer stands on its own, open to scrutiny and debate. It instead turns into mantras which cannot be questioned by anyone who wants to be called a scientist.

Fiat schools

There are few causes that sound more deserving of fiat funding than children's education. In the first decade and a half or so of life, humans aren't able to provide for themselves sufficiently, and must rely on the provision, protection, guidance, and education of older people. These years are critical for forming the habits and temperament that will shape a person's life. A good education can open a world of possibilities, whereas truancy and lack of guidance and education could ruin a person for life. Letting a child's entire future hinge on whether their parents are able to provide them an education in their early years appears like a dangerous proposition for society, as it could lead to a large number of misguided, uneducated, unskilled, unproductive, and dangerous citizens. With government able to effectively conjure money at will, there seem no apparent downsides to having it spend some of that money on the education of children.

Like most ideas financed by fiat, free public schooling only appears good when ignoring the many unintended consequences and unseen effects it has on the people it is meant to help. As funding for education becomes centralized, flowing from the government's money printer, rather than the children's parents, the providers of the service have increasingly more of an incentive to appease their funders rather than their beneficiaries. As funding education becomes a matter of policy, it inevitable becomes politicized, providing incentives for the providers of the service to toe the political line that the fiat funders prefer, relegating the interests of the children to an after-thought.

As funding is enshrined in law and provided by an authority with virtually limitless money supply, there is little need for the providers to worry about the quality of the education they provide to students. In a free market, that accountability is enforced through customers walking out of a business and bankrupting it if it fails to meet their needs. In most of the world, students are required by law to attend schools, and/or are forced to attend a particular school based on their residence district. This completely

undermines their ability to hold their schools accountable by leaving a failing school for a better one. Public schools just can not go out of business, and it is very difficult for a public school teacher to get fired.

Since children's education is the perfect kind of story to elicit popular approval for increased government financing, it has operated with virtually no limitations on funding, and with no accountability for its providers. The specter of infinite cash being provided to public education is a curse, not a blessing. It prevents accountability from taking hold, and allows producers to get away with being incompetent.

Corey DeAngelis, a scholar and researcher on education, has successfully highlighted how catastrophic the impacts of fiat education have been to school children. Astonishingly, DeAngelis [finds that the average private school tuition in Washington DC is \\$23,959](#), while the average DC government school spending per student is \$31,280. Even though they spend 81.3% as much as is spent on public school students, private school students still significantly outperform those from public schools. Clearly the issue is not in the lack of funding, but in the way in which that funding is used. Money that is spent by parents holding schools accountable will be far more productively deployed than fiat from government printers with no opportunity cost. This is a very common theme in the world of fiat: the real catastrophe of fiat is not in the price rises caused by increased government spending, but in the distortions and destruction of incentives it brings to sectors of the economy which can operate as if immune from the ironclad economic laws of nature.

DeAngelis has very compellingly advocated for a very important economic reform to public education: Instead of spending government money on public schools which are protected from market competition, governments should simply hand the money to parents, and allow these parents the freedom to choose for themselves where their children are to be educated. Unsurprisingly, his ideas are met with vehement opposition by the many vested interests in the educational system whose jobs and privileges depend on collecting government fiat directly, without having to be accountable to the students and their parents.

The most vivid example I know of the economic distortion caused by public financing of education comes from Egypt, where an entire parallel private education system takes place in the afternoon for students who have to attend public schools. In the public schooling system, the children don't pay and the teachers receive a pittance. In the afternoon, the teachers will be getting paid a decent wage and the students will pay a decent tuition fee. In some cases, the entrepreneurs who organize these classes will even rent out the school building from the public schools to host the classes. A friend tells me that in some cases, the same students and the same teacher would meet in the same classroom twice in the same day: in the morning, where the students don't pay, the teacher gets negligible pay, and no education happens; and in the afternoon in the privately organized schooling system where the actual education takes place.

Fiat Universities

The impact of fiat on the university system is similar in many ways to its impact on school-children, with the important added effect of distorting and ruining entire disciplines and the university system, with disastrous economic impacts. The most common misconception about modern universities is that they are private, when they are almost all entirely reliant on government financing. Governments provide universities with a sizable portion of their income in the form of research funding. Perhaps more importantly, governments provide students with subsidized low-interest loans to attend university, heavily skewing young adults' choice in favor of attending university and causing a large misdirection of resources in that direction.

After a century, it is fair to say fiat has successfully destroyed the modern university as a center of learning and research, and turned it into a make-work welfare program for nerds, a highly over-priced credential mill, an inescapable debt trap, a country club experience, a political indoctrination

camp, and a corporate advertisement agency. He who pays the piper calls the tune, and as students are not the main source of income for universities, they are increasingly turning into the product universities offer to their various governmental and private sponsors.

In a free market where universities have to compete for the tuition fees of students, universities must remain moored to the real world and receptive of the needs of their students to learn useful skills to become productive members of society. Universities which offer their students a good education would have these alumni graduate to achieve high earnings in their professional careers. This would attract young students to these universities, and the alumni would donate to the university, helping it prosper and advance. A free market ensures that universities must remain true to their mission of educating and advancing knowledge, because if they diverge from it, they would be quickly punished by becoming unattractive to potential students, and by having alumni who do not have the resources to donate to the university.

University research would also have to remain relevant to the needs of the real world in a free market, as universities could only keep financing it if it offers significant material benefits to the world. Even highly theoretical and abstract research must demonstrate some real world relevance for universities and their donors to continue financing it. Fiat upends this. With financing for universities increasingly dependent on the judgment of bureaucrats with access to an infinite credit printer, the discipline of the free market is replaced with the whims and desires of politicians and bureaucrats. Success for a university is no longer primarily a result of meeting the demands of its students in learning productive skills, but instead, on satisfying the wishes of the bureaucrats who finance the university, allowing for the perversion of the university's purpose into all manner of irrelevant and unproductive waste, as well as a political indoctrination center, where the ideology of allegiance to government is heavily promoted to society at large.

With students afforded cheap credit to engage in university education, the opportunity cost of spending four years in university is reduced

significantly by being deferred to a future which fiat money increasingly discounts. The pressing need for university education to deliver results is relaxed with the subsidy and heavy discounting of the future, changing university education increasingly from an investment in a capital good into a consumption good. Universities increasingly resemble country clubs, where students borrow money to live like aristocrats, doing little work while partying, socializing, and enjoying themselves. But the debt accumulated in university country clubs cannot be discharged, saddling the students with a lifetime of having to pay back for the good times. The heavy opportunity cost of university becomes apparent when one looks at the future. Instead of beginning their adult lives by earning and accumulating capital, and deferring the country club experience to the time in which they achieve financial independence and can afford it, young adults are getting in the country club experience first and having to spend the rest of their lives working to pay it off.

Fiat Academics

The role of government in universities increased drastically in the United States in the 1930's, after the Great Depression which was caused by the inflationary policies of the newly-created Federal Reserve to first fight the first world war, and secondly to help Britain manage its inflation in the 1920s, as discussed in Chapter 2. With increased economic problems engulfing university, and with fiat allowing government practically limitless spending, it was only natural that governments would increasingly encroach on universities' financial and intellectual output, particularly as governments needed the help of universities in determining how to manage the modern fiat economy and direct spending to achieving government goals.

Perhaps the most pernicious effect of the fiating of the modern university is the destruction of the scientific method and its degeneration into the current mix of government propaganda, corporate advertisement, make-work welfare program for nerds, and meaning-free irrelevant gibberish. With funding for research primarily coming from bureaucrats and with

universities afforded an effective subsidy and protection from insolvency through subsidized loans for their consumers, the market test for success is removed, and universities are free to drift into a world of irrelevance and corruption with little regard for truth.

The most obvious way this manifests is in the mushrooming of entire fields and departments specialized in producing completely inconsequential and irrelevant noises and marketing them as scholarship. What passes for humanities in the modern university has degenerated into an endless sea of angry grievances and rabid victimology, consisting almost entirely of politically correct platitudes and zero substance, producing heaps of graduates with zero marketable skills, and a strong talent for finding ways to take offense at everything. These departments continue to grow, and the professors in them continue to get their salaries paid, because they face no real market test, and can continue to secure financing from the world's biggest money printer while railing against inconsequential, imaginary, and historical evils. It is no wonder that these departments are heavily populated with semi-literate intellectual midgets of the Marxist variety, as that moronic ideology and worldview is perfectly conducive to the furthering of government power and the anointing of a parasitic unproductive class to control the lives of the productive. For all of the nonsense that Marxists spout about oppression and opposition to the power of capital, it's worth remembering that Marx's entire worldview rested on the need for governments to take over the function of credit and money creation, and for a revolutionary vanguard to be in charge of all economic and social decisions for society at large. It makes perfect sense that parasites who live off government money pillaging the world via inflation continue to promote this criminal ideology even after all the massive death and destruction it has brought the world.

Entire books could be written about the degeneration of humanities education in the modern university, but for our purposes, we will simply invoke one highly indicative story. A physicist by the name of Alan Sokal had for long suspected that most humanities' scholarship was nonsense, and chose to test it himself by handing a paper of incomprehensible gibberish for publication at a leading journal of critical studies. The paper

was accepted for publication. These are the same journals in which publication is necessary for academics to keep their jobs and advance in their career. By publishing deliberate nonsense, Sokal showed us the true nature of fiat academia: meaning-free nonsense being churned out by the bucket-load to tick bureaucrat's boxes.

Fiat Science

While it is common for scholars in the hard sciences to laugh at their colleagues in the humanities, it is worth remembering both these broad fields of scholarship come from the same universities, financed by the same fiat printers, and subject to the same incentive structures. There is nothing inherent in humanities that makes them liable to degenerating into nonsensical politically-motivated drivel, it is the economic and institutional framework into which they are placed, which they also share with the natural sciences. Why would universities giving tenure to semi-literate Marxists writing fashionable nonsense be expected to give tenure to genuine scholars in the hard sciences? One cannot help but wonder whether the natural sciences have been similarly compromised, and whether the reason they aren't as derided as the humanities is that their sophisticated methods makes the nonsense less obvious to the non-specialist.

To answer this question, we must look at the academic publication industry, arguably the root of the rot. With government spending an increasingly important part of university's budgets, the freedom of each university to determine for itself how to allocate its own resources to better meet the needs of its students is compromised in favor of central planners who decide on financing, credit, and benefits for the entire university system, which is now protected from the consequences of market competition. But how can these planners allocate resources and assess the success of different universities, programs, and departments? The answer over time increasingly came to rely on publications in academic journals. Successful researchers are those who get their papers published

in the most important journals, and university funding came to heavily reflect that. Consequently, academics' career prospects became increasingly tied to publication in academic journals, to the point where teaching skills are an afterthought in hiring decisions. Students the world over complain about professors who are unable and unwilling to put effort into teaching, but most universities do not and cannot care about this, because the students are not the customer they are seeking to please here, for as long as government grant money and subsidized student loans continue.

The fixation over academic publication has led to the complete corruption of the academic publication industry into the current abomination which professors worldwide complain about. Academic publishers are the kingmakers of the entire university system, as their journals are the basis for determining who gets hired, promoted, and tenured in their university. Academic publications have been consolidated into a handful of academic publishing houses who are far more akin to a cartel than an intellectual publisher. As long as university funding is tied to publication in prestigious, accredited, and ranked journals, these journals can exploit the labor of professors who need them to secure their livelihoods. Academic journals do not pay academics for writing articles, nor do they pay them for reviewing articles or editing journals. In fact, many journals even charge academics for publishing their articles! The entire production of the journal costs the publishers approximately zero dollars, and yet, these journals are sold back to the universities at exorbitant prices, as is access to their articles online. By being in the position to determine who gets published and thus, who gets promoted and who gets funded, academic publishers have successfully maneuvered themselves to become the prime beneficiaries of the fiat education system, hiring academic slave labor at approximately zero cost to produce journals which are sold back to the same universities at exorbitant prices.

The facade of relevance and coherence was easier for modern academic journals to maintain during the pre-internet days, when producing physical copies and corresponding between editors and journals cost time and money. The occasionally expensive paper used might have made the

exorbitant prices university libraries paid for these journals appear justified. But as the internet has practically reduced the cost of producing journals close to zero, and access to academic articles has primarily become digital, costs of these journals have gone up, instead of down. Universities now pay thousands of dollars to access a journal, and an individual needs to pay more than \$20 to access an individual article, all when the publisher has incurred practically no cost for publication, since the writing, editing, and reviewing was done with modern academia's professor slaves.

All along, the content of the journals has continued to deteriorate to the point where it is predominantly, if not entirely, unreadable academic masturbation with no link to the real world, which nonetheless adheres to the correct political, grammatical, and methodological guidelines needed to keep up the pretense that actual scholarship is taking place. Almost nobody normal or productive in the real world ever bothers reading academic journal articles, and nor do they have any reason to. The only real readership of most journals consists of the academics in the very narrow field looking to respond to the papers in it so they can get published. Rather than communicate important ideas to the world and advance society's understanding of the state of the art in modern fields of research, academic publication has been reduced to a circle jerk which only has consequences for the academic careers of the participants.

Academic research is concerned with purely theoretical constructs and ideas with absolutely no bearing on the real world. The most despiriting and destructive aspect of fiat universities is the knowledge each academic has that their entire life is to produce work that will never make a difference to the world, and will never be read by more than a handful of colleagues pointlessly nit-picking, questioning, problematizing, and needlessly flexing their ability to use a thesaurus. For an academic to publish in the journals that guarantee them a job, their language and methods need to be so niche, arcane, esoteric, and absurdly-tailored to fit the demands of journal editors completely detached from the real world, that it would practically make no sense for anyone else. Publication in academic journals is so agonizingly time-consuming with endless rounds

of review and quibbling back-and-forth, for no discernible benefit to anyone. As you make the tenth nit-picking revision to the same paragraph in the 18th month of the peer-review it begins to dawn on you that you are wasting your life typing something nobody will read or benefit from, like Jack Nicholson's character in *The Shining*, who had lost his mind spending many months at a typewriter working on a novel, only for his wife to discover all his work had consisted of repeatedly typing the same single sentence over and over, for hundreds of pages.

Fiat academia is the enormously wasteful redirection of the talents of masses of intelligent and conscientious people into the production of Jack Nicholson-like nonsense nobody will ever read. Being able to come up with something useful and intelligent to say about the world requires being up to date with the real world and its developments, and constantly evolving with the times. Rather the scholars being involved in the real world, where their knowledge is applied, today's scholars are isolated in ivory towers, working on increasingly arcane and irrelevant minutia, constructing elaborate mental rube goldberg machines purely to impress other socially isolated individuals. Anyone who reads an academic's article does so in the same way a parent goes to their child's soccer game. It is not the entertainment value of watching your son and his fat 8 year old friends attempt to play soccer that is the draw; it is your love for your son and your hope to encourage him and make him feel like he's significant. In private, and sometimes in public, academics will joke about the complete lack of relevance of their work to the real world, and how they need to add a few lines to the conclusion of each study to attempt to shoehorn some relevance for it. Almost all academics understand this and joke about it, as the only academics who survive in the field are those that have accepted the lack of relevance of their work. Those who cannot accept this life of irrelevance will leave to work in the real world, liberated from indentured servitude to multinational academic paper-mills' bottom lines.

An intimate familiarity with, and sober assessment of the reality of academic publications and familiarity with the way the process is made would make anyone heavily discount the content of these publications

and understand their main function as helping further the career of the author. An assessment of the economics of academic research would clearly explain why this is the case. Academic research today is not a product of a free market, it is a product of a central plan, decided by committee. It suffers from the problems of economic production familiar to anyone unfortunate enough to have lived under socialist regimes, or fortunate enough to have read Mises' monumental works on socialism.

In his excellent book, *The Economic Laws of Scientific Research*, biochemist Terence Kealey provides a masterful counter-narrative to the prevailing wisdom in fiat academia that science needs public funding. Kealey observes how the industrial revolution which happened in the eighteenth and nineteenth centuries in the UK was entirely spurred by private enterprise and a free market in academic research. Government funding simply did not exist during that period, and was only to emerge during World War I, which coincidentally, was the same time government effectively went off the gold standard.

In a free market for science, free of the intervention of fiat, research is intimately tied to the needs of the market and any misdirection of resources results in a loss for the investor, either forcing him to learn his lesson, or eventually bankrupting him. Either way, what is wasteful will cease. But with a fiat standard, the waste can continue for as long as the government's currency can be devalued.

Government scientific and research bodies are central planning boards, able to decree by their fiat what is legitimate science, which researchers get funded, which scholars get to call themselves scholars and which get banished as heretics. Like central planners in socialist economies, as Mises explained, these bureaucrats are unable to perform rational economic calculation with their resources, as they do not own the resources they allocate, and cannot estimate the correct opportunity costs for their different uses. There is no real feedback from the market to the decision-makers in the form of profits for productive applications of capital, and losses for wasteful applications. Without the feedback mechanism of profit-and-loss, any bureaucracy is lost. Whereas in the

production of agricultural commodities, central planning boards led to the creation of catastrophic shortages and surpluses, in the context of scientific research, these boards have led to an enormous shortage in proper scientific research, and a glut of largely pointless research papers.

Without a real market test of research decisions, the bureaucrats must assess contributions by imperfect metrics. Free from the test of the market, researchers must focus on the metrics themselves, and eventually, only the best at achieving these metrics succeed. The goal is to get published, not to arrive at important conclusions. Scholars want to publish as much as possible to get more funding, while journals want to publish as much as possible to sell more subscriptions to universities. Research funding bodies also want to support as much research as possible, as that allows them to draw on larger budgets, and it faces no real opportunity cost. Without the real budget constraints that would be enforced by a hard money, this academic system can only head in the direction of ever-increasing amounts of research papers and ever-decreasing relevance and usefulness.

John Ioannidis has published some very compelling research to show why the majority of scientific research findings are likely false, and it is intimately tied to the fiat system's decoupling of science from market incentives and feedback. With incentives to publish so strong, the likelihood of a false result being published increase drastically. With the enormous number of experiments that can be carried out, it is only going to be the experiments with desirable results that get published. With tolerable margins of error around results, there will inevitably be a growing number of scientific papers published with false findings.

Testing novel hypotheses that can attract media attention is a good way to get published, and testing many of these will inevitably lead to many statistically significant results even when the studied relationship does not exist. With the ever-increasing number of scientific journals out there, there is always a market for papers. Perhaps the most profound problem with the incentive structure of fiat science was captured by the remarks of Brian Nosek: "There is no cost to getting things wrong. The cost is not

getting them published.” With little opposition to getting things published, it is to be entirely expected that most research findings are irrelevant and wrong. Anyone who follows science news in mainstream media with a decent memory will notice how "scientists found" that pretty much every single thing on the face of earth causes cancer and also protects from cancer. The requirements to produce a study that implicates coffee, meat, wine, or electronics with causing cancer is so low, that it is equally plausible to find an opposite conclusion. Any sponsor of a study can find the result they want by hiring enough creative researchers.

Fiat Science Capture

With scientific funding removed from the realm of market competition, science inevitably becomes very ripe for capture by special interests. The government boards handing out funding, loans, and titles are made up of scholars who can assess the work at hand, which makes the universities and the scholars in charge of their own regulation. As a thought experiment, imagine the same governing structure of fiat science was applied to the production of any economic good, such as cars. A government-appointed board staffed by car producers itself issues licenses for car producers, judges the output of different car producers, and rewards them based on that output. Independent car producers are not allowed to compete with the officially-sanctioned producers on the free market, and consumer demand and payments for cars are also determined by the board itself. Clearly such an arrangement would be in favor of the car producers, and not the car consumers, who have no ability to influence the production of goods with their preferences, choices, and purchasing decisions.

With this institutional arrangement, government agencies become ripe for capture by private interests who stand to gain enormously from having 'The Science' issue decrees in their favor. The decrees of official fiat science can strongly influence government regulations for consumer

goods, government subsidies for producers, and government licensing of producers in various industry. It is only natural to expect to see significant

In his farewell address, US President Dwight Eisenhower warned his countrymen about the dangers of the emergence of a military industrial complex, and these remarks have become fairly well-known today. Far less known are the remarks that immediately followed, warning of the dangers of government financing of science leading public policy being captured by a scientific technological elite:

In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military industrial complex. The potential for the disastrous rise of misplaced power exists and will persist.

We must never let the weight of this combination endanger our liberties or democratic processes. We should take nothing for granted. Only an alert and knowledgeable citizenry can compel the proper meshing of the huge industrial and military machinery of defense with our peaceful methods and goals, so that security and liberty may prosper together.

Akin to, and largely responsible for the sweeping changes in our industrial-military posture, has been the technological revolution during recent decades.

In this revolution, research has become central; it also becomes more formalized, complex, and costly. A steadily increasing share is conducted for, by, or at the direction of, the Federal government.

Today, the solitary inventor, tinkering in his shop, has been overshadowed by task forces of scientists in laboratories and testing fields. In the same fashion, the free university, historically the fountainhead of free ideas and scientific

discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of new electronic computers.

The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present and is gravely to be regarded. Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific technological elite.

The Science Says

Science is a name given to a systematic organized method for asking questions and experimenting to try to find an answer to these questions. Science relies on demonstrable experimentation precisely because it relies on the word of nobody. Under the fiat standard, Science has become a set worldview with set prescribed statements and commandments. But when the practice of science and all universities are captured by a single authority with infinite fiat at its disposal, the experiments are turned into ritual exercises carried out behind closed doors, whose results are to only be believed by relying on the authority of the experimenters and the bodies that regulate them. By making scientific pronouncements an official function of government bodies, the scientific method is perverted to its exact opposite, and most of its conclusions and findings cannot be treated as scientific, but rather as the pronouncements of figures of authority.

Perhaps there is no better indication of the state of disrepair in which modern science finds itself than the normalization of the completely absurd phrase 'the science says', very commonly repeated by academics,

journalists, politicians, and the public at large. The use of this phrase indicates an understanding of science as if it is a set of unquestionable and immutable pronouncements and declarations. But science is not a sentient being capable of saying things, and it cannot refer to a set of institutions or scientists' conclusions, no matter how much they promote them, or how much fiat they have at their disposal. Science is a method of asking questions and experimenting to attempt to answer them, not a set of established conclusions and facts. The implications of this bait-and-switch have been catastrophic for science as well as for society as large, in various fields.

Chapters 5, 6, and 7 in *The Bitcoin Standard* extensively documented the sorry state of modern academia in the field of economics, and how employment in modern universities is almost entirely contingent on faith in the magical healing powers of inflationary monetary policy in the face of all problems, real or imagined. The Federal Reserve itself supports the vast majority of research in monetary economics, and the full spectrum of academic debate centers on how to best utilize inflation, never on whether it is a good idea. All the major academic publications in economics of course echo these sentiments, and it is virtually impossible to get published without accepting the tenets of the inflationary faith. The long historical tradition of economics which had been thriving up until the nineteenth century with the classic economists, and had thrived for millennia before across civilizations has been completely abandoned in favor of Keynesian number molesters and academic paper mills.

Another powerful example of the depths of the degradation and corruption of modern academic sciences comes from studying the science of nutrition, which was alluded to briefly in the previous chapter.

Fiat Nutrition Science

The research that is used to tout the benefits of meat-avoidance has always been based on poor statistical techniques interpreted with cavalier motivated reasoning which would be laughed out of any freshman

statistics class. The main problem with these studies is that they are observational studies, and there are always many confounding factors to take into account. The most popular studies promoted by Seventh Day Adventists focus on comparing Seventh Day Adventists to the general population. They find that since Seventh Day Adventists are healthier, it must be the reduction in meat consumption that's responsible. But that ignores that Seventh Day Adventists also avoid smoking and drinking, are more affluent than the general population and thus able to live in cleaner and healthier environments, and usually have a stronger sense of community, all of which are factors that are very helpful for longevity. These studies also rely on self-reporting of food intake, and it is well-established that this is not an accurate way of assessing food intake, as people generally report what they would like to have eaten, not what they have actually eaten, particularly when the religious group to which you are reporting has strong stigma around the consumption of meats.

More general observational studies, such as the terrible ones relied upon by the bureaucrats at the World Health Organization, find that people who eat more meat suffer from more diseases than people who eat less meat, and therefore conclude that meat must be to blame. But on a population level, the consumption of meat is very strongly correlated with the consumption of all other kinds of foods. In other words, the same people who eat a lot of meat also eat a lot of sugars, grains, flour, and all manner of industrial sludge. A proper statistical observational study would try to control for these factors, but anti-meat studies never do that, because they are based on trying to validate religious visions, and not the scientific method. Yet, even an observational study that controls for many factors cannot be viewed as definitive.

The mention of laughably poor research techniques appropriately leads us to Ancel Keys, who in my mind is the John Maynard Keynes of nutrition: a man as politically skilled as he is intellectually vacuous, who knew how to play politics to serve the special interests that have popularized and mandated his juvenile and borderline criminal "research" as gospel in universities around the world. Making nutrition science a closed guild protected by the state, and tasked with peddling state

propaganda, has allowed it to be easily captured by special interest industries who used it to promote their products unopposed, as all dissenting voices were silenced and marginalized by not having access to the government's printing presses. Nina Teicholz' modern book, *Big Fat Surprise*, offers a detailed accounting of the extent of corruption in modern science that has made the world eat so much poison.

The work of Ancel Keys and many generations of Harvard "scientists" was the Trojan horse with which agro-industrial businesses managed to inject their poisonous industrial sludge into the bodies of billions around the world, resulting in the disastrous consequence of the spread of diabetes, obesity, cancer, heart disease, and many other fatal ailments which most people accept as a normal part of life, completely oblivious to the fact that they are only a normal part of a life spent consuming fiat foods. It is one of the most shocking and discomfoting realizations of one's life that Keys and the scientists who peddled his ridiculous research have likely been responsible for more deaths around the world than anyone, even more than all Communist regimes combined.

Keys' ridiculous research was based on travels he did around Europe after World War II. He collected unreliable data on the consumption of meat across seven countries, and then plotted that against rates of heart disease. After inexplicably eliminating France from the data, Keys found a correlation between heart disease and meat consumption, which he interpreted as being evidence that meat causes heart disease, and from that was born the famous Seven Country Study, popularized to the heavens by mass media and mass education as the definitive and final word on nutrition. Conveniently enough, Keys had also ignored data from 15 countries that would have made his study show different results. That France has low rates of heart disease in spite of consuming large quantities of meat is still viewed as a paradox by modern nutritionists, when there is nothing paradoxical about it except if one buys Keys' unsubstantiated conclusions.

The criminality of Keys did not stop at the selection of these countries, but also extended to his method for specifying fat consumption. Keys used

the consumption of margarine, toxic industrial waste, as part of the consumption of fat along with healthy and essential animal fats. With this simple trick, the increasing health problems caused by margarine were attributed to animal fats, helping lend credence to his conclusion that saturated fat was the problem, and resorting to processed plant oils is the solution.

Keys also popularized the ridiculous idea that a Mediterranean diet is one low on animal fats and high on plant fats, which has been used to heavily market poisonous seed oils (like "heart-healthy" canola oil which no human would feed to their dog, let alone eat). Keys' travels came after the destruction of World War II, during a time in which people were severely impoverished and relied heavily on olive oil. But the people of the Mediterranean, like all homo sapiens, rely on animal fats primarily for cooking, resorting only to plant-based fats after calamities like World War II or Harvard nutritional advice have befallen them. Teicholz shows countless sources illustrating how Mediterranean diets relied heavily on animal fats for cooking, as the basis of the diet, with olive oil used primarily for soap, lighting, skin, hair, and food dressing. Even after many years of Teicholz publishing her book, and many other researchers pointing out the absurdity of Keys' conclusions, fiat science and all its official organs continue to tell people to eschew animal fats for highly profitable processed industrial waste.

Beyond just the vilification of natural fats in favor of toxic industrial waste, Harvard University played a big role in the mass promotion of sugar. [The New York Times reports:](#)

The documents show that in 1964, John Hickson, a top sugar industry executive, discussed a plan with others in the industry to shift public opinion "through our research and information and legislative programs."

At the time, studies had begun pointing to a relationship between high-sugar diets and the country's high rates of heart disease. At the same time, other scientists, including the prominent Minnesota physiologist Ancel Keys, were investigating a competing theory that it was saturated fat and dietary cholesterol that posed the biggest risk for heart disease.

Mr. Hickson proposed countering the alarming findings on sugar with industry-funded research. "Then we can publish the data and refute our detractors," he wrote.

In 1965, Mr. Hickson enlisted the Harvard researchers to write a review that would debunk the anti-sugar studies. He paid them a total of \$6,500, the equivalent of \$49,000 today. Mr. Hickson selected the papers for them to review and made it clear he wanted the result to favor sugar.

Harvard's Dr. Hegsted reassured the sugar executives. "We are well aware of your particular interest," he wrote, "and will cover this as well as we can."

As they worked on their review, the Harvard researchers shared and discussed early drafts with Mr. Hickson, who responded that he was pleased with what they were writing. The Harvard scientists had dismissed the data on sugar as weak and given far more credence to the data implicating saturated fat.

"Let me assure you this is quite what we had in mind, and we look forward to its appearance in print," Mr. Hickson wrote.

The role of Harvard in spreading this criminal mendacity cannot be chalked off as a private institution being corrupt. Harvard, like most American universities, is primarily funded from government research grants. It maintains its prestige and importance through the very heavy influence it exerts on public policy. The founder of Harvard's Fredrick Stare, was practically a living breathing advertisement for the worse trash concocted by American junk food producers in the twentieth century. [An article from 1978](#) on his school is absolutely mind-blowing in the level of downright shamelessness with which he enjoyed getting rich by using his name and his government connections to ram industrial junk down people's throats. Wikipedia summarizes some of the most shocking facts about this man:

As an adviser to the US government, Stare rejected the idea that 'the American diet' was harmful; stating for example that Coca-Cola was "a healthy between-meals snack" and that eating even great amounts of sugar would not cause health problems.

In his autobiography, Adventures in Nutrition, Stare states that in 1960 he obtained a grant of \$1,026,000 from General Foods for the "expansion of the School's Nutrition Research Laboratories" and that in the 44-year period as a nutritionist he raised a total of \$29,630,347. For instance, Kellogg's funded \$2 million to set up the Nutrition Foundation at Harvard. The foundation was independent of the university and published a journal Nutrition Reviews that Stare edited for 25 years.

Stare also co-founded and served as chairman of the Board of Directors for the American Council on Science and Health. In 1980, during his tenure as Chairman, he sought funding from US tobacco giant Philip Morris USA for ACSH's activities.--

It's important to note that this new paradigm of nutrition science is based on popularizing the managerial state's attempts at economically and efficiently mass-feeding soldiers during the Second World War. After the success of British and American soldiers in defeating Nazism, the managerial state in both countries sought to apply the successes in managing the wartime effort to managing civilian life, and the result was the modern dietary guidelines. These are written with the aim of producing the cheapest way of feeding masses of humans. Instead of allowing nutrition to be an individual choice and food production a free market process, modern governments have treated their societies as industrial lot-feeds, and tasked third rate scientists and terrible statisticians with devising the cheapest way of feeding them enough calories. Humans' natural instincts and delectation were to be overridden by government-employed charlatans profiting from telling them how much to eat of each kind of food, and whose prime directive (as in the war years) was economy. Consequently, the biggest beneficiary from government nutritional guidance were the producers of the cheapest sources of calories and proteins: grains and pulses. But the nutrition mandarins failed to notice, or mention, is that grains are essentially nutrient-free, while pulses contain inferior nutrients to those contained in animal meat.

A monetary system built on a pyramid of unsound debt money gave us a food system built on a pyramid of unsound grains and carbohydrates. In one of the most catastrophic scientific errors of all time, detailed thoroughly in the work of Nina Teicholz and Gary Taubes, carbohydrates were given a free pass and became the foundational basis for nutrition while animal meat and fat, the highest quality and most nutritious food available, were vilified as the cause of modern diseases and illnesses. Modern medicine took the word of slimy politicians pretending to be scientists like Ancel Keys and Fredrick Stare and spread the gospel worldwide. Astonishingly, to this day, even the least health-conscious people still worry about their consumption of animal fats, while finding nothing wrong with eating large quantities of 'healthy' grains, sugars, processed foods, and soft drinks.

The result of this catastrophic mistake has been that people the world over have massively increased their consumption of cheap, nutrient-deficient grains, and all manners of toxic industrial “foods” while drastically cutting down on meat and animal fats. Grains may be more abundant in our modern world but they are not more nutritious, and eating them does not satisfy people’s nutritious requirement, but instead causes more hunger and cravings, motivating them to eat more and more. The obesity of the modern world has its root in a very real lack of necessary nutrients in favor of eating highly-addictive and non-nutritious junk, while the truly nutritious food, fatty meat, has been deemed dangerous by modern governments’ diet dictators. The reason that the obese of today eat too much is not that they are affluent, rather, it is that they are utterly deprived of nutrients and are constantly hungry, and the grain and sugar which forms the vast majority of today’s diet provides close to no nutrition.

The role of the government as the nanny responsible for dictating the diets of the entire population is a natural outgrowth of the totalitarianism that fiat money engenders. When government has the ability to generate any money it needs for whatever purposes it deems necessary, any nice-sounding ideal will eventually come to be viewed as a prerogative of the state. What started off as a well-meaning religious attempt to save people from the 'envisioned' damages of eating meat devolved into a government bureaucracy captured by large agro-industrial food interests motivated to sell food that can easily scale industrially and provide the highest margins.

Fiat Hysteria

The skewed incentives go beyond just publishing an endless stream of trivialities that are likely untrue. The quest for publication is strengthened by researching something that attracts a lot of attention, and a very good way to attract attention is to focus on areas that invoke fear. Academics are strongly incentivized to over-emphasize risks and potential catastrophes in their work, because that significantly increases the chances of publication. More importantly, perhaps, concerning and scary

finding are far more likely to successfully attract more funding in the future. There is a very strong incentive for a researcher in a field not to be the one who failed to warn of an impending calamity. If their warning prove unfounded, he faces no consequences for being wrong. As discussed with the problem of socialist calculation, without ownership of the means of production, no party can accurately calculate the benefits and costs of any particular action. The scholar warning about impending doom from their office will not be the one to foot the bill for the many precautions he asks governments to impose on citizens. There is no market test that would punish a scholar for misleading people into misdirecting resources in a crisis, and government research boards have no incentive to introspect, criticize, or punish their own financing of inaccurate scare-mongering research.

With the incentives aligned for panicking and little downside to it, it is no wonder many modern researchers resemble chicken little more than scholars. One need not invoke any grand conspiracy to push scare stories in science to understand why so many scientists are constantly so terrified of the natural world; the simple reality is that without a market test, and with unlimited government fiat ostensibly dedicated to research topics in the public good, there will naturally be more funding available for scary conclusions, and the more panicky scientists are likely to thrive and achieve prominence than their more reasonably sober colleagues. By separating researchers from the consequences of their research and action, fiat naturally selects for, and magnifies the hysterical conclusions. The application of this point to prominent scientific questions of the day is left as an exercise for the reader.

11. Fiat fuels

One of the most notable consequences of the closing of the gold exchange window in the 1970s was the significant and unprecedented increase in the prices of oil, the first significant increase in the costs of energy after centuries of steady decline had immensely improved the lives of people. The economic shock was very significant for Americans whose modern lives were increasingly reliant on high energy consumption: gasoline for cars, and electricity for a growing number of household appliances.

As with food, government attempted to fix the problem of rising prices by manipulating the market for oil, rather than addressing its underlying monetary cause. Instead of reducing inflationary credit expansion and government spending, bureaucracies sought to find cheaper and better alternatives to oil. Most fiat academics and textbooks continue to this day to blame the energy crisis on the Arab oil embargo of 1973, an astonishingly absurd explanation for several reasons. The shortages had started in 1972, before the embargo. The embargo failed to reduce the imports of oil to the United States in any meaningful sense, as the oil market was liquid and large enough for the US to find oil from other sources¹⁶. And the oil prices continued to rise long after the embargo ended.

16 Lee, Hall, and Tabors. *Energy Aftermath*

The Department of Energy was set up in 1977, and the central planning of energy markets was to proceed along a half century quest for an elusive 'alternative energy' commenced, which has resulted in a very expensive and highly destructive mission to replace oil and hydrocarbon with inferior alternatives through subsidies, favorable lending, and government mandates. For an ever-shifting variety of reasons, markets were viewed to have failed for choosing oil, and the correct and better fuels had to be imposed by fiat.

The seemingly indomitable power of governments with a printing press has been at war with the laws of thermodynamics and the basics of engineering. Centuries of human engineering progress and quality of life improvement had been based on channeling hydrocarbons's awesome power, which means high quantities of energy per unit of time, as well as their high energy density per unit of weight, which made them nature's cheap, powerful, and ubiquitous batteries. To avoid the rise in their prices, the US government's fiat sought to ignore half a millennium of technological advancement, and attempt to build the modern world using the pre-modern energy sources of solar, wind, and biofuels. With their low power, intermittency, unreliability, and massive bulk, these sources were only ever predominant in primitive societies precariously living on the brink of survival, at the mercy of nature, with very little in the way of technological progress. Against all logic and reason, these were designated by government fiat to be the fuels of the future.

For the first time in history, centrally planning the sources of energy humans use became viewed as a legitimate function of government, and it led to the emergence of large industries reliant on government subsidies, mandates, and subsidized credit to operate, while constantly making promises of achieving technical and economic success in a few years. The consequences of this megalomaniac quest to override the laws of thermodynamics are predictable for anyone familiar with the inevitable fate of all attempts to centrally plan market outcomes. Yet, as is the custom for failed central plans, fiat universities and academics spend little time dwelling on them, and those who do are largely ignored. Perhaps the best treatment of the episode comes from *Energy Aftermath*,

a good overview book published in 1990 by Ben Ball, Thomas Lee, and Richard Tabor.

The authors of this book detail how the US government sought to promote five main sources of energy in response to the "energy crisis" (actually just an inflation crisis) of the 1970s, and these sources were Synfuels, photovoltaics, biofuels, natural gas, and nuclear energy. Synfuels were never produced commercially, and photovoltaics failed commercially, with Lee et al concluding: "The major portion of this blunder was assuming that it was possible, in effect, to dictate the supply-demand relationship in advance and that by having the government establish the market through forced, pre-stated quantity purchases, it would be possible to drive the price of the technology down."¹⁷ The second problem, for Lee et al, was the assumption that it was possible to predict the advancement of technology and the cost-curve for the future. Biofuels policies succeeded in initiating large wealth transfer to corn farmers and biofuel producers, but the fuels came nowhere near replacing oil for cars. And with nuclear and natural gas, the authors detail how the crushing embrace of regulatory fiat actually hampered the development of these energy sources.

As the price inflation of the 1970s subsided and hydrocarbon prices dropped in the 1980s, the economic rationale for replacing oil with fiat fuels became less pressing, and many of these projects subsided in importance. But by the 1990s, the fiat fuel industry found fresh winds for its sails from the threat of catastrophic climate change, and in marketing its fiat fuels as the salvation from climate catastrophe.

The drive for environmental panic, like the drive for promotion of industrial junk fiat foods discussed in Chapter 9, represented a confluence of interests coinciding together. The "alternative energy" industries which sprang up in the 1970s stand to benefit from promoting any narrative that suggests the replacement of hydrocarbon fuels with their inadequate replacement, just justifying more government subsidies for these energy

17 Lee et al. 1990. *Energy Aftermath*, p.78

sources. But there is also a religious element to this faith, based on pagan conceptions of earth as pristine and humans as a destructive consuming force. The undertone of much of modern environmental hysteria is the idea that earth left alone and free from human influence is something good and desirable for its own sake. What philosopher Alex Epstein astutely calls the anti-human environmentalism views humans as a burden on earth, and seeks to minimize this burden to allow the earth to thrive. Epstein persuasively explodes this viewpoint, and argues that any assessment of environmental issues needs to be understood from the perspective of humanity, with the goal of increasing human flourishing. Viewed in that regard, humans are not a destructive force on earth, our actions are what make the earth habitable for us, allowing humans to survive, prosper, and flourish.

With modern industrialization picking up in the twentieth century, the environmentalist movement for long warned about the dangers of human consumption and industry to the planet, and the likely devastating consequences it would cause. These warnings came to a head in the 1970s, where the inflationary rise in the price of most commodities was viewed as evidence that earth had reached its carrying capacity, and conflicts, famines, and destitution were the inevitable fate awaiting humanity. Throughout the 1960's and 1970's leading environmentalists made dire predictions of the horrific fate awaiting humanity from the depletion of resources, and as inflation increased, these environmentalists became increasingly popular.

But as inflation subsided in the 1980s, all of these claims became suspect. How could we be running out of oil, steel, nickel, and various industrial materials when their prices had begun a steady decline in real, if not nominal terms. The environmental doomsday cults had a major branding problem on hand, and they only successfully resolved it by pivoting the existential threat to humanity away from depletion of resources to the over-consumption of resources. We're not doomed because we're going to run out of oil; we're now doomed because we have so much oil that its consumption is going to destroy the atmosphere

and boil the oceans. The reasoning had pivoted to its diametrical opposite, but the conclusion remained the same: doom.

Fiat Apocalypse

The previous chapter examined the underlying distortions to the scientific method caused by fiat money providing governments with outsize influence on the direction and results of scientific research. As funding decisions end up being controlled by bureaucrats isolated from market feedback and consequences, the incentives of researchers are skewed toward publication and bureaucratic metrics and away from truth and relevance to the real world. Further, with public funding of science motivated primarily by notions of the public interest, it is more likely to be granted to researchers who identify potential catastrophes than those who arrive at comforting conclusions. Fiat science is optimized for panicking and the more concerning a scientist's finding, the more likely they are to receive more funding and grow their department.

It is only with this context that one can understand the astonishing phenomenon of many seemingly intelligent people worldwide hysterically concerned about carbon dioxide causing the destruction of the planet. Carbon dioxide is a gas that is an essential component of all living creatures, and it has always existed as part of the earth's atmosphere in trace amounts, currently at a concentration around 410 parts per million, or 0.041%. Pre-industrialization, the concentration of carbon dioxide in the atmosphere was closer to 280 parts per million, and modern climate science has been converted into a weird monomaniac cult that attributes every single problem in the natural environment to the increase of the concentration of this trace gas.

The greenhouse effect, upon which most of this hysteria is based, is an effect that is well-demonstrated in laboratory settings, and has been understood as a part of earth's atmosphere since the nineteenth century. But try as they may, fiat scientists have completely failed to demonstrate,

using the scientific method of testable hypotheses, what the increase in CO₂ is causing in the real world. The initial hysteria was primarily concerned with increasing global temperatures, with many decades of doom-mongering predictions about the temperatures of the world rising to the point of making large parts of the world uninhabitable. And yet, the instrumental record of temperatures worldwide shows very little upward trend over the the last century, and whatever variation exists is well within the range of the normal variation experienced by earth before industrialization.

In the early years of carbonhysteria, there was a general consensus around the idea that global temperatures had begun rising in the shape of a hockey stick, coinciding with the beginning of industrialization, and the horror was that continued increases in CO₂ emissions would lead to runaway temperature rises that will have devastating consequences to the planet and the humans that inhabit it. Based on a highly publicized scientific study by highly prestigious fiat scientific research centers, the hockey stick captured the world's imagination, being heavily promoted in the famous fantastically fictional Al Gore movie masquerading as a documentary. Gore, who had taken up the cause of carbonhysteria in the wake of his devastating defeat in the presidential election of 2000, famously got into an elevator that raised him to track the rises in temperature to drive home the point that industrialization was changing the planet irreversibly. But in 2010, one of the most eye-opening episodes of modern fiat science took place, when hackers managed to expose the emails of the researchers who were working on producing this study. In very clear literal terms, the fiat scientists directly discuss applying different tricks with the data in order to "hide the decline" in temperatures witnessed in the second half of the twentieth century. This being fiat science, of course, nobody involved in this blatant fraud was to suffer any consequences for it. They all continue to promote hysteria worldwide. But the exposition of this fraud has thankfully led to the disappearance of the "hockey stick" as the totem and talisman of the carbonhysterics. There is simply no credible evidence that global temperatures in the past couple of hundred years are changing in any manner significantly different from how they have always naturally varied.

There is no conclusive evidence that the increase in carbon dioxide is responsible for whatever changes in temperature have taken place. Contrary to fiat scientists' illusions of control, earth was never at a constant optimal temperature which we are now upending with our emission of CO₂.

Ocean acidification is another common supposed impact of increased concentration of CO₂. Dozens of academic papers discussed this effect. But as scientists tried to replicate the findings of these papers, it became apparent they were based on [extremely liberal methodology to arrive at the desired results](#). When fiat scientists studied the fish in fish tanks, they noticed the fish not thriving. But when researchers tested them in the sea, they found little preference among fish for water with lower levels of CO₂.

So the panic survives from one panic field to another, with the conclusion foregone, but the theories and mechanisms a constantly-shifting variety of motivated reasoning by fiat science. Without a clear demonstrable effect of increased CO₂ emissions worldwide, the carbonhysteria has moved on to promoting an endless list of natural phenomena as being the product of CO₂. Since our earth is moving, not static, it is constantly oscillating between night and day and four seasons, and since it is surrounded by a complex atmosphere, nothing is constant in weather and climate, so the hysterics never run out of changes to attribute to CO₂, in the same way witch doctors and shamans have always blamed the weather on their followers, demanding they sacrifice to fix the weather.

Blaming carbon dioxide has reached pathological levels of delusion at this point. Pretty much everything is caused by carbon dioxide. A [website has collected](#) hundreds of press articles based on scientific studies blaming CO₂ for an endless list of bad things happening worldwide, from increases in cases of depression among pets, to earthquakes, cancer, declines in bird populations, the creation of ISIS, traffic jams, earlier squirrel reproduction, increased aggression by polar bears, floods, sea-level rise, hurricanes, and decline in whale populations is just a random sampling of the many horrors attributed to the increase in the

concentration of a gas essential to all living things from 0.028% to 0.041%.

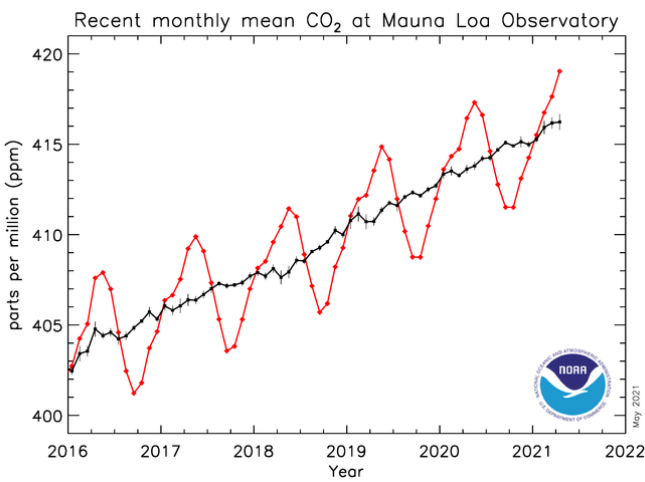
Once it has been established that The Science Says carbon dioxide emissions are bad and a cause of panic, the fiat scientific method is set in motion: the path to publication, promotion, research grants, and increased importance goes through magnifying the panic, finding more reasons for it, and asking for more funding. The path to irrelevance and career suicide comes from soberly assessing the evidence and finding little cause for concern.

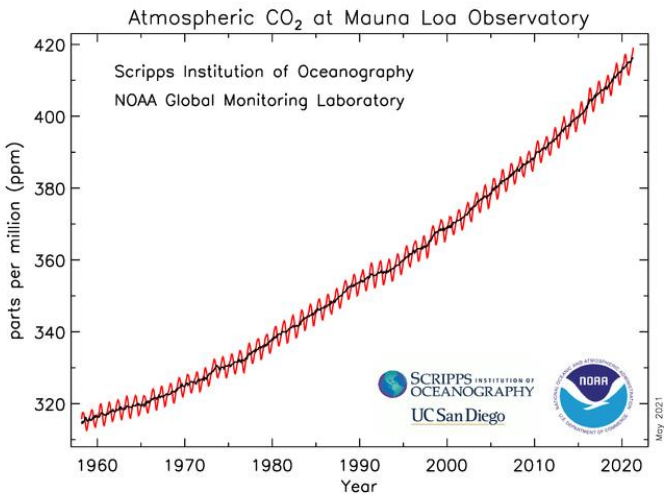
All of the "evidence" for the link between carbon dioxide and these calamities comes entirely from observational studies. All of these things are changing while the concentration of carbon dioxide is rising, and since there's research money to be made from assuming causality, the causality is always concluded, and any doubters are immediately dismissed as deniers. In fact, a closer look at the studies behind these sensationalist headlines shows that the causal link between CO2 emissions and the phenomenon concerned is assumed as a given, and the paper does not make any attempt to prove it, but will instead switch to discussing the details of the phenomenon observed. These papers continue to provide the grist for the mill of news items constantly beating the drums of fear.

What would a proper scientific study need to do to convincingly illustrate a causal link between carbon dioxide emissions and these various phenomena? It would need to posit a testable hypothesis based on the impact of carbon dioxide emissions, and test whether the predictions of the hypothesis accurately map against reality. In other words, a proper scientist would measure bird populations, and make a testable prediction conditional on CO2 emission levels along the lines of: "If CO2 emissions increase by x% over the period between Year X and Year X+10, the population of a particular bird species would decline by Y%." Repeated demonstration of an accurate track record of these predictions would go a long way to establishing the credibility of the evidence linking carbon dioxide to this particular phenomenon.

The previous year has provided climate scientists with a great natural experiment of sorts with which to test the robustness of their claims on the link between CO₂ emissions and atmospheric concentrations of CO₂, and between emissions and climate phenomena. As the world economy went into a debilitating shutdown starting in March 2020, there was a very significant reduction in aviation and car driving, two major sources of CO₂ emissions. The shutdowns were devastating for the livelihoods of billions worldwide who lost their jobs and their earnings, and is an extreme example of the kind of economic reform that environmentalists propose to alleviate climate change. What was the impact of these shutdowns on the atmosphere and climate? One year later, we are beginning to see studies estimate this.

The results so far are a complete slap in the face of the delusion that humans control the climate through our emissions of an essential trace gas. Most fascinating is the discovery that all of these lockdowns had no discernible impact on the trend in CO₂ atmospheric concentration growth, which continued with no perceptible change.





Source: <https://esrl.noaa.gov/gmd/ccgg/trends/mlo.html#mlo>

Another study examined the impact of lockdowns on temperature and rainfall and found no discernible effect. To the best of my knowledge, there has not been a single study to find evidence that the global shutdown had any discernible impact on any aspect of the earth's climate or atmosphere. If locking billions of people at home, with their cars parked and global aviation coming to a complete halt, had no detectable effect on climate, there is no good reason to believe any of the dire predictions of climatologists.

One cannot completely dismiss the hypothesis that humans are having an impact on atmospheric CO₂ concentrations and the climate, but the burden of proof is on the people making these extraordinary claims to present convincing and undeniable evidence that illustrates the causal mechanisms involved, the likely impacts, the value of the mitigation measures they propose, and their true cost. There is no good reason to think that the greenhouse gas effect as studied in laboratory settings will translate to the world at large, where the environment is far more complex

than any lab could ever be. Without testable hypothesis, the entirety of modern climate science is at best conjecture, but more likely motivated reasoning in search of a predetermined conclusion to secure more funding. Without testable hypotheses, climate scientists have to be far more humble and modest about whatever conclusions they arrive at.

It is debatable whether the findings of the modern field of climatology would exist in a free market for research without fiat funding. But it is pretty clear that a society running on hard money, which would force everyone to constantly think about opportunity costs of action, would come nowhere near contemplating the precautions and measured called for by the climate hysteria industry. The threats of climate change are an ever-shifting set of hypothetical doomsdays, while the threat from the transitioning of energy sources to "renewables" is a very real matter of life and death for billions on the planet.

As time has gone by and the many calamitous predictions of the climate hysteria industry have failed to materialize, a more sober and reasonable assessment of the dangers of CO2 emissions is becoming possible. The last year has witnessed the publication of two extremely important books on the topic of climate, whose authors come from a largely pro-hysteria background, but whose conclusions are very much against the prevalent hysteria. Physicist Steven Koonin, a former chief scientist for the Obama Administration, has just published *Unsettled: What Climate Science Tells Us, What It Doesn't, and Why It Matters*, the culmination of many years of examining the scientific studies published on climate change, the supposed consensus around it, and the real world evidence for it. Koonin's conclusion is unabashedly non-panicky. One by one, he takes apart the major tenets of the climate hysteria religion and shows how little evidence there is to support them.

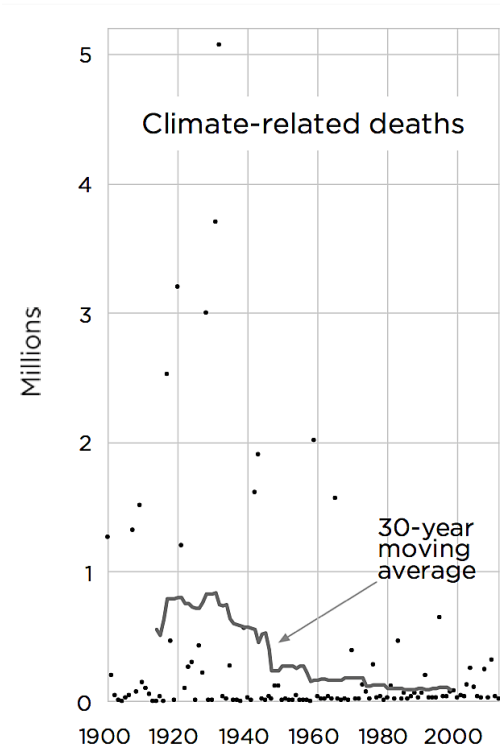
In *Apocalypse Never: Why Environmental Alarmism Hurts Us All*, life-long environmental activist Michael Shellenberger takes a very sober look at similar topics and shows why the popular alarm and hysteria around climate change is very misplaced. Beyond just dispelling the fears of climate alarmists, Shellenberger provides a very thoughtful and eye-

opening treatment of the social and psychological impacts of the growing number of people who have been conditioned by fiat scientists into a state of despair, panic, and constant fear over the weather. Moreover, he illustrates how the obsession with CO₂ has overshadowed and displaced the interest in other pressing environmental phenomena.

Reading these two books is a massively relieving let-off for anyone still suffering in the delusion that their driving of a car or taking a flight is causing irreparable damage to the planet and our environment.

There is little reason to believe whatever changes in temperature we've witnessed over the last century are in any way out of the ordinary for our planet, which has witnessed far larger variation in the past without our CO₂ emissions affecting it. There is also no reason to suspect changes in CO₂ concentration in the atmosphere will cause catastrophic ocean acidification. Beyond these two headline threats, what remains is an ever-shifting endless list of supposed threats each with a very tenuous link to CO₂ emissions. But more important than the hallucinations of fiat scientists looking to get published is the state of the planet and the livability of the climate, for which we have very reliable data. If CO₂ emissions were in fact causing dangerous damage to the climate, we would expect to see this reflected in an increasing number of deaths caused by climate and natural disasters. Yet reality shows us the exact opposite: deaths from natural disaster and climate-related causes have been declining drastically throughout the past century, thanks to the amazing and glorious technological advancements of the past century, which have made survival into old age far less uncertain than it was at any point in history. As humans have mastered our natural environment, we have steadily tamed the harms of nature and protected ourselves from them. Perhaps the most significant factor in our mastery of our climate has been the utilization of high power energy sources for the meeting of our needs. It allowed us to make ubiquitous cheap steel to fortify our houses and protect them from the elements, to drain the swamps that breed insects and diseases, to keep our homes warm for little cost, to build hospitals full of modern equipment that save our lives. The irony is

completely lost on the climate alarmists that the materials they want to ban are our best weapon to survive the natural dangers of climate.



Fiat thermodynamics

Fiat society thinks it can decree new laws for thermodynamics and override engineering reality by government fiat. The eternal adolescents of fiat want to live in modern homes, easily survive winters, travel faster than walking, use modern electronic devices and medical equipment, and have electricity on demand, but they don't want to use the substance that makes all of these possible. Any person with a familiarity with the engineering realities of modern life will realize that the policies and

demands of fiat people when it comes to energy are as reasonable as the child who wants to go to Disney Land, but throws tantrums refusing to get into the car taking him to Disney Land, because he doesn't want to get into the car, he just wants to be in Disney Land. It is difficult to communicate to a child in a tantrum that the car is his only realistic option for getting to Disney Land, and that the only possible alternative is walking for days, and not some magical teleportation device. This is exactly the plight of trying to explain to fiat people that hydrocarbons are the only reason most of our modern life is possible, and that the only realistic alternative is grinding poverty and a precarious existence, not some absurd Star Trek world where all that we want materializes with the flick of a switch without any combustion taking place. The child who wants to be teleported to Disney Land should present their teleportation device before throwing a tantrum, and similarly, it is time for fiat fuel enthusiasts to first show the rest of us how they manage to survive on fiat fuels before demanding we give up the hydrocarbons that are essential for us.

There is no evil conspiracy of oil companies and oil producing nations to force fiat fuel enthusiasts to consume oil. They consume it because their actions are grounded in the real world, unlike their insane ideas. The intellectual brain, being largely used for insignificant entertainment purposes, can contemplate insane and meaningless ideas like a modern world free of hydrocarbons, but the acting man looking to survive and thrive, cannot. Even as they virtue-signal about wanting to get rid of hydrocarbons, they do so from the safety of a house built with hydrocarbons, lit with hydrocarbons, powered by hydrocarbons, using electronic devices that would be impossible to make without hydrocarbons.

Initially, you might expect that solar energy, being so plentiful and abundant, would be far cheaper than hydrocarbon energy, which needs extensive prospecting, drilling, extraction, and transporting to utilize. The sun shines down on every inch of the earth for significant parts of the year, and its rays bring large quantities of energy. It is estimated that the solar energy that falls on earth in one hour is larger than the energy that

all humans consume in a full year. Why would solar energy then not be cheaper than hydrocarbon energy?

The answer is that in its raw form, solar power is cheaper than hydrocarbons, but in its raw form solar power can only satisfy the human needs for skin exposure to sunlight, and for growing plants. Solar energy in its raw form cannot satisfy the majority of our modern energy needs, since humans do not need large quantities of energy in the aggregate; we require high amounts of energy at the margin, in large quantities over short periods of time in order to produce power (defined as unit of energy per unit of time). High power is the driving force of modern technologies that makes modern construction, industry, transportation, electronics, and many more modern accomplishments possible. One cannot use the rays of sunlight directly to move a car or power a factory, and their absolute quantities are irrelevant. Whereas solar energy is plentiful, being able to concentrate it into high power is a very complex operation that requires significant investment in capital infrastructure through solar panels and batteries. As a form of energy in the abstract, solar is infinitely cheap. But as an economic good that meets our need for power, solar energy requires highly sophisticated and expensive equipment to become usable, and that is why it remains far more expensive as a source of energy than hydrocarbons, and continues to require subsidies, mandates, and subsidized fiat credit. It is not the aggregate quantity of the good that matters, but its ability to satisfy our particular needs, at the time and place where we need them.

The term "alternative" is a misnomer when used to refer to fiat fuels, as no "alternative" energy source constitutes a satisfactory alternative to hydrocarbons. None of these energy sources could be used exclusively for building and transporting the equipment that makes its production possible. It would be extremely expensive, if not impossible, to build a windmill factory that operates purely on wind power, or a solar panel factory that operates purely on solar energy. The low power associated with these energy sources make a factory operating powered by them very difficult. An attempt to collect these energy sources into high power applications would require extremely expensive equipment, the production

of which is also highly energy-intensive. And even if someone had managed, against all common sense, to build a windmill factory running on windmills, it would be far more difficult to transport these enormous wind turbines to the locations where they need to be installed using wind energy. The technology needed to transform wind energy into electric energy, and then store it into a battery is far more expensive than just refining oil and putting into a car engine. The more familiar one becomes with the industrial processes involved, the more you realize how utterly contingent they all are on the presence of hydrocarbon fuels.

The production of electrical batteries and solar panels is extremely energy intensive. The extraction of the rare earth metals that go into them is a highly sophisticated process requiring large amounts of power to dig very deep holes into the crust of the earth. None of these processes would be practically possible without hydrocarbons, in a technical sense. In an economic sense, they are even less feasible when one remembers that in a world without hydrocarbons, we will have far more pressing and basic needs to invest our time and resources into. While engineers might in theory devise roundabout ways of producing batteries and windmills without hydrocarbons, in reality, without fossil fuels humans will have nowhere near the resources available to invest in such highly sophisticated methods of production, when survival in the winter is far from certain, and when basic transportation has become massively expensive. The entire division of labor on which our modern economy depends is impossible without hydrocarbons.

Beyond very small-scale non-commercial applications employing windmills and solar energy sources, the vast majority of humans' actions (and not their empty virtue-signaling) clearly show that humans prefer and require hydrocarbons. The growth of the renewables energy industry has simply been almost entirely a function of growing government subsidies. This was the case in the 1970s, and that left behind a large number of white elephant projects. Today, easy money is creating a similar misallocation of resources in these industries.

The only viable alternatives to hydrocarbons are hydroelectric power and nuclear power, but these are extremely limited in their scope for growth. Hydroelectric is only economical in areas near large sources of hydroelectric power, while nuclear faces very strong political and regulatory barriers to its expansion, and is itself dependent on hydrocarbons for the industrial materials that make it possible. Even if all political and regulatory barriers to nuclear adoption were removed tomorrow, it would still take many decades before the infrastructure for nuclear energy can be built to match hydrocarbon fuels, and it would still require hydrocarbons as inputs into the process. Building the plants, training and educating the engineers, and generating enough market demand to invest heavily in nuclear fuels will be very time-consuming and expensive when one remembers that existing fossil fuel infrastructure is still highly functional.

In the conclusion to *Energy Aftermath*, Lee, Ball, and Tabors explain how the environmental crusade against hydrocarbons followed the same failed playbook of the 1970s' anti-inflationary crusade against hydrocarbons. Thirty years after publication, they continue to be proven correct:

“A second set of evens is occurring as this book goes to press. The academic, business, and governmental worlds are beginning to focus on the issues of global change, specifically global warming and the effect that increased combustion of fossil fuels plays in the production of the greenhouse gasses. The debate has opened, the research potential is clearly there, the opportunity to look forward and backward to identify new alternatives is also there. It is discouraging to the authors to note that many of the technologies trotted out for inspection are those we evaluated in the 1970'. Most of the modeling tools that we tried—and largely rejected—in the 1970's are being dusted off, updated to produce environmental residual measures, and running again. There were lessons, as we have pointed out, that do apply to the questions of global

warming. Learning implies that the mistakes of the past need not be repeated.”

The cost of fiat fuels

I studied these questions in depth when doing my PhD until 2010, and became pretty disillusioned with the state of the scholarship on these questions and the enormous and blatant theft these policies encourage. It appeared to me clear at that time that the renewable energy scam was that was fast becoming as entrenched as the corn subsidies that are a permanent fixture of world and US politics. There were powerful interests making a significant income from these scams, and they set the terms of debate around these questions. Trying to discuss these issues with sanity was just an invitation for ostracism and abuse. Intellectually and professionally, there was little point in trying to confront these terrible ideas. Hydrocarbons would continue to provide the vast majority of energy in our world anyway, as people's market choices will inevitably triumph over their vacant virtue-signaling.

More recently, it has become clear to me these questions are far more significant than the economic inefficiency and theft they entail. As the utilization of unreliable and uneconomical energy sources has increased, the cost of power has begun to rise again, reversing the essential process of progress that is human civilization itself. In all of our history, humans have sought ways to increase the amount, and reduce the cost, of the power they are able to deploy to meeting their own needs in life. From lighting fire, to domesticating horses, building waterwheels and windmills, burning coal, oil, gas, and utilizing nuclear energy, humans have constantly sought and found the technologies and raw materials that can bring them more and cheaper power to meet their daily needs. And with this growth came the constant improvements in the quality of life which most of us take for granted today. By mandating the use of primitive low-power unreliable energy sources, governments are raising the cost of all

economic activity, making life more difficult, and effectively rolling back human civilization.

All over the world, places that have aggressively mandated the use of fiat fuels for the grid are witnessing a steady rise in the cost of electricity. Germany has witnessed a [51% rise in the cost of electricity](#) between 2006 and 2018, and a doubling in price between 2000 and 2020. California, the US leader in mandating fiat fuel, has witnessed a [39% rise](#) in the cost of electricity between 2011 and 2020. The United Kingdom's electricity prices [rose by 27%](#) in the decade leading up to 2020. These power cost rises seem to be normalized and accepted by many in these economies, but the implications are severe in the long-term, in three particular ways. First, higher energy prices badly impact the poorest in society, who usually spend a much higher percentage of their income on energy. Second, higher energy prices translate to rising prices in all goods and services, as energy is an input into every production process. Finally, rising energy prices are debilitating for energy-intensive industries, particularly manufacture, which effectively means these societies are deindustrializing and destroying their high productivity industries. It is astonishing to imagine that Germany, the industrial powerhouse whose efficiently engineered and manufactured goods have blanketed the planet, allowing the world to increase its productivity drastically, is now committing industrial suicide by making manufacturing prohibitively expensive thanks to power prices.

It's important to understand why power prices rise with the deployment of fiat fuels, and that is due to their intermittent nature, which means that they produce energy according to the whims of nature, and not the demands of consumers, resulting in [expensive problems of under-production and over-production](#). Since there are times in which renewable energy sources will produce no energy whatsoever, and these times can coincide with peak demand, all power grids must maintain reliable power plants able to provide them with peak demand when needed. As a result, the investment in fiat fuel plants is almost entirely an added cost to the grid, not a replacement. To ensure that electricity users have full power when they needed, there can be no reduction in the capacity of reliable

power sources. Over-production is another major contribution to cost. When demand is low, but fiat fuel plants are running at high capacity (such as windy nights for wind turbines, or cool sunny weekend days where there is little demand for heating, cooling, or industrial production) the grid must invest significantly to find ways to safely dispose the excess energy, and this energy can cause damage to the grid, leading to black-outs.

Beyond the rise in the direct market price of electricity, the imposition of fiat fuels has also led to a plummeting of reliability of the power grids in much of the industrialized world, which entails significant indirect costs. The fatal flaw of "renewable" energy sources is that they are intermittent. No matter how many windmills and solar panels you install, and how advanced their technology, there is no way they can generate electricity when the wind doesn't blow and the sun doesn't shine. The transformative power of hydrocarbons lies not just in the high power they deliver, but also in their ability to deliver power on-demand, when required, anywhere on earth, freeing humans from having to tailor their actions around the weather. Fiat energy is reversing this enormous leap forward for humans. It is astonishing to watch a place like California, which had managed to secure 24 hour reliable electricity for its citizens many decades ago, reduced to having its governor call on its citizens to avoid doing activities requiring high power in the evening as the sun sets and solar power generation slows down.

This unreliability is far more than just an inconvenience, as residents of Texas found out during the last winter. As a large snowstorm hit the state, solar and wind power generation was rendered completely useless for days on end, causing massive outages at a time when people needed their power to stay warm in their homes. It was very sad irony to find the residents of an energy-rich state having to leave their freezing homes to spend the nights in their cars overnight, as the cars were the only place they owned with reliable hydrocarbon energy. Years of investment in unreliable energy sources, and under-investment in gas and nuclear plants have left the infrastructure of many advanced economies teetering at the brink, one natural disaster away from complete collapse.

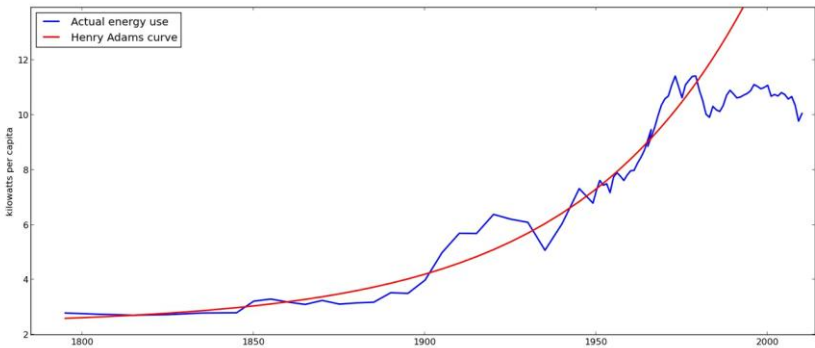
Shellenberger's *Apocalypse Never* provides a good overview of the extent of this malinvestment in California, and as the rest of the world continues to head in the direction of California with fiat fuels, it is hard to escape the conclusion these catastrophic grid failures will become far more common, leaving humans to fend for themselves against the challenges of the natural environment without the power technologies that have made survival progressively easier over the past few centuries.

Once one strips away the carefully-crafted and expertly marketed romantic pseudoscientific halo around fiat fuels, there is no escaping the conclusion that they represent nothing less than the reversal of the process of civilization and the devastation of human progress achieved through centuries of hard toil, sacrifice, capital accumulation, and technological ingenuity. Providing 24 hour electricity reliably, regardless of the weather or time of day is an engineering problem that advanced industrial societies like California and Texas have solved many decades ago. The failure to have this luxury in the twenty-first century cannot be explained through any technological or natural reasons, it is purely a result of the sabotage wrought by attempting to mandate fuels by fiat.

But the disasters of fiat fuels are not restricted to the developed industrial societies forsaking development and progress. Fiat fuel have arguably been more devastating for many undeveloped and predominantly pre-industrial societies, countries with low levels of capital for which wasting capital on these luxuries is an unconscionable waste. Poverty is the inevitable consequence and symptom of a lack of available power, and the only proven technologies for delivering high power on demand at low prices are based on hydrocarbons, and to a limited extent, nuclear and hydroelectric. Yet the last three decades have witnessed a proliferation of development projects aimed at helping poor countries "transition" to renewable energies, instead of investing in reliable energy. The track record of these projects has been calamitous. Western donors and 'misery industry' bureaucrats get to write their virtue-signaling reports full of rosy language on the transformative potential of these energy sources, but the people who have to rely on them end up with unreliable low power available intermittently, and usually, they still have to pay enormous costs

in debt servicing and maintenance. At a time when reliable power generation from hydrocarbons is becoming cheaper than ever, burdening the world's poor with the expensive useless virtue-signaling toys of the west is no less than criminal.

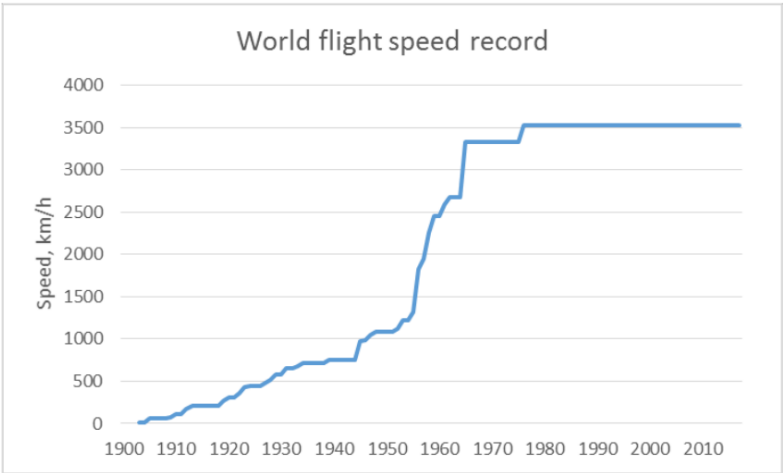
In his book *Where Is My Flying Car? A Memoir of Future Past*, J Storrs Hall finds a steady trend stretching for three centuries, of usable energy growing at about 7%/ year, which can be approximated as a result of 2% increase in energy efficiency, 3% population growth, and 2% growth in actual energy consumed per capita. The growth in energy consumption per capita at 2% is a relationship that held since the beginning of the nineteenth century, with the beginning of the utilization of fossil fuels, until the 1970s. The material of this chapter can go a long way toward explaining why the growth in per capita energy consumption stopped rising in the past 50 years. With inflation causing the prices of energy to rise, individuals had to economize and consume less energy, and the development of modern technologies that are highly energy intensive subsidized.



Energy consumption per capita in the US. One kilowatt, of course, equals 8,766 kilowatt-hours per year.

An industry that best illustrates this trend is aviation, which I have studied in another paper. It is a remarkable feature of the modern world that airplanes today travel at slower speeds than they did in the 1970s. Commercial flight times have not only failed to get shorter, they actually take longer than they did in the 1960s, at least in the US where I was able to obtain reliable data. Forty years after its introduction, supersonic flight is no longer available for civilians, neither in commercial nor private jets. Jet manufacturers continue to be conspicuously silent about any plans to reintroduce supersonic flight.

But perhaps most astonishing is the failure of anyone to come near challenging the world speed record for flight for four and a half decades. The world speed records for flight was constantly increasing from the Wright Brothers' maiden flight in 1903 until 28 July 1976, when a US Air Force SR-71 Blackbird registered the fastest speed for an air-breathing aircraft, at 2,193.2 mph, 3,529.6 km/h, or Mach 3.3. On that same day, another SR-71 registered the highest altitude record of 85,069 feet (25,929 m). Forty five years later, both records still stand. The SR-71 was decommissioned in 1991, and none of the replacement aircraft has come close to achieving its speed or elevation.



World flight speed record, 1903-2017. Data from 1910-2017 obtained from the Fédération Aéronautique Internationale. Data from 1906 to 1909 obtained from Taylor, John and Kenneth Munston. 1961. *Jane's Pocket Book of Record Breaking Aircraft*. Collier Books, New York, NY. Data from 1903-1905 obtained from the Wright Brothers Virtual Museum www.wright-brothers.org

III. The Fiat Liquidator

12. Why bitcoin fixes this

Part I of this book examined the operational mechanisms of fiat money, while part II focused on the broader economic, social, and political implications of the use of fiat money. This third part of the book will examine the implications of the introduction of bitcoin to the world of fiat. Whereas *The Bitcoin Standard* focused on examining bitcoin's salability across time, this chapter explains how bitcoin compares to fiat and gold in terms of its salability across space. As a present good whose value is not incumbent on credit obligations, bitcoin allows the world to escape from debt monetization and the universalization of indebtedness. And unlike fiat, bitcoin is money without the need for the commands or regulations of any central authority, allowing for a full separation of money and state. Bitcoin is further a neutral global currency that can obsolete the many geopolitical problems resulting from one country issuing a global reserve currency.

Salability across space

The Bitcoin Standard used the Mengerian framework of salability to assess the monetary properties of bitcoin.

Bitcoin, being free from having a physical form, offers us a significant leap over gold in salability across space. Consumer-facing payments based on any monetary medium can be made instant between any two accounts with liquidity on the same proprietary network. Instant payments already exist with fiat applications, and could easily be adapted for gold, silver, bitcoin, or even seashells as the underlying asset. The correct comparison of salability across space can only be in terms of the final settlement of the asset. Bitcoin is currently proven to carry out half a million final settlements transactions every day, and receives six confirmations for a transaction in roughly an hour. By comparison, final settlement in fiat between financial institutions takes days domestically, and weeks internationally. The comparison is not entirely like for like, due to the arbitrary nature of the manual fiat protocol, which effectively does not have a final settlement option, since accounts are subject to confiscation at all times, and large amounts of fiat cannot be easily converted to physical cash and withdrawn from banks. Bitcoin on the other hand offers settlement that is final, and can only be compared to the physical movement of gold.

A bitcoin transaction incurs loss across space equal to the bitcoin transaction fee, which is independent of the distance traveled and the size of the transaction. Sending 1 satoshi to your next door neighbor costs exactly as much as sending 100,000 bitcoins, worth billions of dollars, from the US to China. While transaction fees are currently under a dollar, it is probably safe to assume they will not remain this low forever. The cost of a bitcoin transaction might rise significantly, but the irrelevance of the distance between transacting parties is a feature that will remain. The digital ownership of bitcoin on-chain is completely divorced from physical location on earth. Bitcoin's salability across space does not decline with distance, nor does it decline with value of transaction. As the value of the transaction rises, the transaction fee constitutes a progressively smaller

fraction of the value of the transaction. This means bitcoin's salability across space increases the larger the value of transaction, which is another way of understanding one of the central points of *The Bitcoin Standard*: bitcoin will scale through an increase in the value of transactions conducted on its base layer, not with an increase in the number of transactions it conducts.

This can help us understand why bitcoin transactions continue to rise in value over time and will likely continue to do so. Bitcoin transaction fees can be a significant percentage of the value of a small transaction, but they are a very tiny percentage of large transactions. A bitcoin transaction fee of \$1 can be 100% of the price of your coffee, but it would be 0.0001% of a million dollar transaction. Alternatives for buying a coffee are far more likely to be preferable to bitcoin than alternatives for the final transfer of \$1m.

This also suggests bitcoin on-chain transactions will likely be used predominantly for international money transfer rather than domestic money transfer. The domestic options for money transfer will likely be cheaper than international options, given the increased cost of conducting transfers across central bank networks, and as bitcoin block space becomes scarcer, domestic transactions will be gradually priced out in favor of international transactions.

If we are to quantify a money's salability across space, as mentioned in Chapter 6, it would simply be the average transaction fee as a percentage of the transaction value over a specific distance. The comparison between the gold and bitcoin here is also not very straightforward since all bitcoin on-chain transactions have similar transaction fees, in the same rough range, while gold transactions can vary enormously in cost, from close to zero to millions of dollars in shipping, security and insurance for large intercontinental international transactions. Given the preceding analysis of bitcoin being more likely to get used in international clearance transactions, we can take a standard transaction and compare its value with gold to bitcoin. For reference, we will take the cost of sending a bitcoin transaction across the Atlantic to sending a good delivery gold bar.

In order for bitcoin to have a significant chance of unseating fiat, it needs to be significantly more resistant to capture and centralization than gold was, and that can be measured by seeing if it can offer significantly cheaper and faster cross-Atlantic clearance.

As it currently stands, it costs around \$3,000 to send a 400-oz good delivery gold bar, worth around \$750,000, across the Atlantic. A similar amount of economic value sent over the bitcoin network currently costs around \$1. But as bitcoin continues to grow, you would expect this fee to rise significantly. It has a very long way to go before it matches the price of a cross-Atlantic gold transaction. Even a 100-fold appreciation in bitcoin transaction fees would still leave the value of the bitcoin transaction at around 3% of the good delivery gold bar equivalent. The comparison becomes even more favorable for bitcoin as the economic value transacted increases, because the transaction cost rises for more physical weight of gold, but does not rise for bitcoin.

In terms of time, the gold transaction needs at least a whole day to be shipped to and from the two airports, to fly over the Atlantic, and clear customs. The bitcoin transaction's clearance will take a few hours, depending on the number of confirmations the recipient wants. But perhaps the most important aspect of salability in which bitcoin improves over gold is in the ease of verification of transactions. Running a bitcoin full node costs around \$100-\$700 as a one-time set up cost, and can verify the validity of all bitcoin payments at marginal cost per transaction very close to zero, and a very small daily running cost in terms of electricity and bandwidth. By contrast, verifying the honesty of a gold transaction is significantly more expensive. Spectrometers exist that cost several thousand dollars and can verify the content of coins and bars, but for good delivery 400oz bars, the thickness of the bar means that the only way to be 100% sure that the content is gold is to melt the bar and check for impurities. The current global system of gold trading has at its base layer the London Bullion Market Association good delivery bars which are all marked and serialized, and must remain held by participating custodians, and can only move between them. Should an owner of one of these bars choose to take physical delivery of it, the bar will no longer be

part of the LBMA's network of bars, and the owner will have a large brick that's expensive to send anywhere in the world, and also expensive to break into smaller pieces.

Looking closely at how the gold market works is another useful way to understand the rise of fiat. Even gold trading is effectively done by fiat, with all participants having to trust a central organization to assay and guarantee gold bars nobody else can verify and tamper with. With their verification costly, and their conversion into other monetary unit sizes, these LBMA good delivery bars become similar to digital tokens in an independent payment platform, not very different from bitcoin or fiat. The fact that the operation of this network depends on the authority of the LBMA makes it far more similar to fiat in its nature. The hardness of gold becomes less consequential to its operation when it increasingly resembles a fiat token on a proprietary payment network. It is precisely the absence of a cheap reliable free market option for gold clearance that made its monetary role untenable in the twentieth century.

The higher the spatial salability of a form of money, the less incentive its owners have to leave it with centralized custodians to facilitate payments, and the easier it is for those who do leave it with a centralized custodian to take full delivery of it if they ever suspect it is not safe. The higher the salability of a money across space, the more it can travel without needing third parties, the lower the cost of redeeming it out of a banking system, the harder it is for the rail operators to tamper with the supply. The more expensive the cost of redeeming and verifying the underlying tokens, the more leeway the rail operators have with compromising the hardness of the money under their command. On a gold standard, trading across significant distances ultimately reduces to trading on a centralized scorecard managed by the operators of the rails. The premium gained from having a money placed with a centralized custodial declines the more salable the money is. The ability of banks to increase their liabilities beyond their holdings of the money is compromised the easier it is for their clients to redeem their liabilities.

Imagine a money that can do an infinitely high number of on-chain transactions every day, at an infinitely low transaction fee, why would anyone ever need to centralize their holdings with a payment processor when they can just transact themselves on-chain? How could anyone engage in fractional reserve banking when a bank run is very cheap and quick? Bitcoin is not this money, and there are hard limits to its scaling with on-chain transaction, as discussed in chapter 15, as well as in *The Bitcoin Standard*. While we are likely to develop financial intermediaries in bitcoin, the superior salability across space means we can have many thousands, or maybe even millions of banks able to perform cross-border final settlement on-chain. The equivalent in a gold standard was few dozen central banks, and under fiat it is under two hundred central banks in principle, although de facto, only one of them is really able to perform and validate final settlement, and that is the US Federal Reserve.

The most important question for bitcoin's success and security remains whether this increase in spatial salability will be enough to protect it from being centralized in entities granted government monopolies and able to over-issue liabilities backed by it. There are no guarantees, but bitcoin's superior salability gives it a better chance than gold.

Separation of money and debt

Monetizing a monetary asset with low spatial salability like gold effectively means the monetization of the credit of the operator and guarantor of the payment network attached to it. The best way to understand the gold standard, and its failure, was that the basic monetary asset on which it is built is not just the physical gold, but also includes the payment infrastructure used by the banks and central banks. An economist or engineer who lives in the nineteenth century would view the gold as the monetary asset, and the payment infrastructure around it as a secondary layer independent of the gold. A good economist or engineer would view a 100% gold-backed payment system as being the desirable and rational way to organize a gold monetary system. But after everything we learned

in the twentieth century, the economist and engineer of the twenty-first century is better off understanding the payment infrastructure as part of the monetary system, and a party that has a monopoly control of the payment system will inevitably end up using this control to further its own interests, by issuing more liabilities than the gold it holds. If you expect the fallible humans of banks, governments, and central banks to act according to what is in the interest of the larger population relying on them, then you think the monetary asset is gold. But if you expect these fallible humans to act based on what their monopoly position allows them to do, you will think that the control of the payment rails itself is the monetary asset, along with the gold.

The implication of the monetization of the payment rails is that the credit of the operators of the payment rail is now as good as money. Having an ounce of gold in your bank, or having a promise from your bank to pay you the ounce of gold is no different. The bank can equally renege on both promises. This would work for as long as the bank was not subject to a bank run, but that possibility becomes more remote with the increase of the distances along which trade takes place.

This is how we can understand the monetization of government and bank credit in the twentieth century. As trade became more globalized, government strengthened their grip on the payment rails, centralizing all banking through monopolies they heavily control, and thus converted their own debt into money. The conflation of money and credit has become so entrenched that the majority of modern fiat academics are taught to insist that the two things are the same, and that money is by its nature credit. The difference should be obvious, but bears restatement: money is a present good which can be exchanged for other present goods at its face value. Credit is a promise to deliver money in the future, which can be only exchanged for a present good at a discount, and likely only among people who have some strong bonds tying them together, and the need to perform repeated interactions with one another.

Bitcoin is an amazing opportunity to end this confusion and reintroduce the distinction between debt and credit into global financial markets and the minds of economists, for two reasons. The first reason is its high

spatial salability discussed above, which makes the need to rely on any particular payment rail much lower, and reduces their ability to issue unbacked liabilities. The second reason is bitcoin's timechain structure, where one new block of transactions is added to the record of transactions every 10 minutes, making crystal clear the distinction between present and future goods, and between money and credit. Owning money in the bitcoin network is control of the private keys corresponding to a particular address at a certain block time. There can be no ambiguity about this, and no conflation between future promises of bitcoin with bitcoin. If you have the private keys, you have bitcoin. If you don't have the private keys corresponding to an address, you have a promise from someone else to deliver you bitcoin at a future date. The two cannot be equal, because the bitcoin you own is far more salable at all times.

Every 10 minutes a new block is produced that shows who can spend which coins, thus establishing clearly what are the present goods and what are the future goods. Ownership of the private key in bitcoin is 10/10th of the law. With every new block, it is clear who has the present good, and is thus able to spend the bitcoin in the next block. Unlike monopoly central bank technology built on primitive moneys with low spatial salability, the bitcoin network cannot engage in maturity-mismatching its obligations. The Bitcoin network can only give its members access to bitcoin as a present good. There is no scope for conflating a claim on future bitcoin for a present bitcoin, because the claim on a future bitcoin cannot be spent over the next block. In the fiat standard, customers had no choice but to deal with their local central bank for banking and settlement of international payments, thus central banks could maturity mismatch their obligations, and give customers fiduciary media instead of money. The monopoly command over international transfer of wealth protects central banks' fiduciary media from facing the market test.

Bitcoin is the zero maturity asset against which all liabilities and obligations can be placed and measured. With banks no longer able to pass off their maturity-mismatched debt as money, the command over the

banking system stops being a license to print money. Banking returns to being a normal business offering services to customers, rather than a monopoly money-printing operation. Control of banking will no longer offer governments the *carte blanche* to erase all their debts and foist them on their population. By having superior spatial salability, bitcoin obviates the need for central bank monopolies, taking away the money-generating monopoly from governments. While *The Bitcoin Standard* focused on the temporal salability of bitcoin making it superior to other forms of money, I believe the success and survival of bitcoin, and its ability to resist capture and centralization, will depend on the extent of its spatial salability.

A significant portion of demand for debt creation in the fiat system comes from the large demand for holding debt assets as a store of value, in the form of bonds or other credit instruments. As fiat money itself cannot meet this demand, and as lending also creates new money, there is a very strong financial incentive to create debt. Bitcoin is the astonishingly neat technological solution to this problem, as it monetizes a hard asset, and offers everyone a chance to hold an asset as a store of value that does not have liabilities attached to it. You no longer need others to be indebted in order for you to have savings. You can hold a hard asset as your savings, and the work that went into it would already have been performed in bitcoin's proof-of-work calculations. It doesn't require future production and repayment from the borrower to have market value.

Bitcoin is a global debt jubilee of sorts, because its continued growth will likely undermine the demand for the creation of more debt, and could reverse the enormous growth in debt over the past decades of fiat.

Anti-fiat technology

By constantly devaluing the existing money supply with the creation of credit, governments are constantly robbing their citizens' future, and making it more uncertain, to finance their present-day spending. Until the currency collapses, this credit issuance effectively makes government spending limitless. Governments thus have boundless resources to

attempt to jackhammer reality into the shape they would like to see by fiat. The results of this were outlined in detail in the second section of this book, Fiat Life.

By demonetizing government credit, bitcoin defangs government fiat, and reinstates reason to a world wrecked with the insanity of attempting to impose reality by fiat. Without government able to monetize its own credit, the vast majority of horrors described in the second section of this book would not be possible. Without the ability to hand trillions in subsidies and artificially cheap credit to manipulate markets, economic reality will return to shape humans' incentives, actions, and world.

There were no government dietary guidelines in the US, UK, and likely in most of the world before World War I. There were no government attempts to impose the choice of fuel on individuals. The US and UK had no public funding for science before World War I, the period in which these countries led the world's industrialization and technological development. The engine, telephone, car, airplane, and countless of the most important technologies of the modern world were invented in the nineteenth century by individual inventors financed by their own savings, or the savings of others, but not from government departments. There was no war on drugs in the nineteenth century and the notion of government micro-managing individuals' life and choices was quaint before fiat. It is fiat's unlimited spending power that makes all of these ideas possible, by separating the lunatics who pursue them from the costs and consequences of pursuing them.

Neutral global currency

Bitcoiners have long thought of poor countries as the poster child for the problems bitcoin solves. Many have pointed to the potential for bitcoin to bank the unbanked and allow them access to global markets, reduce transaction fees, and make remittances cheaper. Yet, twelve years after its inception, it has made very little progress on these fronts. More of the unbanked have been banked by the traditional banking system in this

period than by bitcoin. The belief in bitcoin's ability to achieve these feats comes from the common mistake of assuming that its primary use case is a cheap mass payments network, as opposed to a base settlement network inextricably linked to a native hard money. Bitcoin does not offer the poor a cheaper, more inclusive Visa or Paypal, it offers the entire world an alternative to central banks' monopoly on money. Unlike Paypal or Visa, which can run on top of any currency, Bitcoin the payment network is completely worthless without people demanding to hold its native token, and the network's utility rises in direct proportion to the value of cash balances held in its native token. This constitutes the pool of liquidity available to potential traders, and the larger the cash balances, the more frequently opportunities will naturally emerge for trade with bitcoin as the medium of exchange. For individuals holding their government's money and looking to trade with one another, bitcoin is highly inconvenient as it would involve the conversion into and out of government money, with significant transaction costs.

Does this mean that Bitcoin offers no benefit to the world's poor? On the contrary, if Bitcoin succeeds as a base global settlement network, the benefits would be of far greater significance than a cheaper payment network. The importance of bitcoin for the world's poor lies in its ability to obsolete the horrific political and economic arrangements discussed in chapter 7.

There is nothing secret, complicated, or elusive about economic growth. It is a very simple process that happens when people accumulate capital, trade, and adopt new innovations. These are the three drivers of economic growth in any time and place, and today's poor countries are no different. They have had little capital accumulation in the past, little to no integration into sophisticated global markets, and cannot innovate or adopt the innovations of others.

The correct question, then, is not 'How can poor countries grow?', but rather, 'What is stopping these countries from accumulating capital, integrating into world markets, and utilizing advanced technologies?'

The answers are as obvious as they are impossible to ever find in the thousands of development agencies' unreadable reports published yearly. Capital accumulation is punished severely through inflationary government policy and control over the banking system. Government debt, prompted by the all-powerful International Financial Institutions, shackles the population with debt that lasts generations and requires endless taxes to repay, reducing their ability to accumulate savings from their income. When these debts are used to finance government central planning, the majority of the population's productive capital is put in the hands of central planners. Meanwhile, government control of the balance of payment accounts scares away a lot of potential foreign investment, free trade, and technological imports. On a national level, the division of labor and the natural workings of a market economy are sabotaged through the central planning that IFI's impose on developing countries, which destroys the price mechanism and leads to misallocated resources. On a global level, free trade is hampered by Mercantilist bureaucratic parasites who don't see how critical it is for people's lives, and only deem it a threat to the international cash balance that allows them to continue extracting seigniorage. To cap it all off, IFI's and puppet-master foreign governments impose trade restrictions and prevent technological transfer under the name of "free trade agreements" and patent protection.

The three International Financial Institutions are inherently set up to destroy the only three mechanisms for economic growth and prosperity. The World Bank's central planning destroys the division of labor, the IMF's monetary stipulations destroy the chance of having sound and hard money and thus accumulated capital, and the WTO prevents technological advancement of poor countries through patents.

Bitcoin's promise is to undo the twentieth century's uninvention of a global money. Bitcoin could then save the world's poor from those who have been relentlessly and catastrophically "saving them" for decades. There was no World Bank, IMF, United Nations, or World Trade Organization under the gold standard, and that is likely to be the case in a bitcoin standard.

Without governments' national currencies, protectionist policies, and capital controls, the movement of talent, technology, and capital around the world would be far more free. Had the IMF never existed as an enabler of the worst inflationist impulses of the world's governments, one can only imagine what sort of prosperous world we would live in today.

Important to keep this in mind in light of last month's bulletin and possible bitcoin failure scenarios. This is what Bitcoin is up against, and as long as this system continues to be as dysfunctional as it is, demand for bitcoin around the world will continue to rise.

Will there be corrupt governments under hard money? Of course, but they will face the consequences of their corruption far faster, as they run out of money and can no longer afford to pay the henchmen that prop them up. This global system will not be ended by the people who benefit from it, and they will not want to reform it. They are a bureaucracy whose *raison d'etre* is perpetuating its *raison d'etre*.

Poverty cannot be ended in absolute terms any more than ill-health can be ended, because it is a consequence of individual actions (both chosen and sometimes unchosen) that cannot be stopped. Humans who choose to spend more than they regularly earn will eventually be left destitute, just like how those who consume junk food will be left unhealthy. Bitcoin cannot end poverty, of course, and it cannot save those who cannot save themselves. But what it does offer is far more valuable than anything fiat can buy: economic freedom. A world financial system built around bitcoin would replace International Financial Institutions with the normal workings of the free market. There can be no global lender of last resort in that world, and there can be no global bureaucracy to centrally-plan the world's economies' trade and capital movement.

13. Bitcoin scaling

This chapter examines the magnitude of the scaling problem, and the challenges Bitcoin will face on its way to a much larger volume of transactions. Due to its nature as a hard money, I argue it is not realistic to expect it to remain a niche network limited in its adoption by on-chain scaling capacity. Demand for hard money is self-reinforcing and will likely make Bitcoin grow far beyond its on-chain scaling capacity, necessitating off-chain scaling solutions. We examine the trade-offs and risks involved in these solutions, and then discuss what can be learned from the growth of the gold standard, and whether Bitcoin can avoid the fate of gold.

The magnitude of the problem

According to The World Payment Report 2020 from Capgemini and BNP Paribas, 708.5 billion non-cash transactions took place around the world in 2019 (about 1.94 billion transactions per day). The report further expects this trend to continue until there are 1.1 trillion annual non-cash transactions by 2023, which is around 3 billion transactions per day. For comparison, the highest daily transaction volume that the Bitcoin network has ever achieved is 490,459, which happened on December 14, 2017. In the three years up to May 2021, the average daily number of transactions was 297,476, with a standard deviation of 50,682. Assuming bitcoin can process half a million transactions a day, that effectively means it can

process approximately 0.025% of non-cash transactions in 2020, or 0.0167% of all non-cash transactions expected to take place in 2023. Put differently, if Bitcoin is to handle all global digital payments in 2023, it needs to increase its transaction capacity by around 6,000-fold in the next two years.

Current bitcoin transaction capacity is being achieved at a block size of around 1 megabyte. The naively obvious approach to scaling simply suggests an increase in the size of blocks until they are large enough to accommodate whatever number of transactions is needed for Bitcoin to take over the world. This was the scaling approach favored by the doomed hard fork attempts Bitcoin XT, Bitcoin Classic, Bitcoin Unlimited and Segwit2x. It was also the driver of the doomed Bcash hard fork (as well as its own even more doomed hard fork, BcashSV). The sorry history of all these poorly thought-out attempts is well worth revisiting in-depth, and Kyle Torpey has written many [articles](#) on their failures. The important conclusion from all these episodes is that increasing the block size is not a workable scaling solution because even relatively small increases wouldn't move the needle, and would come at the expense of a significant increase in the cost of running a bitcoin full node, likely reducing the number of full nodes, which is ultimately the only guarantee of Bitcoin decentralization and immutability.

Bitcoin's core value proposition is its immutability enforced by the consensus rules that full nodes run, which ensures its uncensorable nature and hard monetary policy. A block size increase approach to scaling has proved highly unpopular with bitcoiners, and anyone who attempts it will likely end up with a pointless altcoin like the many dozens of worthless bitcoin forks out there. And even if bitcoiners were to adopt much larger blocks, it wouldn't provide the orders of magnitude increase in scalability needed to for Bitcoin to handle all global transactions.

To handle all global transactions, Bitcoin would need to scale to blocks of around 5 gigabytes each, meaning every computer on the Bitcoin network

would need to download this much data roughly every ten minutes and have the hard drive to store all of these massive blocks, which would accumulate at a rate of almost 0.7 Terabyte per day, indefinitely. This is roughly equivalent to the total hard disk space on today's average commercial computer, implying that no commercial computer owners would be able to download the Bitcoin blockchain; only people who could afford highly advanced computers would be capable of running a full node. Such a form of Bitcoin would fail to have a large number of people running full nodes, and as a result it would be under serious threat of capture or centralization. When there are only a few dozen full nodes worldwide, it's relatively straightforward to compromise them directly, or to influence them to change the rules of consensus.

Fortunately, other solutions exist that can increase on-chain transaction capacity while avoiding a blocksize increase. Many of the recent improvement proposals promise more efficient transaction handling. But even with all of these improvements, there are hard limits to how many transactions Bitcoin's ledger can record. No matter what optimizations are performed, the bare minimum needed for a single payment to take place is the data needed for the transaction output, which is still 34 bytes of data per transaction. Assuming 4 Megabyte blocks, even the most theoretically efficient use of block space would translate to around 17 million daily transactions, still a far shout from what would be needed for handling all global transactions.

Since Bitcoin's decentralization is the only thing that makes it valuable, its transaction capacity cannot possibly come at the expense of a reduced number of full nodes. Does this mean that Bitcoin is doomed to never scale and remain a niche network processing a few million transactions a day? I would suggest that this is a highly unlikely fate for bitcoin, because hard money cannot stay niche.

Hard money cannot stay niche

There is a school of thought that argues Bitcoin must remain a niche and fringe payment network accessible globally, drawing inspiration from Esperanto as a niche global language. Their claim is that Bitcoin will not scale to become a global money given its capacity limitations and government opposition to it. It will only remain useful for people looking to escape capital controls or inflation, and won't ever grow to widespread adoption.

The first problem with this view is that hard money is by its very nature a viral and all-conquering technology that cannot be restricted or restrained from growing. As the first four chapters of my book explain, monetary history is but the history of harder moneys destroying the value of easier moneys and replacing them. A hard money cannot coexist peacefully with easier moneys around it. That state of affairs in itself is an unstable equilibrium that contains the dynamics to alter it. When Europeans found that west Africans were using beads as money, they took advantage of the fact that the beads are cheap to produce in Europe but expensive to produce in Africa, and brought very large quantities with them to purchase everything valuable in west Africa. There was no way for beads to remain as money in Africa, no matter what the feelings of their holders. Anybody who chose to continue using them as money completely lost their purchasing power; in effect, the beads ceased functioning as a money. The existence of a harder money and other human beings acting in their own self-interest will very severely limit your choice as to the type of money you can use. This is not just about finding someone willing to accept the money you have; more significantly, it is about the consequence to the money you hold from people able to produce it at a cost lower than its market value. As soon as a harder money is found, that money will store value and resist losing it through inflation due to the difficulty of producing it at a cost lower than its market value. That harder money will retain value better than the easy money over time, as its supply increases by relatively smaller quantities.

As the relative value of the two forms of money begins to change in opposite directions, the harder money's pool of available liquidity increases relative to the easier money's pool; in other words, the probability of wanting to trade with someone who is willing to pay with or accept hard money increases. The appreciation in the value of a money results in an increase in its salability, or the likelihood that an individual will be able to sell it when they need to dispose of it. Salability, as Carl Menger emphasized, is the key property of money. Hardness is key to salability because it constantly serves to increase the relative value of the pool of liquidity available for trade.

This process is of course accelerated when people understand it and rationally choose the hardest money. Over time, as more and more wealth goes toward the harder money, more people will want to use it, and demand for it must increase.

The other important example discussed in *The Bitcoin Standard* concerns the move from bimetallism to gold. For as long as trade in physical coins was the dominant form of trade, silver retained its monetary role due to its superior salability at small scales. But as technology advanced, new forms of money allowed payment in gold and silver without the need to physically move these metals. Paper notes backed by these metals were the most obvious such invention, and other forms of bank accounts and credit instruments also allowed for payment using gold or silver that laid dormant in vaults.

As gold started to also become liquid at small scales, even through intermediaries, there was little reason left to hold on to silver, and its use as a money began to collapse. Even though payments in gold began to increasingly be processed through banking intermediaries, the liquidity of gold continued to grow, along with its value. Even though small payments could still be made with physical silver coins without relying on banking intermediaries, the liquidity of silver continued to decline along with its

value. Once silver lost its *raison d'être* as a method of payment for small transactions, there was no reason for two forms of money to continue existing; everyone who used the less liquid money benefited from switching to the more liquid money (and the sooner they switched, the more they benefited).

The lessons from the collapse of bimetallism are applicable to bitcoin and other digital currencies. As soon as gold was usable for all scales of transactions, silver's fate was sealed. That it could still be used for small transactions was no match for the two inexorable forces against its monetary role: the faster supply increase depreciating its value relative to gold, and gold's larger liquidity pool attracting holders toward it and away from silver. Even though many governments had mandated silver as legal tender, they were helpless to stop it from losing its monetary role by the end of the nineteenth century (in yet another fatal blow to The State Theory of Money). Misguided attempts by governments to prop up the price of silver, such as the Silver Purchase Act in the United States, were futile in preserving silver's monetary role; as the value of the national currencies tied to silver plummeted, countries on a silver standard were impoverished.

By the early twentieth century the world was using gold-backed currency, and the growth of gold's liquidity pool further repelled holders away from silver. Even with silver's legally mandated monetary role, its superiority for in-person exchanges without reliance on intermediaries, a monetary role that had lasted for many millennia, and an enormous amount of liquidity held in it until the late nineteenth century, it was to be demonetized in favor of the harder and more liquid money as soon as technology allowed for it. There was simply no reason to hold a different currency less likely to retain its future value, and the market test determined that people preferred the hardness of gold even despite the reliance on an intermediary issuing banknotes (vs the physical silver coins that did not rely on this trust).

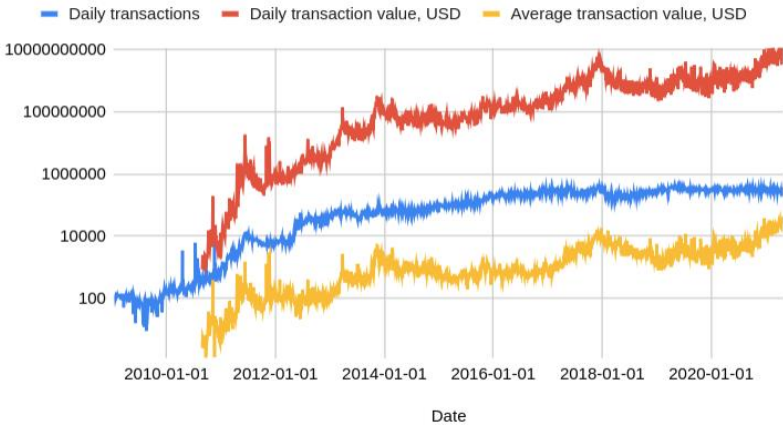
This brings us back to the initial comparison between Bitcoin and the World Payments Report statistics. The 708.6 billion transactions mentioned above were specifically called "non-cash transaction" for a reason: they involve intermediaries processing the payment. While these transactions are mostly digital today, that does not make them categorically similar to bitcoin transactions in economic terms. Even though it is digital, a bitcoin transaction is still a cash payment, because the payment is not the liability of anyone. Bitcoin is a form of cash because only the bearer is able to dispose of it, and they can do so without the need for the consent or permission of a third party intermediary. Bitcoin as digital cash is more comparable to the physical transfer of physical money, such as in-person cash payments, or movements of gold between gold clearing banks or central banks. It is not really comparable to the non-cash payments, even though the two might appear similar because they are both digital. The essential quality of bitcoin is that it is a form of payment free of counterparty risk, not that it is digital. Those who expect Bitcoin to grow by displacing intermediated non-cash payment have completely misunderstood its fundamental nature; fortunately, most of those people are no longer involved in Bitcoin, having moved on to some of its doomed forks. If Bitcoin is to continue to grow, it will grow primarily through an increase in the value of the cash payments, or final settlements, it performs, not through the increase in their numbers. Payment solutions are being built on top of bitcoin through secondary layers. The movement of bitcoin on-chain is happening for increasingly higher value transactions, and many more transactions are happening on secondary layers (with both lower security and cost).

Bitcoin block space supply

A look at the twelve years of Bitcoin's existence shows these trends unmistakably. As the chart below shows, while the number of daily transactions has grown, it is far outpaced by the increase in the value of these transactions. Comparing the most recent year of data (May 2020 to

May 2021) to the earliest year of data, we find that the yearly average value of a bitcoin transaction has increased by 150 fold. Daily transaction number has practically stalled for the last five years, mid-2016 to mid-2021, in the range of 200,000 to 400,000 transactions, while the value of transactions has increased roughly 15-fold over the same period.

Daily transactions and average transaction value



As its demand has increased, Bitcoin has not scaled through a larger number of on-chain transactions, but rather by increasing the value of these transactions. Should its demand continue to increase, I expect this trend to continue. With a fixed block size, there is a hard limit to how many transactions can be done on-chain. Even assuming non-contentious forks can increase the block size, they will not be adopted unless they come nowhere near compromising average users' ability to run their own nodes; this means that any block size increase will likely be slow and gradual. Growth in demand for holding bitcoin, on the other hand, does not have the same hard limit. Should bitcoin continue to maintain its core value proposition as a hard money whose supply is

perfectly predictable, the growth rate of demand for it will far exceed its ability to handle individual on-chain transactions.

The economics of Bitcoin's block space are a beautiful illustration of market dynamics at work. Its scarce nature necessarily means that a bidding war will ensure only those who value block space the highest will get it. Over time, this pressure has priced out many types of transactions from being registered on-chain, and now more and more are settled off-chain. As was the case with gold and silver, the inability of individuals to use the harder money directly and without intermediaries was not a dealbreaker for them to hold it over the easier money.

Today, many bitcoin-based businesses conduct a majority of their transactions in bitcoin on their own internal databases, and only use the Bitcoin blockchain for final settlement to and from the business. Gambling websites, for instance, will record all bets and winnings on their internal ledgers, and will only use the Bitcoin blockchain when a user deposits or withdraws bitcoin from the website (the same is true for exchanges, where traders speculate on bitcoin and digital currencies). For each on-chain transaction, many thousands of bitcoin-denominated transactions can occur and settle on internal and private ledgers. This is in contrast to the situation in the earlier days of Bitcoin when betting services would record thousands of transactions daily on the Bitcoin blockchain. As transaction fees on the network have risen, these models are no longer sustainable and have changed to rely on the Bitcoin blockchain for settlement only.

Should demand for bitcoin increase significantly, many more uses like this will inevitably be priced out. Because there is no hard limit on its demand, its total daily transaction value can rise to many multiples of today's daily transaction value. If it does, the pool of liquidity for transacting bitcoin will grow, allowing for more valuable purchases and sales to be conducted in bitcoin; this will inevitably price out the transactions of smaller value, as they will not be able to match the transaction fees of these larger transactions.

When considering the types of transactions that will remain on the Bitcoin ledger, it is instructive to think of the alternative avenues available for such transactions. By determining the opportunity cost of not using Bitcoin on-chain for various use cases, we can see which ones can afford to bid the highest for block space. Assuming market participants desire superior security and hard monetary policy, they would be willing to use bitcoin even if transaction fees are significantly higher than alternative payment solutions that rely on trusted third parties and inferior security.

Conversely, if users are not as concerned with superior security and a hard monetary policy for a given use case (e.g. involving smaller value transactions), the opportunity cost of not using Bitcoin is lowered. Currently, individual consumer payments are processed with fees of 0-3% over various payment processors. Given that market participants are less concerned with Bitcoin's value propositions for these use cases, it would only make sense to use bitcoin for these payments if a bitcoin transaction fee were in the cents or at most single digit dollars. Similarly for international remittances, transaction fees are usually tens of dollars, which suggests that as a potential cost ceiling for bitcoin in this use case. If the use of bitcoin for these uses takes off, transaction fees will eventually rise past the cost ceiling, and it would be no longer economical for the users to conduct these transactions on chain.

This feedback mechanism will continue to price out all manner of uses of Bitcoin's blockchain and will reserve block space only for transactions that need Bitcoin's guarantees the most. As it stands, bitcoin on-chain transactions are a tiny fraction of total bitcoin-denominated transactions, if one were to count trades on exchanges and casinos, as well as all manners of second layer transactions on companies conducting bitcoin financing. As bitcoin transaction fees increase, one of the use cases likely to be the most willing to pay will be international final settlement payments between large financial institutions. These are by their nature the most valuable and most security-sensitive transactions today, and the closest

thing to a bitcoin transaction currently, in terms of their finality. They currently require days (or even weeks) to complete. Bitcoin is barely beginning to acquire the size and liquidity to allow it to conduct such payments with confidence and security. As it grows it will likely attract more and more of these transactions, which will crowd out many other use cases and push them off-chain. For some of these crowded out use cases, second-layer solutions will inevitably emerge that retain some of Bitcoin's guarantees while relieving users of its on-chain fees.

Second layer scaling

Just as transactions with financial instruments based on gold displaced silver coins, it is my contention that second layer bitcoin transactions will in the long run displace transactions that currently take place with easier forms of money, as bitcoin liquidity grows. Bitcoin purists may complain that second layer bitcoin transactions will never have the equivalent on-chain transaction security and certainty, but that misses the point. Second layer bitcoin transactions do not compete with first layer bitcoin transactions, they compete with second layer transactions on inferior moneys.

The scaling limitations for bitcoin's on-chain volume discussed above make it clear that Bitcoin will probably not scale past a few million on-chain transactions a day, nowhere near the number needed for all individual consumer payments. Bitcoin itself on its base layer will never be able to handle all of that volume. Further, transactions need about 10 minutes to get a single confirmation on the network, which is highly unsuitable for individuals who expect their consumer payments to complete much more quickly. The level of security and certainty Bitcoin provides for a transaction after it has received a few confirmations is also wasteful overkill for small purchases. For individual small payments, Bitcoin's security is too expensive and wait times are too long. In the same way that payments with gold were standardized and more

convenient through banknotes backed by gold, second layer solutions will make bitcoin more predictable, faster, and cheaper, but in the process incur a trade-off of security, liquidity, and censorship-resistance.

While the purists will complain that these kinds of transactions will never have the same level of security as real bitcoin transactions, they cannot do anything to stop the economic reality of individuals preferring these second layer payments with hard money as the base layer to second layer payments on easy money. The limitations that exist will also be present in second layer payment solutions for other types of money. The main difference is that the payment solutions on hard money are likely to allow holders to retain value better into the future. Given the choice between payment solutions on a hard money and payment solutions on an easy money, salability across time dictates that the harder money will inevitably win.

The common mistake that many bitcoiners make when assessing second layer solutions on top of bitcoin is to compare them to bitcoin transactions, but the more accurate comparison is to consumer payment technologies on other forms of money. Conceptually, Bitcoin could scale to handle all of the world's transactions by next week if central banks replaced all their reserves with bitcoin this week. Hypothetically, if the Bitcoin blockchain were only used to settle large transactions between central banks (while they issued currencies fully backed by bitcoin), then all of the world's transactions would effectively be bitcoin second layer transactions. Your government paper money, your checking account, your credit card, and your PayPal account would all become second-layer bitcoin payment solutions in that scenario. Of course, this is not to say that I think such a scenario is likely or even in any way politically feasible; this is just a thought experiment to drive home the parallels between bitcoin and settlement layers.

As the number of bitcoin holders grows and more people demand payment solutions, there will be an incentive to provide them; the

solutions will be optimized and tailored to work best with bitcoin as it is. This will likely lead to a reinvention of most of the mechanisms we use today for payment. Secondary layer transactions do not share the same level of security as on-chain transactions, but it is not clear why that level of security is needed at all for such transactions. When a customer has an account with an exchange or online casino, they are already trusting that party on many different levels; allowing that party to record transactions on their own ledger, after they've received the deposited customer funds, adds no risk whatsoever. If they choose to exit scam, they could do so regardless of whether their internal transactions were recorded on-chain or off-chain (since funds are only truly under the control of the user after withdrawal from the third party service).

As demand for bitcoin increases, these second layer solutions for scaling will only proliferate, and different levels of risk and safety will emerge for different use cases. Opendimes are another good example. These physical usb keys are made to be tamper-proof, and the bitcoin balance inside them can be verified very quickly. For small sums and transactions between people with a sense of familiarity and trust with one another, this is a very useful mechanism that allows for in-person transactions without needing to be registered on the Bitcoin blockchain. While clearly unsafe for larger sums, it can nonetheless handle a very high number of small transactions and allow for more liquidity in bitcoin transactions.

Multisignature custody solutions will likely also play a role in allowing for cheap second layer payments. Holders could deposit their coins in multisig accounts, such that the coins can only be moved on-chain with both the private keys of the holder and the bank. That bank could then create a payment network for holders of such accounts on its own internal databases to allow individuals to transfer ownership to each other, which would only be settled with on-chain transactions at the end of the day, week, or month.

Lightning

Perhaps the most interesting and promising second layer scaling proposal is the Lightning Network, which is a new emerging ecosystem of node implementations that allows for an automated, fast, and cheap implementation of a multisig channel-based payment network. Lightning nodes open channels with one another by sending funds to a multisig address using an on-chain transaction. Each party keeps an individual balance on the multisig account, and the parties can pay each other by signing off-chain lightning transactions that reflect their updated respective balances. When either party chooses to close the channel, an on-chain transaction (reflecting the result of all the off-chain balance updates) is sent from the multisig channel address to the two parties with their respective outstanding balances.

But Lightning users do not necessarily need to build channels with everyone with whom they wish to transact, as payments can be routed through various other nodes and channels to link two parties who do not share a channel. As the number of channels and the liquidity they contain rise, the possibilities of routing payments between users increases. Individual nodes that route payments between nodes can charge routing fees to compensate them for providing the liquidity.

The strength of this approach to scaling is that the setting up and closing of a channel requires just two on-chain transactions in total, and allows both parties to conduct an effectively infinite number of off-chain transactions. Additionally, the timing of the on-chain transactions is flexible, since channels can be opened and closed when demand for on-chain transactions is low. People who establish a pattern of repeated transactions can settle transactions locally on their channel, or through other channels, without having to record every transaction on the Bitcoin blockchain. Despite these benefits, it is important to remember (as Lightning Network engineers such as Alex Bosworth emphasize) that an off-chain transaction on Lightning is not as secure as an on-chain

transaction. While most analysis I have seen suggests Lightning is highly secure, it is beyond the scope of my expertise to compare its security to on-chain transactions. I will focus instead on analysing the liquidity of the Lightning Network and how it affects its operation.

The real limitation of the Lightning Network is not in its security or number of transactions, but the depth of the liquidity pool in the network. More people on the network and more money sent to payment channels produce a higher chance that an individual can conduct a trade with someone else on the network (as well as a higher chance that the payment can clear quickly and with low fees). This pool of liquidity, however, is not something that can be solved naturally as the network grows in popularity. The provision of liquidity to the network is a highly complex web of individual economic decisions inextricably linked to people's valuation of time and the inescapable uncertainty of the future.

In page 250 of *Human Action*, Ludwig von Mises discusses how uncertainty about the future is the key driver of demand for holding money. With no uncertainty of the future, humans could know all their incomes and expenditures ahead of time and plan them optimally to avoid ever having to hold cash. But as uncertainty is an inevitable part of life, people must continue to hold money for future spending.

Committing a balance of bitcoin to a lightning channel is not the equivalent of holding a cash balance, because the money on that channel is only useful for payment for the counterparty of the channel or others who are connected to them on the Lightning Network, and because establishing channels involves non-negligible costs in fees, time, and coordination. Also, user's channel funds are only liquid to the extent the counterparties in their channel have liquidity. Since liquidity in a channel can generate a return in terms of routing fees, it is more accurate to understand channel balances as an investment to secure routing fees, as well as an option contract: having the right but not the obligation to instantaneously send value through that channel as long as it is open.

Since there is profit to be made from providing liquidity, the optimal liquidity decision for a particular node is not based on individual demand for liquid cash balances, but rather an investment decision based on expected returns from routing fees. If people managed their lightning balances solely based on their need for cash balances, there would be no reason to expect sufficient liquidity to route the payments of others. But since there is a market demand for liquidity, the amount needed to meet that demand will be provided by investment in that liquidity for a return, which implies specialization.

With digital technology, anyone can send a cheap signal to clear a payment and settle it. In reality, the difficult part of payments is the initial deferral of consumption liquidity allows in order to then provide it to those who request it. The job of banks in processing payments can be understood as the provision of liquidity, and in traditional finance they are the ones able to put up cash for payments when needed. As the Lightning Network grows, I believe it will become clear that its growth depends on professional management and provision of liquidity.

The management of the liquidity on channels to optimize for fees is more similar to a specialized commercial enterprise managing liquidity than to individuals managing their expenditure between bank accounts, credit cards, and cash. It is unlikely that an extensive network of liquidity and routing could develop purely from individuals entering into channels with one another, primarily because each individual will be bottlenecked by the liquidity held by their channel counterparties. When an individual opens more channels on the network they create more liquidity for it, but they'll also incur higher costs involved in opening and closing channels. In contrast, opening a channel with a single node specialized in providing liquidity (and with an extensive structure of channels open with many other nodes) will allow that person far more liquidity and reach.

The opportunity to profit from providing reliable liquidity and routing to users suggests that if the Lightning Network were to continue its growth, providing liquidity would likely grow into a profitable and highly sophisticated business. Economic efficiency suggests that the network would be far more robust if liquidity were to become a professional service provided by businesses to consumers. In such a scenario, one would expect a hub-and-spoke type of arrangement where a global network of nodes with large liquidity all open channels with one another, while individuals would have just a few channels open with these large liquidity nodes. A robust network of nodes each with large liquidity would allow individuals access to cheap and quick routing through deeper liquidity.

Further, if the analysis above with regard to need for custody is accurate, then it is expected that many people will prefer to avoid having to deal with channels themselves, and instead have their bitcoin held in custody by lightning node operators who can also clear payments on-chain.

Trade-offs and risks

The move toward second layer scaling is one that involves risk for users individually, as well as systemic risk for the network. The first and most obvious trade-off is in the network's censorship-resistance. Bitcoin has produced the only reliable technology for transferring value without reliance on intermediaries, and it only manages to do a few hundred thousand of these transactions per day. As demand for bitcoin transaction increases, and individuals resort to second layer solutions that rely on third parties to clear their payments, these parties will be able to censor their transactions and possibly confiscate their coins. One of the main advantages of the Bitcoin network is thus lost for individuals if they choose this type of second layer scaling.

The second risk is more systemic to the network overall, and involves alterations to the network's protocol or consensus parameters. If bitcoin transactions move to second layer solutions where many individuals are trusting third parties to validate their transactions and enforce network consensus rules, Bitcoin deviates from being a peer-to-peer system, and the risk of collusion between nodes processing transactions rises. One can think back to the Segwit2x attempted upgrade and imagine that in a world where far fewer individual users ran their own full nodes, that businesses wanting to change Bitcoin's consensus parameters might have actually gotten away with it had users been reliant on them to enforce consensus rules. If the number of nodes declines, the remaining nodes become more influential and easier to co-opt by attackers or governments. A Bitcoin network with a few hundred nodes is a far less immutable and secure network than one with tens of thousands of nodes.

The risk of losing censorship-resistance is one that each individual needs to assess in contrast to the convenience and cost of other payment and custody options. The other risk is not directly the result of second layer processing itself, but rather a reduction in node count to the extent that jeopardizes the decentralized nature of Bitcoin. However, the Schelling point of Bitcoin nodes agreeing on the main consensus parameters does not require every user to run their fully-validating node, it merely requires that enough independent full nodes exist to prevent any one particular party from altering the code in a direction it chooses.

What is essential for bitcoin to survive is that the main consensus parameters, particularly the economic parameters, remain immutable, and for that to happen, bitcoin needs a large number of independent nodes unable to coordinate. The larger the number of nodes, the less likely that subgroups will collude. It is not strictly necessary that every individual is able to verify their every transaction on-chain for bitcoin to survive. If the growth of second layer solutions results in a larger liquidity pool for bitcoin, and operating bitcoin full nodes becomes a profitable way to provide banking services, it would financially incentivize the growth of independent nodes, thus making the bitcoin protocol more ossified and

harder to change. Not only does the increase in the number of nodes make coordination more difficult, but the profit motive would likely make nodes conservative.

As Bitcoin scales, the challenge will be to introduce second layer solutions that minimize both the trust in third parties and their ability to censor transactions. Yet one must be realistic, and Bitcoin's trustless transactions are not something that can be easily scaled. As discussed above, those priced out of them have no alternatives with the same guarantees. Altcoins have nowhere near the liquidity of bitcoin in the real world, and exist mainly as trading pairs with bitcoin on exchanges. As I have traveled around the world and met many bitcoin brokers, I always ask what percentage of their business is in bitcoin; the answers I have gotten range from 90% to 99% to 99.9%. Altcoins are thus useful for speculating on exchanges, but not so much for the transfer of large sums of money across the world. Most importantly, no altcoin can possibly be viewed as decentralized. Whereas bitcoin is a neutral protocol that only has users, altcoins are subject to small, centrally controlled groups that face no significant barriers to changing consensus rules; this renders altcoins lousy substitutes for Bitcoin's use case as a long term store of value and a neutral protocol for international payment settlement. Even if an altcoin were to copy Bitcoin's code, it does not follow that it can access the same liquidity and network effects. If bitcoin continues to grow in value due to its hardness as a money, then demand for accessing it as a store of value and for using its large pool of liquidity in trade will mean that second layer solutions on top of it are also likely to be more popular than base layer payment solutions of altcoins. The lesson of the demonetization of silver is again relevant here.

As discussed previously, if demand for bitcoin transactions increases and on-chain transaction fees rise, smaller transactions will be priced out. In my essay from TBSRB3 on the Economics of Mining, I talk about how Bitcoin block space is scarce, and that price is the only way to allocate it. Any approach to scaling will never alter this fundamental reality. The block space can increase, or it can be used more efficiently, but it will always

remain scarce and will never be able to accommodate every transaction in the world. This is the reality of how Bitcoin will operate, and nobody benefits from hand-waving away these trade-offs and limitations, or pretending that they will be solved completely.

If Bitcoin continues to survive and generate increased demand, smaller transactions will find ways of settlement that are not as secure as on-chain transactions. We can imagine a world in which transaction fees continue to rise to the point that only the 1 million transactions that are most willing to pay high fees will be settled on-chain, and everything else will be transacted through less secure means.

Off-chain transactions will never be as safe as on-chain transactions. It took ten years and millions of hours of software development, Satoshi's inimitable genius, and the daily consumption of about as much electricity as Ireland to find a way of doing half a million digital cash transactions daily. We may be able to increase this number marginally over the coming years, but there are no easy ways to increase that number to a global scale, and anyone pretending there are is not being realistic.

The good news is that Bitcoin does not need to be scaled globally on-chain. Bitcoin doesn't have any competitors for trustless, automated, and censorship-resistant global clearance, and the only other asset that comes close to it is gold, whose movement is far more expensive and subject to confiscation, as discussed in TBSRB1. Bitcoin needs to be secure and decentralized enough to resist control and capture, and to establish a very clear, broad, and immutable consensus around network rules and money supply considerations. It does not need to accommodate your coffee transactions on-chain.

14. Bitcoin banking

Savings technology

Chapter 5 surveyed the historical evolution of the technologies used to fulfill the function of savings. Up until the nineteenth century would save in physical silver or gold coins. Then came the saving account, where the saver would hold government money that was backed by gold. Based on hard money, the saver could reliably expect these instruments to hold their value for the future. But as the gold-backing of the money was to be eroded over the twentieth century, the ability of bank savings accounts to keep up with inflation was gone, and in order to store value into the future, investors had to shift to buying government bonds. The demand for bonds for savings was what drove the enormous bubble in government debt worldwide, far beyond what governments' credit-worthiness would warrant, bringing yields down to savers. As inflation continued, returns on bonds could no longer keep up with it, and savers needed to take more risks with their capital in order to just preserve wealth. The stock index fund emerged as the saving vehicle of choice in the 2010s as bond yields continue to plummet and enter negative territory. After the coronavirus crisis of 2020, and the significant monetary intervention by governments and central banks worldwide, bond yields have plummeted significantly, and investors have little choice but to take on more risk simply for capital preservation.

Ideally, one wants to save their cash balances in the instrument with the highest degree of salability across time and space. Fiat man faces a

complicated problem here, as none of his potential has good salability across time and space. A dollar in a bank has great salability across space, allowing the owner to send it across the world in a few days, but it has terrible salability across time, making it unwise to hold large positions in it for the future. Fiat man thus has to actively manage his cash balance between a part he wants to use for sending across space, and a part he wants to save for the future, an expensive balancing act that impedes individuals' ability to plan for the future and reduces the utility of their cash balances in the present.

The emergence of bitcoin as a hard asset, free from debt, provides everyone in the world a compelling alternative mechanism for saving. Unlike fiat money, whose supply is constantly expanding, bitcoin has a predetermined and constantly decreasing supply growth rate. Unlike stocks and bonds, bitcoin has no yield, which is more suitable for a monetary role. If stocks and bonds appreciate because of increased demand, their dividends and yields decline, making them less attractive to hold, and creating a bubble in their valuations. Either their valuations will decline nominally, or they will decline in real terms as devaluation continues. By having no yield, bitcoin's appreciation does not make it less attractive as it grows. Bitcoin in this way is similar to gold, but it is superior to gold in that it has a much higher salability across space, making it less likely to be captured and centralized. As bitcoin is also starting off from a very small market capitalization, increased capital flows into it will cause a much higher rate of price appreciation than gold, making it a more attractive proposition as a store of value for the future.

Individuals might initially buy bitcoin for short-term price speculation, to conduct black market transactions, or as an experimental technology in payments. While some might be ruined by the volatility in the short-term, and many will quit, bitcoin's relentless upward trend will make apparent to the majority of bitcoin holders the value proposition of holding bitcoin as cash. People who allocate a small percentage of their net worth to bitcoin will likely watch it become a progressively larger fraction of their portfolio over time. Others will notice and copy them. Financial analysts will notice the spectacular rise over time and start recommending allocations into it.

This process has intensified over the last few years, with a growing number of people worldwide now saving a fraction of their paychecks in bitcoin, and a growing number of services dedicated to this.

Corporations are also likely to recognize this value proposition, and consider replacing parts of their cash balances in bitcoin rather than in national currencies. In mid-2020, we saw the first example of a company using bitcoin as a cash reserve asset, when MicroStrategy, a billion dollar publicly traded firm, announced that it purchased 21,454 bitcoin, worth \$250m at the time, to hold as a cash asset on its balance sheet. This makes it the first publicly traded company to hold bitcoin in its cash balance, and the first company to hold bitcoin as cash in spite of having no operational or business reason for holding bitcoin. This is not a bitcoin exchange or mining company whose business revolves around bitcoin and for whom holding bitcoin is necessary. This is a strategy and consulting firm whose work doesn't have to have any connection to Bitcoin. They chose to hold it purely as a monetary asset.

MicroStrategy is not buying bitcoin in order to use it as a payment network. Nor is it wasting its resources on the futile quest to use "blockchain technology" applications that do not involve bitcoin, as many corporations have done over the past few years, with exactly zero return. It is buying Bitcoin to hold it on its balance sheet because it has recognized it as a superior cash reserve asset to the US dollar.

In their announcement, MicroStrategy explain in particular why they chose Bitcoin:

"This investment reflects our belief that Bitcoin, as the world's most widely-adopted cryptocurrency, is a dependable store of value and an attractive investment asset with more long-term appreciation potential than holding cash. Since its inception over a decade ago, Bitcoin has emerged as a significant addition to the global financial system, with characteristics that are useful to both individuals and institutions. MicroStrategy has recognized Bitcoin as a legitimate investment asset that can be

superior to cash and accordingly has made Bitcoin the principal holding in its treasury reserve strategy.”

“We find the global acceptance, brand recognition, ecosystem vitality, network dominance, architectural resilience, technical utility, and community ethos of Bitcoin to be persuasive evidence of its superiority as an asset class for those seeking a long-term store of value. Bitcoin is digital gold – harder, stronger, faster, and smarter than any money that has preceded it. We expect its value to accrete with advances in technology, expanding adoption, and the network effect that has fueled the rise of so many category killers in the modern era.”

The thought process behind choosing bitcoin is explained later in the letter:

We have a large amount of USD on our balance sheet and we have carried that for a while. Over time, the yield on our dollar values has decreased and at points, we had an expectation that we would get higher real yields, and therefore, there was no real urgency to address this issue. But as of today, we're expecting negative real returns or a negative real yields on U.S. dollars, and that's an expectation that has materially changed over the course of the last three months. We expect, on a macroeconomic basis, more monetary stimulus. From the Fed, we expect more fiscal stimulus. From politicians, both in the U.S. and Europe, and perhaps, everywhere else in the world, and we expect a low-interest rate environment for quite some time. As Jerome Powell said, we're not thinking about raising interest rates and we're not even thinking about thinking about raising interest rates. And not being the case, if you're -- if you have large dollar values and you're hoping for any kind of return on them, that's faded.

Unbonding the world

Perhaps the most profound implication of the monetization of bitcoin is that it competes with fiat debt for monetization, and its continued growth would likely result in a reduction of demand for debt instruments as a method of saving. As more individuals and corporations like Microstrategy buy more bitcoin to hold as their non-cash-flow generating savings, they will demand fewer bonds and debt obligations. Should this trend continue to grow until it reaches an appreciable volume of global financial assets, bitcoin will have a profoundly transformative effect on the shape of the world's capital markets and banking sector. The enormous incentive to borrow in the fiat standard, discussed extensively in Part I of this book, is ultimately driven by the monetization of debt, which creates a huge incentive for lenders to create more loans. But as demand for holding these loans is decreased by investors choosing instead to hold bitcoin, the demand for lending would decline too.

As national currencies are expected to devalue significantly, they constitute a small part of what investors think of as their cash balances, which include gold, bonds, and debt instruments that are free from equity risk. The largest potential for bitcoin's growth comes from it displacing bonds, and the implications are staggering, in two particular arenas: government finance and the structure of the banking sector and the financial markets.

Chapters 3 and 7 outlined in some detail how the operation of the fiat standard revolves around the central bank monopoly for banking licenses and foreign transactions, placing all bank accounts and financial assets under the effective custody of the central bank, allowing it to lend to the government with the citizens' wealth as collateral. Whether through explicit default or illicit inflation, the value of the assets will decline as the bonds are issued, more money supply is created, and the government can finance itself. The devaluation of the currency itself is what creates the demand for the bonds, which in turn allows for the devaluation of the currency, in the eternal perverse cycle of fiat monetary damnation of the

last century. What happens if savers increasingly prefer to hold hard money over government debt? The impact may not necessarily be sudden, leading to a collapse of bond markets, but if combined with continued devaluation of national currencies, it could lead to the gradual decline in the economic value of the bond market in real terms even as nominal fiat numbers continue their eternal rise.

Bitcoin offers superior salability across space and time to bonds, gold, and government cash, but its main drawback remains its relatively small liquidity. At current market price of \$50,000, the total market value of all bitcoin in circulation is around \$1 Trillion, a sizable number that places bitcoin among the largest national currencies, but still a drop in the bucket of the total market value of bonds, which is around \$140 Trillion. Bond markets still offer significant depth and liquidity for the largest institutional investors. But the advantage bitcoin has as it grows is that it is a monetarily fungible good, so demand for bitcoin can be met by any bitcoin seller. In the bond market, on the other hand, while the overall market liquidity is very large, the liquidity available for individual bonds and maturities are fractions of the overall liquidity. The homogeneity of bitcoin, and its not having a yield, give it a natural advantage over bonds in playing the role of money. Gold was chosen as a money on the market precisely because it has no yield, as the monetary role of money optimizes for liquidity at the expense of risk and return, while equity optimizes for return at the expense of liquidity. In a world where there is little incentive to monetize debt, it will be fascinating to see what happens to the bond market.

Demonetizing the world

The move to fiat was a huge step backward in cash balance technology, when compared to the international gold standard, where anybody anywhere could easily save any amount of wealth in the world's hardest and most salable money across time and space. Everyone from a child to

a pensioner could hold their wealth in a medium they could hold for the future, or carry anywhere in the world, and not worry about liquidating it.

The average fiat user has suffered from a severe problem with their cash balance over the past century. They need to hold their local fiat to make day-to-day payments, but it has severe limitations on its spatial and intertemporal salability. Most fiat currencies are only usable domestically and need to be sold for foreign transactions. Many fiat users will thus need to hold another currency for conducting transfers with other countries. Given fiat's relatively high supply increase rate, most fiat users have learned (one way or another) not to count on fiat's intertemporal salability, and will thus also want to hold other assets for the long-term. By trying to optimize for salability across time and space, fiat users end up having to resort to a large basket of goods each with its own drawbacks.

The demand for saving is currently being met by a variety of sub-optimal objects: bonds, real estate, gold, art, and equities. In order to save and hold a cash balance, one needs to perform complex calculations to decide an allocation between forms of cash being held for spatial salability, like fiat currencies, and assets held for salability into the future, like bonds, stocks, real estate, gold, silver, commodities, art, and equities. Under the gold standard, all these needs were met by the same money.

None of these non-monetary alternatives can perform the role of money any more satisfactorily than a spoon can perform the role of a knife. Bonds and stocks can no longer offer yields that beat money supply inflation, and they carry heavy risks. Real estate is highly illiquid and carries very large opportunity costs. Gold and silver have low spatial salability, as there are no precious metal based banks allowed in the fiat era. They also entail heavy transaction fees with each purchase and sale. Managing a savings portfolio is an endless task of weighing a multitude of risks against potential returns for an endless variety of markets.

The absence of a workable medium of saving also results in the distortion of markets for all other alternative monetary goods. Excess demand for bonds rewards undeserving borrowers, misallocating capital, and causing

periodic default crises. Excess demand for real estate leads to the rise of real estate valuations, pricing out younger generations, and causing periodic housing market crashes. The increased demand for anything that offers scarcity causes rise in valuation for art, resulting in the incredible inflation of valuation for products hardly differentiable from children's scribbles. Commodity and equity markets are heavily distorted by the excess demand looking to avoid inflation.

From an engineering perspective, these are extremely blunt instruments to perform the task of saving value. Should bitcoin's liquidity grow significantly and with it its salability, it would likely offer an increasingly compelling and efficient alternative to these technologies. Demand for these issues would become purely industrial, rather than monetary. Housing would return to being thought of as a consumer good, rather than a capital good or investment good. House prices would reflect demand for houses only as a places to live, not as saving accounts. Equity markets would be valued based on the underlying fundamental values of the company, rather than being a gauge for monetary policy. Commodities' prices would reflect demand for the commodity itself, and equity would reflect the underlying fundamental values of the company, rather than being a gauge for monetary policy as it is now.

Bitcoin Banking

There are two core functions of banking: holding deposits and allocating investments. The need for these two specialized services is not the result of technical shortcomings of government money that bitcoin could improve upon. They are demanded in a free market for the same reason any good is demanded: consumers value it, and producers specializing in it can provide it at a lower cost and higher quality than individuals could provide it for themselves. Demand for legitimate banking services will likely continue to exist under a bitcoin standard, just as it has existed under other forms of money. Bitcoin block space does not replace the essential functions of banking. There is a lot that is wrong with crony

capitalist modern banking, but this is primarily the result of government protection of banks that allows them to profit from unproductive practices and offload the downside risk of their activities to taxpayers.

The majority of people with any appreciable liquid savings prefer to have most of their savings deposited with a specialized service that can provide better security. Individuals do not want to have physical possession of their entire life savings at all times because of the risk of loss or theft, and the stress that comes with it. Homes are not designed to optimize for securing large amounts of money, but bank vaults are. It is an inevitable part of human trade and specialization that enterprising individuals would take the initiative and build a facility optimized for securing large amounts of money and employing the kind of security that is unsuitable for a residential home. Individuals would then benefit from paying a small cost to have their money secured at that facility.

While bitcoin allows people to send money globally without censorship, it cannot possibly offer them safe and reliable self-custody, as that is inescapably a real world flesh and bone problem. The same censorship-proof nature of bitcoin that allows the sender to irreversibly move money across the world can be utilized by a thief to steal someone's bitcoin. The nodes of the Bitcoin network have no way of distinguishing between different people wielding a private key, and no notion of legitimate or illegitimate ownership of these keys. It is entirely unreasonable to expect bitcoin can eliminate the demand of humans to buy custody on the market.

It is also inaccurate to assume that the continued existence of banking will necessarily result in censorship, inflation, and fractional reserve banking. The systematic lack of economic freedom enabled through banking censorship and inflation is the result of the monopolies that governments grant to their banking systems. There is no inherent reason why banking cannot be a normal business where providers strive to please their consumers (think warehouses). Neither is there anything inherently wrong with banking that prevents it from building trusted relationships. People will every day trust strangers to deliver them safe food, water, and critical

tools like cars and airplanes. These industries will function well and consumers will be safe only when a free market exists in these goods, and when consumers have a choice in their providers; this choice forces providers to either care for their clients or suffer the penalty of lost customers and potential failure. As seen in many industries, government monopoly provision of these goods causes problems for the consumers. The problem with banking, then, is not the nature of banking itself, but the fact that it is a government monopoly. In a free market, banking would continue to exist, but would be subject to consumers' choice and their satisfaction. The freedom to choose forces providers to behave their best and swiftly punishes any deviations.

While many bitcoiners themselves have a very strong anti-bank sentiment, and a desire to hold their own money, it does not follow that newcomers entering Bitcoin will necessarily have the same desire or need to follow these ideals. In fact, to impose this model on everyone flies in the face of bitcoin's permissionless nature. Many bitcoiners may want a world in which everyone gets to be their own bank, but the vast majority of people don't want this anymore than they want to be their own butcher, builder, or baker. There is nothing old-time bitcoiners can do to stop new bitcoiners from banking with bitcoin, if that is what they choose. It is also inaccurate to assume that the benefits of bitcoin are lost to those who choose to deal with custodian services. One may lose the censorship-resistance and permissionless control of owning their own bitcoin private keys, but they nonetheless benefit from holding a hard asset that cannot be inflated away. While there is definitely demand for a permissionless way to send value worldwide, that use case is without a doubt dwarfed by the potentially universal demand for the hardest money. Not everyone has a pressing need for making payments their government does not approve, but everyone will inevitably be compelled by economic reality to converge on the hardest money in the market. As time goes by, and if current trends continue, we can expect demand for holding bitcoin as a hard money to increase even while more transactions are priced off-chain.

The second core function of banking is the allocation of capital through credit and equity investments. The demand for this function is also not

something bitcoin can possibly eliminate. The development of banking institutions is an advancement in the process of capital accumulation, allowing for a much more sophisticated division of labor and higher productivity. Because bankers specialize in the deployment of capital, they allow individuals to specialize in their respective fields and focus on being as productive as they can. The individual is freed from the labor of analyzing various investments and assessing their likely returns and risks, since the task is delegated to professionals who specialize in matching individuals' investment goals and risk tolerance with suitable investment projects. The allocation of investment is an act that cannot benefit from the automation and immutability that bitcoin provides to financial transactions. These are activities that require human judgment of factors outside of the bitcoin blockchain, in relation to subjective individual preferences and desires, and they would exist in any sufficiently advanced capitalist economy. This part of banking would arguably also exist on a bitcoin standard.

While it is not possible for bitcoin to replace banks, its monetary properties will likely lead to a banking system built around to be significantly different from one built around fiat. Here are four ways in which we can expect bitcoin's monetary properties to influence the banking system around it.

1-Robustness

A financial system built on a hard monetary asset at its base would be far more robust than one built on debt obligations at its base, and would cause far fewer financial and liquidity crises. The monetization of debt, through the treatment of future promises of payment as being monetary assets similar to cash on hand, creates an inherent fragility to the fiat monetary system. During times when financing conditions are favorable, banks are able to meet their financial obligations, as are most of their customers. But market financing conditions can turn unfavorable, for many reasons: monetary policy tightening, collapse of large borrowers or financial institutions, natural disasters, and wars are just some examples. When funding conditions become unfavorable most, or all, debt

obligations are valued at a discount by the market, which places financial institutions using them as their financial assets to have a precarious position. This creates liquidity crises which plagued the fiat standard in the twentieth century, and which mainstream economists have come to agree can only be treated through the injection of liquidity into the monetary system.

A financial system built on full cash reserves would not experience such liquidity crises, as financial institutions would keep on hand cash instruments equal to the face value of all their liabilities that are redeemable on demand. Whatever the state of the credit market, the bank would have on hand enough cash to satisfy all depositors and creditors to the full extent of their claim, as the claims are themselves denominated in that cash, and the quantities of cash are held on hand. The growing monetization of bitcoin allows more people to peacefully opt out of having to hold debt as their prime treasury reserve asset and allows them a hard cash asset whose value is not contingent on future cash flows and credit risks.

2- High cash reserves

Bitcoin's higher spatial salability makes it likely it will have a high degree of cash reserves on hand, as individuals are able to withdraw their assets far more easily than in banks and physical currencies, and can perform international settlement with it, and at a tiny fraction of the cost for physical gold. The lower the salability of a money across space, the more reliant individuals are on physical infrastructure and government oversight to conduct their trades, and the harder it is for them to withdraw from a bank and operate outside it if they don't like its business. While bitcoin cannot offer everyone the chance to make on-chain transactions every day, it can offer many millions, and maybe billions, an affordable credible threat of withdrawing their balances and taking full possession of their coins in the matter of minutes. With bitcoin's blocks acting as clear consensus checkpoints on ownership of coins, which are fully audited by all network members, there is a clear demarcation between present

bitcoins and future bitcoins, and a very easy to verify public test of liquidity and ability to fulfill financial obligations.

3- Fractional reserve banking

The processing of payments can be understood as a market good that becomes more valuable as the scale of an economy grows, and the circle in which a person trades expands, since there are clear economies of scale for banks in clearing, netting, and settling large numbers of transactions over individuals carrying these out individually. Some examples are paper notes backed by gold, bills of exchange, modern credit cards, and paypal accounts.

In any monetary system, such networks for banking and settlement will emerge, and they will benefit from economies of scale by holding many accounts for people and netting transactions, bypassing the need to physically transfer money (or in the case of Bitcoin, the need to transfer assets on-chain). Under the gold standard, the physical movement of gold was expensive and insecure, and economies of scale accrued to those that physically amassed reserves and thus could provide a centralized clearing mechanism. As a result, only a few global central banks emerged who could cost-effectively trade gold with one another. The emergence of fractional reserve banking on top of this system can then be understood as a result of banks' ability to expand credit, backed by their operational capital and aided by a trusted network of banks with which it can clear.

In a sense, fractional reserve banking could be sustainable when the alternative to dealing with banks is too expensive, and banks' reserves are high enough to make mass withdrawals unlikely. If the physical settlement is expensive and the network of banks is very valuable to its customers, banks could conceivably get away with not keeping all deposits on hand without experiencing a bank run. It is possible for fractional reserve banking to continue in a bank that is the only one in a town, or where it enjoys some monopoly privilege from government, because there are no easy alternatives for clients to process payments if

they choose to withdraw their money from the bank. This becomes particularly easy if the money is easy.

The degree to which a bank can get away with fractional reserve banking is a positive function of the cost of final settlement of the monetary asset, and the ease of debasing the monetary asset. Under a gold standard, the cost and time required to move gold around physically is relatively high, so the economies of scale from centralization will provide existing banks a degree of leeway in extending unbacked credit without their depositors noticing or being able to do anything about it. Yet this system is not very sustainable, because the longer it lasts, the safer banks feel, the more risks they take, until it comes crashing down, as was the case during the 19th century. Since it is not easy to increase the supply of gold on demand, and no lender of last resort is able to print it to bail out banks engaged in fractionally lending gold-backed notes, fractional reserve banking was the bug that kept on derailing the gold standard. Eventually the gold standard itself was sacrificed to keep fractional reserve banking alive, when a dollar-based standard was used for settlement. This makes settlement entirely centralized with a government monopoly while leaving the currency elastic to the demands of the banking sector.

Here we see an advantage that bitcoin has over gold: It can provably perform hundreds of thousands of settlements a day, each in under an hour. Compared to the physical movement of gold, the final settlement costs are much lower, which translates to less economies of scale for centralized bitcoin clearing, and thus even less incentive for a central banking ecosystem around Bitcoin to emerge. Any system for bitcoin settlement would be far more distributed at its core than gold. That means a central banking ecosystem around Bitcoin would be far more distributed at its core. The benefits from economies of scale are not as pronounced as with the case of gold. There is room for far more institutions able to perform settlement with one another.

4- Equity finance

Bitcoin-based financing will likely cause a shift toward more equity investment rather than credit instruments and interest-based lending. We can identify three drivers of this trend. First, if bitcoin continues to rise, the seigniorage benefit from monetizing debt will dissipate, as people monetize a hard asset instead. This on its own would reduce the incentive to issue debt.

Secondly, the the lack of a lender of a last resort reduces further the incentive for interest-issuing debt. With a strictly fixed and perfectly auditable supply which anyone can verify with relatively affordable hardware, there is very little scope for any entity such as a central bank to pass off its own liabilities as money, and increase the money supply. Fiat allows banks and central banks to pass off their own liabilities as money, because they ultimately have monopoly control over the infrastructure that gives the money its spatial salability. Under the gold standard, too, gold's limited spatial salability, and the difficulty and cost of physical redemption also gave banks, particularly larger ones, the ability to pass off their obligations as money, and to act as lenders of last resort. Without a lender of last resort, it becomes very difficult for a bank to offer a fixed-interest loan with a guaranteed return, as there can never be a guarantee that the bank won't face insolvency. Risk of complete ruin is ever-present in any business enterprise, and any bank that backs its demand deposits with loans issued to businesses is taking on the risk of the business's complete ruin. There can never be a mechanism for guaranteeing the return of capital if it is to be involved in a business activity. Even with insurance, there are acts of war and nature that cannot be insured against, or where the insurance companies go bankrupt themselves. Banks simply cannot make a promise to return capital to the depositor with an interest. They are undertaking risky investment and the depositors is always taking on the risk of being wiped out without a lender of last resort able to compensate them for their loss by distributing it over existing currency holders through inflation.

With bitcoin's high spatial salability and quick final settlement capabilities, the possibilities for a bank to offer fixed interest returns for on-demand deposits is even more difficult to foresee. With bitcoin able to perform so many global transactions, there is likely to be less advantage to access to the payment rails of any particular bank than there is to access to fiat monopoly payment rails. Depositors who suspect their deposits are being lent out can very quickly withdraw and leave the bank insolvent. It is doubtful that the extra returns banks are able to generate from lending demand deposits, as they do in a fractional reserve banking system, are even possible in a hard money economy where no lender of last resort exists to protect the banks and their clients from the downside risk. With the clarity brought about by the fixed supply, and the efficiency brought about by the high spatial salability, it is likely for banking to bifurcate into its two essential and clearly demarcated functions: deposit banking and investment equity banking. One could argue the gray area of investing in credit and fixed-interest rate lending is a function of the limitations of spatial salability and supply vagueness of fiat money.

With a highly salable money like bitcoin, depositors who want access to their money will only be able to get it safely by placing it as a deposit and paying a fee for its safe-keeping. Investors who would like to earn a positive nominal return on their bitcoins would need to accept the risk of default and complete ruin inherent to a money with no lender of last resort. With the downside unlimited, there is little reason to agree to an investment with a fixed upside, as is the case with fixed interest loans. Seeing as the money is all at risk, investors who accept fixed interest loans on the long-term will lose capital, as their upside is limited and their downside is unlimited, and with enough investments, the losses will accumulate. They will likely be outperformed by investors who take an equity stake, and thus match their unbounded downside with unbounded upside, collecting better returns.

Another driver of equity finance is the growing accumulation of cash balances. As cash's zero nominal returns translate to positive real returns with a hard money, cash becomes a more attractive financial instrument than debt on individual and corporate balance sheets, leading to a

growing abundance of it. The availability of cash reduces the incentive to lend, and the resulting abundance in cash reduces the return on lending. As human civilization progresses, and money improves as a technology, humans accumulate more cash balances and that leads to lower interest rates on the price of capital.

The process of human civilization, as the lowering of time preference, is driven by, and in turn drives, more savings and lower interest rates. Austrian economist Eugen Böhm-Bawerk said that cultural level of a nation is mirrored by its rate of interest, as explained by Schumpeter:

[Interest] is, so to speak, the brake, or governor, which prevents individuals from exceeding the economically admissible lengthening of the period of production, and enforces provision for present wants—which, in effect, brings their pressure to the attention of entrepreneurs. And this is why it reflects the relative intensity with which in every economy future and present interests make themselves felt and thus also a people's intelligence and moral strength—the higher these are, the lower will be the rate of interest. This is why the rate of interest mirrors the cultural level of a nation; for the higher this level, the larger will be the available stock of consumers' goods, the longer will be the period of production, the smaller will be, according to the law of roundaboutness, the surplus return which further extension of the period of production would yield, and thus the lower will be the rate of interest. And here we have Böhm-Bawerk's law of the decreasing rate of interest, his solution to this ancient problem which had tried the best minds of our science and found them wanting.

This lowering of interest rates is a process that has been taking place throughout human history, as discussed in detail in Homer and Sylla's *The History of Interest Rates*, which documents 5,000 years of data on interest rate history, in which interest rates are in a long-term declining trend, interrupted by various catastrophes. By the end of the nineteenth

century, after decades of the international gold standard and the ensuing capital accumulation, the lowest interest rates were around 2%. The move to fiat, and the ensuing world wars reversed this trend in the twentieth century, but there is no reason to assume it would not continue with a return to hard money. And as it continues, it is hard to escape the conclusion that it would head to zero. Lending would be done at a nominal rate of return of zero, but a positive real return, which is the result of both the appreciation of the monetary asset, as well as the lender saving on their storage cost and risk of loss or theft. Carrying a cash balance always involves a cost and risk, and by lending, the lender is able to offload that cost and risk to the borrower, so that even receiving a zero percent interest would be a positive improvement.

I suspect that the end result of developing hard-to-confiscate strictly scarce hard money with very high capacity for decentralized fast global settlement is that interest rates would naturally go to zero, to the point that interest-based lending would cease to exist. Given that money would be expected to constantly appreciate, a zero percent rate of interest is a positive interest rate in real terms. And given that the holding of deposits would usually incur a cost, there is an opportunity cost to holding on to money rather than lending it, which effectively increases the real rate of return of a 0% nominal loan. Combined with increased savings and lower time preference, all this is likely to lead to there being an approximately zero percent nominal rate on credit. Creditworthiness will be all that matters in these loans, and not an interest rate. But such lending is more likely to take place between family, friends, and people with some kind of relationship between them, or the likelihood of repeated interaction. For business lending, it is hard to see lenders willing to forego capital and take on venture risk merely to save on storage cost. Rather than seek a fixed yield for lending, lenders would seek an equity stake and a share of the business' returns.

For every business, the possibility exists that it goes to zero. In a fractional reserve banking system, central banks protect depositors against such an outcome, through generating new easy money. In a hard money monetary system, there is no amount of financial risk engineering

that can protect savers from loss of their capital in a venture. Banks can diversify, but can never make a guarantee for a minimum return, or maximum loss. Without the ability to protect the downside of the saver, there is no reason why the saver should not prefer to be fully exposed on the upside as well. Why settle for a fixed return on their investment if it succeeds, but unlimited downside if it fails? The more attractive model for savers will be one in which they make the real return from the businesses in which the bank invests their money, sharing in the profit and loss. The role of the bank will be in matching maturities and risk profiles between borrowers and lenders, and identifying the correct projects in which to invest.

15. Bitcoin and energy markets

Bitcoin Mining: Anti-fiat technology

As discussed in the first section of this book, the fiat standard solves the problem of spatial salability of physical money by replacing the need to move the physical money with the credit of the sovereign operating the fiat payment networks. Fiat converts all underlying monetary assets into virtual tokens arbitrarily assigned or deleted by the central fiat node, since it has a monopoly on clearance and issuance of these monetary tokens. Any transaction can be reversed, any balance can be confiscated, and large amounts of these tokens can be conjured out of thin air into any particular balance, by pure fiat. All value and truth in the banking system can ultimately be decided politically, and as time goes, this kind of assignment of value overtakes economic production as the source of wealth creation in a fiat society, degrading the institutions and economics of society. The longer fiat monetary systems operate, the more they come to resemble a loyalty rewards scheme for government. As the stakes for control of political power over the financial system rise, so do the costs people will incur in order to gain control of this political system. Domestic and international politics are more likely to degenerate into

violent conflict when the winning prize is the control of the mechanisms for capriciously creating and destroying wealth.

Bitcoin offers an entirely different technology for operating a monetary and financial system, built entirely on verification, with no functional role for fiat authority. To transfer the control of a certain number of coins from one address to another, the network requires the command of the private keys associated to the sending address, and nothing else. There is no economic, financial, political, or religious form of authority capable of transferring coins without the associated private keys, or of reversing the transfer of coins by someone who controls their private keys. This technology is what makes bitcoin a neutral apolitical technology for money and payments, the use of bitcoin is more akin to the use of a knife or wheel than a credit card, in that it is a technology that just does its job if you use it properly, and it doesn't require the supervision of authorities to work. At some point in time, telephones required a manual operator made of flesh and blood to connect your call to the party you wanted to contact. The automation of telephones reduced the cost of calling to an infinitely small fraction of its manual cost. Bitcoin is the implementation of this concept to international transfers and monetary policy.

The remarkable engineering feat of bringing automation to record-keeping, and thus completely obviating and annulling the role of any supervisory authority, is achieved thanks to the utilization of the system of proof of work. Bitcoin is a network of nodes which voluntarily choose to arrive at consensus on the record of transaction and ownership by utilizing this automated process of proof of work, without deference to any particular authority.

In the bitcoin system, every node is free to use any record of transaction or monetary policy it desires, and there is no authority that can stop it from, or punish it for, using fraudulent records. But in order for the node to be operating in consensus and synced with the network, it needs to only consider additions to the blockchain presented by miners who have solved the proof of work mathematical problems. It's trivial and very cheap for nodes to verify the validity of the transactions presented by miners,

and the validity of the proof of work solution, but it's very expensive for miners to present these transactions in a block, because it requires the solution of the proof of work problem, which requires running mining equipment and consuming electricity. As discussed in *The Bitcoin Standard*, this asymmetry between the cost of solving the proof of work problem, and verifying the solution, is at the heart of bitcoin's security model. This asymmetry makes it expensive for miners to commit fraud, and makes the problem of arriving at consensus between nodes very easy, as they only have to consider and audit a very small number of nodes.

Agreement is very easy when fraud is very expensive to present and very cheap to reject. By ensuring the cost for presenting each new block is always roughly in the range of the reward that comes from it, bitcoin nodes streamline and compress the computational and political burden of arriving at consensus, allowing them to achieve it peacefully, reliably, indisputably, and simply.

In any monetary system for payments that does not employ proof of work, there is little cost to attempting fraud, fake transactions, or inflation. The potentially enormous number of claims and disputes requiring adjudication and punishment will ultimately lead to the development of some form of authority able to decree validity and overrule the decisions of others. A monetary system without proof of work is ultimately subjective, and given humans' self-interested nature, and given the historical track record, such systems operate based on the outcomes of political and military conflict.

One can view proof of work as an efficient technological replacement for political and geostrategic conflict as a way of determining the validity of a record of transactions. When using fiat currencies and their attendant monetary infrastructure, one is reliant on the government authorities behind them remaining honest and competent. When one uses bitcoin, they are not reliant on any particular individual or authority. The bitcoin network will clear the transactions and maintain the monetary policy because it is a mechanical process which only requires that some

humans, anyone anywhere, wants to profit from the users and receive the block reward.

Bitcoin effectively puts the truth of the ledger up for sale to the highest bidder, but attaches a very high cost to the bid, and provides the other members with a very cheap mechanism to detect fraud. The result is that the only bidders are honest, and many thousands of network members arrive at peaceful non-controversial consensus every ten minutes. The key to making this system work is that the bidder has to expend resources to make their claim; the bitcoin network nodes do not consider blocks presented without the solution to the proof of work problem, and that has proven an effective mechanism for guaranteeing that bids are only made by people who have carried out activities with demonstrable "unforgeable costliness".

The fiat system's payment rails do not require proof of work to function, but the fiat system effectively still does. While very little cost or energy is needed to update fiat ledgers, a lot of energy is spent to acquire the ability to control that ledger, in the form of political conflict and war. Fiat is a technology that allows anyone to expropriate all other users, and people will not gracefully accept this being in the hand of others; they will fight for it, and expend a lot of costs to secure it. The costs in fiat are in the form of war, and ultimately come back to raw power: the ability to direct overwhelmingly large amounts of energy in short bursts at enemies to force them to accept your will. Military conflict is ultimately a contest of power in its most primitive sense, as the winner is the one able to move more equipment and channel more power into the destruction of its enemy. It was the first world war that birthed fiat money in England, and it was the second world war which placed the US at the pinnacle of world power, giving it the ability to architect the post war fiat system, and export its inflation to the world. US monetary supremacy is to this day propped up by military power, through a network of military bases spread across the entire planet, and a large fleet of aircraft carriers, ready to deploy overwhelming military might and explosive power across the planet at very short notice. It is ultimately this power that allows the flow of the dollar worldwide, keeping it as the underlying base layer of the global

monetary system. The power expenditure needed to maintain the US military's imperialism abroad, and the constant churn of wars the US carries out across the globe, represent the work and energy expenditure required to keep the dollar, and its supervisory authorities, in charge of a global financial system that facilitates the movement of capital worldwide.

The point from this analysis is not to rail against US foreign policy, much as that would be deserved, but to illustrate that in a world in which billions of people are spread out over 200 countries across the globe, there are no easy ways for allowing them to all trade with one another using one monetary system if they do not all submit to the same authority. If the US had spent the entire twentieth century following an isolationist foreign policy, another government would likely have taken over the role of the world's central banker. A world of fiat money requires a central global authority to impose rules on all transacting parties, and the reward for being that authority is enormously attractive. With fiat as the pinnacle of monetary technology, the alternatives to US global imperialism are likely to be imperialism by another country, or perpetual conflict combined with the Balkanization of monetary systems, and consequently, of trade areas, reducing the extent of trade and division of labor worldwide, with devastating humanitarian and economic consequences. Fiat's proof of work mechanism is simply too costly and inefficient.

Bitcoin is an ingeniously efficient technological workaround for the political conflict that is the hallmark of fiat. Instead of having the work done in battlefields, it concentrates it into highly efficient machines. Anyone can choose to be in charge of updating the global ledger of transactions; they just need to pay the going market rate for the honor. This is similar to the reality of the fiat system, where anybody can control the local payment system and the distribution of local fiat tokens if they are able to take over their local government and central bank; and anyone can take over the global monetary system if they are to defeat the US in military conflict. Technological progress and global trade allowed fiat money to effectively destroy the honest model of money offered by gold, and replace it with a model where might makes right. Bitcoin formalizes the reality that power controls the ledger, but brings the power expenditure forward, and allows

network members to verify the accuracy of these transactions. By using the network, bitcoin members implicitly accept this security model and trade: there is no authority to decide what is correct and fraudulent, and anyone can present any record of transactions they want, but they can only do so after expending costs roughly equivalent to the amount they stands to gain from the block of transactions they present. It is a sober recognition of the reality of power, and an ingenious engineering solutions to tame it with voluntary verification in the service of truth and peace.

Difficulty Adjustment: The Secret Sauce

In order for bitcoin to operate, its security model requires that miners expend resources before they are able to provide blocks to be added to the consensus chain of transactions. For this to work, the value of the proof of work needs to be high enough that it discourages spam attacks, but also not too high so as to discourage even honest miners from mining. Bitcoin ensures this is the case by deploying an algorithm for adjusting the difficulty of mining, or the expected time to solve a proof of work problem.

The way that bitcoin miners solve proof of work problems is by repeatedly guessing the answer and checking it. The guessing of the number is a probabilistic process, and the more processing power is dedicated to the guessing, the more guesses are made per unit of time, and the faster the correct answer will be arrived at. The bitcoin mining difficulty is a measure of the difficulty of guessing the correct answer. It is adjusted every two weeks as a way to calibrate the time it takes the current computing power on the network to arrive at the correct solution to 10 minutes.

At its inception, the bitcoin difficulty was set to 1, meaning that the computers on the network would be expected to solve the proof of work problems in 10 minutes on average. As the computers on the network increase, the time it takes them to arrive at the solution will decline, and blocks will start arriving faster. If the processing power on the network were to decline, the time it takes to clear blocks would be longer than ten

minutes. With every 2016 blocks, or two weeks approximately, the time of block clearing is compared to the 10 minute optimum, and the difficulty is adjusted to attempt to calibrate the time to 10 minutes with the average processing power that was present over the previous two weeks. It's important to remember this is not a precise process, but a calibration that takes place over two weeks. Block times are rarely at exactly 10 minutes, but the average blocktime stays close enough to 10 minutes in the long run.

Most elements of bitcoin's architecture are not original to bitcoin, and had existed before it. Public key cryptography, peer-to-peer networks, proof-of-work, hashing, and Merkle trees had all been invented many years before bitcoin. The genius of bitcoin was in combining them all together, and the magic ingredient that made this recipe possible is the mining difficulty adjustment algorithm.

The mining difficulty adjustment is the link between the bitcoin network and the world's economy, and what allows bitcoin to operate at whatever scale it is demanded without needing to alter its structure. Adjusting the difficulty to calibrate around 10 minute block times means that the network will continue to maintain its monetary policy with coin production not deviating from its set schedule, and that the security model discussed above remains intact: the cost of presenting a block for the network is always close to the cost of the reward for doing so.

As the value of the network grows, the difficulty adjustment raises the cost of committing the transactions to the network, making it more expensive to attack the network with fraud, inflation, or disputes. The difficulty adjustment ensures the security of the network by ensuring the cost of mining a new block is roughly equal to the mining block reward. As the price of bitcoin rises, the amount of resources dedicated to mining bitcoin rises, and the value of an attack on the bitcoin network, in the form of inflation or fraud, also rises. The difficulty adjusting upward ensures that the cost of submitting a block for the network nodes rises commensurately as well.

The difficulty adjustment simply takes everything in the economic reality of the world and how it deals with bitcoin and turns it into one metric: the block time. It adjusts the difficulty to calibrate the blocktime around the desired 10 minutes, so the protocol continues to function as expected, irrespective of demand. It is this property which makes bitcoin the only liquid commodity with a strictly limited supply, and the only one whose supply cannot respond to increased demand. Regardless of how many more computers join the network to mine bitcoin, there is no increase in the supply of bitcoin, only an increase in the difficulty of mining it. This automatic adjustment is how bitcoin is uniquely different from all other monetary assets. If demand for any metal increases, the production of that metal will accelerate, and thus its supply will grow at a quicker rate than previously. For every other market commodity or monetary asset, the increase in demand will generate more supply, but for bitcoin, the increase in demand only results in increasing the security of the network.

Bitcoin mining is like a sports competition: there is only one trophy to be handed out, and even if more people compete, more trophies aren't made; winning the trophy just becomes harder. This effectively ensures that the cost invested in producing a bitcoin is roughly equal to the value of a bitcoin, which is what ensures bitcoin is hard money. If a miner could produce bitcoin cheaply, it would be so profitable that other miners would join, and the difficulty would rise, increasing the cost of production until the profit is eliminated, or preserved for only the miners with the lowest electricity cost.

I view the difficulty adjustment as the crucial ingredient missing from previous digital currency attempts that allowed bitcoin to succeed. It ensures that the cost of producing a bitcoin always trends close to its price, thus ensuring that bitcoin remains hard money, where nobody is able to produce money at a cost significantly and persistently different from the market price. The difficulty adjustment is also what makes bitcoin escape the easy money trap discussed in *The Bitcoin Standard*, and allows it to have the positive feedback loop of economic incentives which I believe is the only way to understand its quick rise in value.

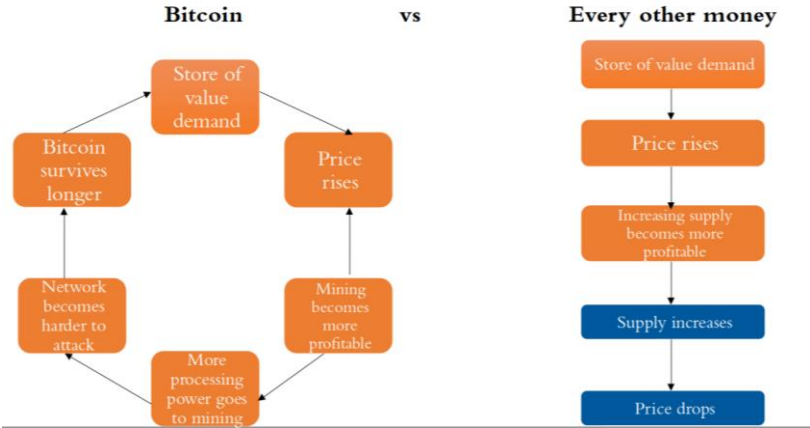


Figure 1: Bitcoin's monetary uniqueness

As the bitcoin price has risen over time, bitcoin production has proceeded according to the original schedule, while the amount of processing power dedicated to the network, in terms of hashrate, has continued to rise inexorably. As the security has risen, so has the value stored on the network.

- Daily chart, 2009-2021
- bitcoin supply
- bitcoin price
- bitcoin hashrate
- bitcoin value secured = supply x price

Bitcoin Fuel

One of the most common misconceptions about energy is that it is scarce or limited. In the popular imagination, the earth has a limited supply of energy that humans consume whenever they heat or move anything. This scarcity perspective views energy consumption as a bad thing because anything that consumes energy depletes our planet's finite supplies of energy. Mainstream media and academia act as if energy is a zero sum game, whereby any individual consuming energy in the world is taking it away from others. Reality is very different. The scarcity of energy lies not in its absolute quantities, but in having it delivered, at high power, at the time and place where it is desired.

The total amount of energy resources available for humans to exploit is practically infinite, and beyond our ability to even quantify, let alone consume. The solar energy that hits the earth every day is hundreds of times larger than global energy consumption. The rivers of the world that run every hour of every day also contain more energy than global energy consumption, as do the winds that blow, and the hydrocarbon fuels that lie under the earth, not to mention the many nuclear fuels we have barely begun to utilize.

To begin with the most obvious of energy sources, the sun alone showers the earth with 3,850,000 exajoules of energy every year, that is more than 7,000 times the amount of energy humans consume every year. In fact, the amount of solar energy that falls on earth in one *hour* is more energy than the entire human race consumes in one year. The amount of wind energy alone blowing around the world is around four times the total energy consumed worldwide. Some estimates put the potential hydroelectric yearly power capacity at around 52 PWh, or a third of all the energy consumed in the world. The earth's reserves of hydrocarbons continue increasing every year with increasing human consumption, because as consumption increases, so does oil prospecting and excavation, discovering more and more reserves, as discussed in detail in my economics textbook, *Principles of Economics*.

There is no energy scarcity problem, because energy cannot run out as long as the sun rises, the rivers run, and the wind blows, and because the hydrocarbon and nuclear fuels under the earth are far larger than our ability to even measure. Energy is constantly available for us as humans to utilize as we like. The only limit on how much energy is available to us is how much time humans dedicate toward channeling these energy sources from places where they're abundant to places where they're needed. All energy is ultimately free, but the costs lie in paying the supply chain of individuals and firms to transport this energy to where it's needed

and in a usable form, at specific quantities over specific periods of time. It thus makes no sense to discuss energy itself as a scarce resource, which implies a fixed, god-given quantity for humans to consume passively. In its usable form, energy is a product that humans create by channeling the forces of nature to where they are needed. Like with every economic good other than bitcoin, there is no natural limit to the production of this good; the only limit lies in how much time humans dedicate to producing that good, which in turn is determined through the price mechanism sending signals to producers. When people want more energy they're willing to pay more for it, which incentivizes more of its production at the expense of producing other things. The more people desire it, the more of it can be produced. The scarcity of energy, like all types of pre-bitcoin scarcity, is relative scarcity, whose cause lies in the opportunity cost of securing resources.

The real scarcity of energy lies not in its absolute availability, but in its availability in the right times and places (e.g. high energy over short periods of time) when and where it is needed. Hydrocarbons have value because they're chemically stable, light, and easy to transport forms of energy, which lend themselves to usability for purposes that demand high power at any time and location in the world. Concentrated populations anywhere in the world can regularly access energy through the importation of relatively small volumes of hydrocarbons.

Bitcoin as a technology is entirely unique in its ability to purchase electric power anywhere it is produced in the world. Unlike all other uses of electricity, bitcoin does not require power to be transported to it; it can buy the power anywhere it is available. Bitcoin is an insatiable buyer of cheap reliable electricity.

1- Waste energy

When combining an understanding of the bitcoin difficulty adjustment with the realization that bitcoin can purchase electricity anywhere, one can conclude that bitcoin will obviously subsist on the cheap and wasted electricity which has a very low opportunity cost. Mining is consistently profitable only for the miners who mine using electricity secured at rates significantly cheaper than the majority of world electricity prices. The global average price of electricity is [estimated around 14 cent per kWh](#). At any particular price of bitcoin, there are billions worldwide who have access to electricity which they could use to mine bitcoin at a price of 14 c/kWh or less. As more of these people attempt to mine bitcoin, the difficulty for mining rises, thus reducing the expected return to bitcoin miners, eroding the profitability of miners mining at higher prices of electricity and they start mining at a loss. As losses accumulate, these

miners eventually go out of business, leaving behind only those with significantly lower cost of electricity. From my years of studying and investing in the mining industry, it is my estimation that reliably profitable mining operations are those able to secure reliable electricity at rates lower than 5 c/kWh. At higher electricity rates, miners can be profitable during periods where the bitcoin price rises quickly, but they will lose profitability when the price goes down. It is the nature of bitcoin's difficulty adjustment to create ruthless competition between miners, and from this competition, only those able to secure electricity at extremely cheap prices will thrive.

Wherever energy is in high demand by residential, commercial, or industrial facilities, using that energy to produce bitcoin will carry a significant opportunity cost, as there are people who would pay dearly for using that energy. Energy sources that are isolated, however, can be used for bitcoin mining but cannot be used for residential, commercial, or industrial uses, and so carry a very low, zero, or even negative opportunity cost. Difficulty adjustment will ensure that bitcoin is only mined with the electricity sources with the lowest opportunity cost.

Given the high costs of transporting and storing energy, energy production leads to very large quantities of energy getting lost in the attempt to move from demand to supply. In 2019, the world produced around 173,000 TWh in 2019. Around a third of that energy is wasted, leaving humanity to consume around 117,000 TWh. The entirety of the bitcoin network currently consumes around 120TWh, or 0.1% of the total energy wasted in the world.

Bitcoin could grow 1,000 fold and still not consume more energy than humanity has wasted. Bitcoin will continue to grow by consuming this energy, primarily, because this energy has a zero opportunity cost, and no other potential buyer but bitcoin. All other electricity which has demand will find a higher bidder than the bitcoin network, because the bitcoin network can buy the cheap electricity at prices unavailable to those who need valuable electricity near large demand.

2- Reliable energy

The other main cost to mining bitcoin is the mining equipment, which has now grown into a highly specialized and competitive industry. These machines' costs are also bid up as bitcoin's price rises, and the miners who will be able to afford paying their prices are the ones who will operate them the most profitably. To operate them most profitably to their capacity, the miner must have them connected at all times to reliable and stable power. Any period of time in which the miner is not connected to

electricity it is depreciating in value without producing the expected return, putting its owner at a disadvantage to miners able to utilize their equipment 24 hours a day, 365 days a year. More than just cheap electricity, miners also need reliable and stable electricity available at all hours of the day in order to be profitable.

Bitcoin requires ever-growing expenditure of power in order to arrive at consensus without having to trust in a single authority. And to secure that power, it initiates relentless competition between potential miners to find the cheapest sources of energy worldwide, and to deploy their equipment most efficiently. Bitcoin will buy cheap energy wherever it is located, and however it is produced, and to do so, it requires no expensive pipelines, trucks, tankers, or trains--just an internet connection at the energy source's electric output. Bitcoin is an entirely new technology for buying electricity digitally, with a profound transformative impact on how electricity can be produced and sold. Bitcoin is a technological solution that makes energy production far more fungible and liquid. Bitcoin mining is unique in being an energy-extensive and highly profitable use of energy that can operate from anywhere, and can sell its energy output digitally. The implications for energy production are enormous.

3- More energy

The essential property of capital goods is that they increase the marginal productivity of the producers who uses them. The fisherman who catches fish with a modern trawler has a much higher hourly productivity than the fisherman using a little boat and net, whose productivity is in turn higher than that of the fisherman on the coast holding a fishing rod, whose productivity is higher than anyone trying to catch fish with their own hands. As the stock of capital increases, the marginal productivity of the worker increases, and that is why countries that have higher capital stocks have higher income than poorer countries¹. The march of human progress and civilization is the march of capital being accumulated to produce more output per unit of effort expended by a human being, and the more capital is accumulated, the more productive humans are, and the lower the marginal cost of the good produced.

As mentioned above, energy on this globe is not a fixed stock which we slowly deplete, but rather an ever-renewing flow from which we only need to utilize a tiny fraction to thrive. As such, more capital investment in energy production will only lead to more capital dedicated to the utilization of these vast resources of energy, more energy production, and lower energy cost.

Applying this analysis to the question of bitcoin power consumption has startling implications. Bitcoin isn't "consuming" the world's energy, bitcoin is providing a powerful market incentive to energy producers worldwide to increase their energy production. By giving a large financial incentive to anyone able to mine at an electricity cost below that of the market, Bitcoin makes the development of cheap reliable sources of electricity, anywhere in the world, very rewarding. This financial reward in turn leads to growing investment in capital infrastructure for cheap energy sources, which leads to increased energy production, and decreased cost. This is particularly interesting in light of the discussion of chapter 11, where we saw how the development of low cost and reliable sources of energy is being hampered by fiat policies seeking to mandate and promote unreliable and intermittent energy sources. Bitcoin's growth is the antidote to the damage caused by the growth of these fiat fuels, as it continues to offer a large bounty to anyone who can produce cheap and reliable electricity, independent of government control and centralized grids and infrastructure.

The growth of bitcoin is the monetization of a digital commodity produced from electricity, and growth in demand for bitcoin will result in growth in demand for electricity. The full extent of the powerful upgrade that bitcoin represents becomes apparent when one realizes bitcoin's monetization will drive the production of electric power, one of the most important economic goods humans ever invented, while replacing the fiat monetary system which monetizes debt and government fiat, driving the growth of indebtedness and government power. Rather than direct the benefits of seigniorage to governments, bureaucracies, lenders and borrowers, and belligerent militaries bitcoin directs it to the production of the miraculous commodity that has allowed man to prosper and conquer darkness, cold, disease, and the violence of nature.

4- Hydroelectric development

The sources of waste electricity that can go to bitcoin are numerous, and many more will be discovered as entrepreneurs sense the opportunity. Given the nature of the electricity demand of bitcoin, it is possible to identify a few likely trends in the source of fuels likely to power bitcoin mining. Solar and wind energy are unlikely to ever play a major role in bitcoin mining, as they are intermittent sources of energy, unable to produce a reliable stream of energy around the clock. Miners who mine with this equipment will have no option but to leave some of their miners idle for some part of the day, which entails significant loss. Oil, coal, and gas powerplants are also unlikely to be major sources of bitcoin energy, because of the high opportunity cost associated with power generation, and the significant running cost of fuel supply. Hydrocarbon power plants

are built in areas of high demand for reliable power, and that means electricity prices usually significantly higher than the 5c/kWh which bitcoin miners need. These plants could mine bitcoin with regular spare capacity if they have that. Bitcoin could help finance the building of large power plants accounting for future growth by allowing the operators to defer some costs by mining with spare capacity. And bitcoin can also help finance the building of some margin of spare capacity which would be needed for emergencies or failure of other power sources. As the world's grids are becoming more fragile thanks to the mandating of unreliable fuels, power generators could use bitcoin mining to finance building spare capacity to bring online at the times when wind and solar inevitably fail.

Hydrocarbons are much cheaper to transport than hydroelectric energy. They are thus in high demand everywhere humans settle. They can be used for cars, homes, cities or all kinds of other uses. They will always have a high opportunity cost, relatively, because there is always someone who could use them for something highly productive. Hydroelectric energy, on the other hand, usually has a very low opportunity cost, or even a negative opportunity cost, when one considers the dangers posed by flooding. Unlike hydrocarbons, hydroelectric energy is frequently located far away from areas of high demand, and requires little running cost, as there is no fuel needed to operate it. Unlike solar and wind, hydroelectric power has the advantage of being reliable and predictable around the clock. The average cost of electricity from hydroelectric plants is usually in the range of 3-5 cents per kWh, which is ideal for bitcoin miners. Operating hydroelectric power facilities away from population centers appears to be the most successful long-term strategy for mining bitcoin profitably.

Nuclear power is also likely to benefit, since it is usually very cheap, and since many nuclear plants have the ability to produce a lot of power that may exceed local demands. Another very important potential source of mining is the flaring of methane gas from oil fields. The production of oil leads to the inevitable production of large amounts of methane gas which are too cheap to transport from most oil fields. Oil fields usually flare this energy, but bitcoin is able to buy it on site by installing a generator and miners. Waste incineration plants are another potential source, as these are usually situated far from population centers and their energy output is much cheaper.

Understanding how difficulty adjustment allows only the cheapest energy sources to succeed at bitcoin mining explains why mining will inevitably be overwhelmingly sourced from waste, stranded, and otherwise unusable energy sources. The total amount of methane that is flared and burned away every year contains 1,500 TWh of energy, which is around 10 times larger than the consumption of the bitcoin network. Hydroelectric energy alone produced 4,306 TWh in 2019, or more than 30 times what

bitcoin consumes. With bitcoin allowing for the building of hydropower plants in areas unconnected to major grids and population centers, the generation capacity of hydropower can increase much further. With spare nuclear capacity, as well as back-up and spare capacity in hydrocarbon-powered plants, there is an enormous room for bitcoin to grow purely on spare capacity, wasted, and stranded energy sources, at very low costs.

16. Bitcoin cost benefit analysis

The first section of this chapter explains the nature of the trade-off between fiat and bitcoin. Fiat only scales by having an authority able to decree the reality of the ledger, and that ultimately leads to conflict over the authority which is very destructive and expensive in terms of the power and human life it consumes. And an even higher cost of this system is the growing omnipotence of the fiat authority, which can dictate economic reality outside the fiat ledger through its control of the ledger. Bitcoin frontloads the application of power, subjects it to voluntary verification, and ensures that a global monetary ledger can be operated peacefully without needing to trust any authority, and more importantly, without empowering any authority with monetary omnipotence. This is a stark difference in design between the two monetary systems. As always in matters of human action, the theoretical debate and discussion of such issues cannot substitute for, or overrule, the outcomes emerging out of human action. Engineers, economists, and others may have strong opinions about what is a useful and wasteful use of electricity, but the only actual answer that matters are the ones humans offer with their actions, in the goods they consume and produce in response to the market reality offered by these technologies.

Should people find no value in this network, they would not be paying for its continued operation. The appropriate professional response of an economist in this case is to analyze where the value lies for the users, and not, as is the case with the majority of the world's fiat economists, to declare that the network is worthless because they can't see the

usefulness. Rather than take the well-worn path of dismissing the network's value based on theories of fiat textbooks, this chapter attempts to explain why people are able to find value in bitcoin by examining the costs and benefits associated with upgrading from fiat to bitcoin.

Bitcoin Costs

1- Electricity cost

The amount of energy that Bitcoin consumes can theoretically be estimated from its hashrate, or direct output of the energy consumption of the machines that secure the network. The machines that mine bitcoin have known specifications in terms of how much electricity they consume, and how many hashes they can produce. The bitcoin hashrate can be estimated from the difficulty and the block time. The hashrate and some reasonable assumptions of the composition of bitcoin mining equipment can give us a good idea of how much electricity is used by the bitcoin network at any point in time. Current best estimates put bitcoin's energy consumption somewhere in the range of 100-150 TWh/year. This is an enormous amount of energy, and the fact that it is deployed voluntarily is a testament to the amount of value people place on the network and its assets.

As discussed in the previous chapter, the vast majority of this energy is energy that would otherwise have been wasted. It is almost always electricity that's very cheap by international standards, probably in the range of 2-5c/kWh. At that cost, and at its current hashrate, bitcoin is likely consuming \$2-\$6/year worth of electricity, most of which would not have been usable for any other uses. By being able to buy electricity anywhere, and by allowing only the most profitable miners to survive, bitcoin only buys the cheapest electricity and does not compete for the expensive sources near population centers.

2- Overall security cost

As mining is a very competitive industry, the costs incurred by miners on hardware and electricity to secure bitcoin will be roughly in the range of the rewards they are able to collect from the network. The cost of securing bitcoin can be approximated to be equal to the aggregate miners' reward, which is the total sum of bitcoin received by miners in bitcoin block rewards, containing the block subsidy (new coins) as well as transaction fees.

The daily mining reward is precisely ascertainable from the bitcoin client, and when combined with daily average price, it can give us the dollar market value of daily rewards received by miners throughout bitcoin's existence. At the time of writing, bitcoin is trading at around \$40,000 while the daily mining reward is running around 1,000 bitcoin per day, giving a security expenditure of \$40,000,000 daily. When examining bitcoin's entire lifetime, we find that it has consumed \$30b² in security expenditure.

This can be considered a reasonable estimate of the total expenditure of miners on operating the bitcoin network.

Bitcoin Benefits

Secure savings

We can understand bitcoin as an electricity-based technology for saving economic value. It takes electricity and hardware as an input and produces savings protected from inflation and fraudulent manipulation. We can measure its efficiency as a savings mechanism by measuring the value stored in it compared to the value spent on securing it. The economic value stored in bitcoin can be approximated by the market value of the total supply of bitcoin, since anyone holding bitcoin at that price is indicating that they value it more than they value holding its value

in other currencies or assets, or consuming its value by purchasing the consumer goods it can secure. The cost of securing bitcoin is equal to the miners' rewards.

The mining reward consists of the transaction fees paid by users, as well as the block subsidy, which contains the new coins created with each block. So far, transaction fees have been lower than 5% of total block reward for the majority of bitcoin's existence, which means that the total block reward has been very similar to the block subsidy. If we consider the operational efficiency to be measured as market cap over mining reward, and reward approximates subsidy, then it is a number very close to the percentage growth rate of the bitcoin supply, or the inverse of the stock-to-flow ratio. This brings us back full circle to the discussion of stock-to-flow at the beginning of *The Bitcoin Standard*, where I argue the stock-to-flow ratio is an extremely important metric for determining monetary status. Goods with a low stock-to-flow ratio will witness a large increase in their liquid stockpiles as a result of any rises in price, but goods with a high stock-to-flow ratio will only witness small increases to their existing liquid stockpiles. Calculating bitcoin's operational efficiency as a savings vehicle reveals that it is very close to stock-to-flow, and that is an engineering explanation of the nature of the role of money. Money is as efficient as it resists debasement, and the better it is at resisting debasement, the more value will accrue to it. As bitcoin's supply growth rate has declined, its operational efficiency has increased, and the amount of value it has attracted has increased.

[PLOT mining reward vs market cap, and mining reward/market cap, vs $1/s2f$]

Up until this point in bitcoin's existence, the mining reward has been very close in value to the block subsidy, but as the block subsidy declines, transaction fees will necessarily become a larger fraction of the total block reward, and the operational efficiency of bitcoin will diverge from the stock-to-flow ratio, and converge toward the ratio of transaction fees to total market capitalization. It will be fascinating to watch what happens to

the ratio of transaction fees to total market capitalization as the block subsidy goes to zero, and whether it stabilizes at a specific level.

[Extrapolate block subsidy and transaction fees into the future and project efficiency going forward.]

Appreciating savings

Another way of thinking of bitcoin's efficiency is to consider how efficient it has been as a savings technology for those who have utilized it. We can estimate that based on the ratio between the total current market value of all bitcoins over the value that was invested in producing these coins. We can approximate the sum of dollars spent on bitcoin as being the sum of the dollar value of daily bitcoin production over bitcoin's existence. On any given day, new bitcoin are being produced and sold on the market at the predominant market price. This is the case even if the miner who mines the coins does not sell them, as they are effectively buying them at the market price and holding them. At any given bitcoin price, the production of new coins increases the amount of value that needs to be held in bitcoin cash balances in order for the price to stay constant, and that increase is equal to the bitcoin price multiplied by the the number of bitcoin mined on that day. Whether through bitcoiners holding a larger market value of bitcoin balances, or through new buyers buying new bitcoin, each day witnesses increased new expenditure that is approximately equal to the market value of new coins produced.

Summing the daily dollar value of market rewards results in a sum of ~\$30b spent over the previous 12 years, at a time when bitcoin's market capitalization is in the range of \$1 trillion. This represents a 3,333% average return on investment. Effectively, bitcoin network's native tokens have appreciated an average of 33 times their original value since their creation. As a mechanism for saving wealth into the future, bitcoin's efficiency is off the charts. As a superior technology for saving, bitcoin is attracting a growing amount of wealth, and bitcoin's scarcity causes pre-existing holders' bitcoins to appreciate.

Global money transfer

Bitcoin does not just secure savings, it can also move economic value around the world. Estimating bitcoin's efficiency as a mechanism for transferring value can be done by measuring the ratio of transaction values to the fees paid to transfer them.

[Plot transaction fees as a percentage of bitcoin transactions, in bitcoin terms and in USD terms]

Overall, bitcoin has consumed around \$30billion of resources in order to secure \$1trillion of savings, while accruing value at an average rate of 200% per year, and has moved \$xxt of value for a cost of \$xxx.

Bitcoin is a technology that currently secures around \$1 trillion of wealth at a running cost of \$10b per year. It also transfers XX\$ of transactions yearly.

Obsoleting Fiat

A very important consideration in economics is the opportunity cost of each action, or the foregone alternative one could be utilizing. We cannot understand the costs and benefits of bitcoin without understanding the system it replaces? Whereas the costs of bitcoin are relatively easy to estimate thanks to its very transparent and mathematically precise nature, the costs of fiat are much harder to quantify. The following sections take a stab at this formidable problem.

Functionally speaking, bitcoin replaces existing technologies for saving and international money transfer, or the fiat standard as discussed in the first part of this book. There are many things which bitcoin does not really displace and do not matter much to this calculation. Even if bitcoin were to

completely supplant gold's monetary role, it will not replace gold mining and the gold industry, which will continue to exist to satisfy gold's ornamental and industrial demand. Bitcoin is also orthogonal to the replacement of commercial banks and their infrastructure and buildings. Much of fiat banking can become digital and the energy expenditure of much of the physical infrastructure might decline. Furthermore, the continued growth of bitcoin will likely also lead to the development of physical financial infrastructure. Much of consumer-focused physical infrastructure attached to a fiat or bitcoin banking system appears to be more a function of modern consumer interface technology than the underlying monetary asset.

Bitcoin would likely displace part of banks' physical infrastructure that pertains to settlement and clearance of physical forms of money, but that is likely an infinitely tiny fraction of the infrastructure and energy expenditure of the modern banking system. Bitcoin could potentially replace all central banks, but these, too, have a very small physical footprint consisting of no more than a few thousand buildings around the world. Compared to the true costs of fiat these are an insignificant rounding error with which we will not contend.

With bitcoin, the cost for securing the network is incurred upfront by miners. But the cost of operating and securing fiat, like the cost of sniffing glue, lies not in the small direct cost paid upfront, but in the many very expensive consequences of partaking. The physical infrastructure and energy needed to operate the fiat monetary system are insignificant compared to the economic, political, social, nutritional, and civilizational consequences of deploying fiat monetary technology. Most of these costs are invaluable and incalculable, but some of them can be approximated, and will give a very good accounting of the extent of the damage caused by fiat.

Only by considering all the costs associated with using fiat which bitcoin eliminates for its user can we understand the appeal and growth of bitcoin. We can classify the costs of fiat into four broad categories: the destruction of holders' wealth through inflation, the destruction of the role

of money in economic calculation, the increased power of government to shape economy and society, and the increased likelihood, and cost, of conflict.

Cost of inflation

The first and most obvious cost is the wealth destroyed by the devaluation of national currencies. Every national fiat currency has devalued in real terms almost every year since its creation, continuously eroding the wealth of their holders. As bitcoin amply demonstrates, there are no good reasons for the increase in the size of economic activity or user base to require an increase in the supply of tokens used in a monetary system, but government credit money is constantly expanding in supply, and as a result, it is constantly declining in value.

Measuring consumer price inflation is inadequate for the purposes of measuring the waste of fiat. More than just the obvious and severe problems with reliance on government statistics which governments have a very strong incentive to influence, changes in consumer prices are a complex product of decrease in the value of fiat money, and the increase in productivity of goods. With monetary inflation, the decline in the value of the currency indicates an increase in supply larger than the increase in productivity. Without any monetary inflation, the increases in productivity would translate to price decreases. This means consumer price inflation does not allow us to determine the magnitude of waste caused by the use of fiat money. The increase in the supply of the monetary unit is a much better proxy for it, since it is purely dilution of the value held by the holder.

We can get an estimate for the amount of devaluation happening worldwide by measuring the supply growth of all national currencies and calculating the average, weighed by the share of each currency in the global money supply. For the years 1960 to 2015, we find that the planet has increased its money supply by an average of 32% a year. This is not an accurate assessment of the level of debasement worldwide because it gives individual currencies equal weight in measuring the average, giving an outside weight to small countries and their even smaller national

currencies. Given that the US dollar is widely available in most of the world's countries, a fiat defender could argue that its rate of devaluation is the real measure of wealth devaluation under fiat, since practically anyone worldwide can save in US dollars. In that case, we find that the rate of devaluation comes to an average of 7.42% over the same aforementioned period. The reality is somewhere in the middle, since some people do not have access to dollars, and there are many reasons for people to have to hold their local fiat tokens. A more accurate assessment would weigh national currencies by their market value and calculate the average supply growth rate weighted for currency size, but such calculation is made extremely complex by the daily variations in currency exchange rates and valuations. As a very conservative estimate, we can assume global money supply will increase by an average of 10% for the average fiat user. Compared to holding a hard money with a fixed supply, the average fiat use is experiencing a 10% loss of purchasing power per year.

In 2019, total global broad money supply stood at around \$95 trillion, while total global wealth was around \$360 trillion, meaning money constituted 26.3% of humanity's wealth. For a nice round number, we can estimate that a quarter of humanity's wealth is held in fiat money, and as that is being debased by 10% every year, humanity is losing 2.5% of its wealth every year due to the leakage of value from its liquid assets.

It is important here to stress on the supremely regressive impact of the fiat tax on humanity. The world's poor are predominantly in countries experiencing higher inflation than that of the world reserve currencies. Further, the world's poor have the majority of their wealth in money, and not in financial assets. The world's rich are the ones who hold the vast majority of the 75% of world's wealth that is not in fiat, but in hard assets like stocks and bonds. The rich will own more liquid wealth than the poor, but their liquid wealth is a small fraction of their wealth, a fraction that declines as wealth increases. By having the majority of their wealth concentrated in the little liquid fiat they are able to own, the poor are constantly paying a heavy price for inflation.

A lot of ink is spilled over the evils of inequality, but very few will point to this very obvious and devastatingly cruel form of economic punishment inflicted on the world's poor, in which their meager wealth, and the little hope they have of improving their lives, are constantly being devalued to reward the rich who are able to borrow large quantities of devaluing fiat, and protect themselves by holding hard assets. Predictably enough, the economists, academics, activists and politicians obsessed with inequality tend to be highly concentrated in fiat institutions, supported by government fiat subsidies, and understandably unable to draw the obvious connection between the inflation that pays their salaries and the poor who foot the bill.

One reason why bitcoin is far more efficient than fiat is that it does not impose this form of wealth confiscation through inflation. Holders of bitcoin can verify the supply for themselves, and the supply is devaluing at a rate lower than 2% per year, which is halving every four years on its way to zero, eventually.

Cost of economic distortions

The second cost of fiat money can be understood as the second order economic effects of an inflationary global system of partial barter around government currencies, and the enormously costly distortions it causes the world economy. Chapter 5 in *The Bitcoin Standard*, and chapter 8 of this book discuss the connection between money and time preference, and how devaluing currency disincentivizes long-term thinking and encourages short-term focus in decision-making. The result is a reduction in saving, and an increase in indebtedness. There are no easy ways of quantifying the enormous impact on humanity of a century of government manipulation of time preference and distortion of the most important economic calculations each human performs: their trades with their future selves. We simply have no idea what the world would have looked like had the world's population continued to have a safe store of value to provide for its future self, allowing more long-term thinking. The impact on technological advancement, capital accumulation, and many societal problems can only be imagined. Chapter 6 in *The Bitcoin Standard*

discussed in depth how business cycles are the inevitable result of the manipulation of the money supply causing the distortion of the price of capital, causing malinvestments, liquidations, recessions, and large amounts of capital destruction. The financial crisis of 2008 is [estimated to cost every American \\$70,000 in lost lifetime earnings](#), or roughly a total \$21 trillion for the nation overall. An accounting for the costs of fiat should take into account the cost of financial crises in the fiat century. Another second order effect of inflationary money is that it causes losing investments to appear profitable to investors, and thus attract their capital. A business expecting a nominal profit will appear like a good investment to an investor, but in real terms, with the devaluation of the currency between the period of investment and the period of revenue accrual, the investment will actually turn out to be a losing investment. With money expected to debase at X%, any business that offers a positive nominal return smaller than X%, will appear profitable while actually being a net drain of society's capital. Inflation turns money into a melting ice cube, strongly encouraging individuals to spend or invest, even if they should not. Wasteful spending and wasteful investments are an inevitable outcome of a monetary system in which the money can't be expected to hold its value. The cost of the capital wasted in this way is incalculable, as we'll never know how much more capital we could have accumulated, and innovations we could have discovered, had capital owners not had to dispense with it like a hot potato.

Also discussed in Chapter 6 is the balkanization of the world's money from one universal medium of exchange, gold, into hundreds of government tokens with limited salability, a huge step backward for humanity's monetary technology, resulting in what Hoppe called a global system of partial barter. The foreign exchange market is not only a high cost in terms of transaction fees as people engage in cross-border barter, but a much bigger expense on the world in terms of the problems of calculation it creates for entrepreneurs who have to become part-time macroeconomic and monetary policy analysts to simply figure out the prices of their inputs and outputs. That cost, too, is incalculable.

Fiat governments

Fiat enthusiasts might argue that the cost of debasement discussed above is not entirely a cost, since that devaluation has allowed government and its Cantillion-favored partners to spend, which is not entirely waste. I would argue the opposite, as government spending, unlike private spending, is highly distortionary to the economy, causing a lot of waste and misallocation of resources. The spending is itself a cost, independent of the devaluation of the currency, because it facilitates the kind of catastrophes outlined in the second section of this book. It is difficult to imagine the degree of government intervention in food production and diet discussed in chapter 9 under a hard monetary system. The scientific process could not have degenerated into the current corrupt cartel for the mass production of content-free papers were it not for government spending distorting the entire structure of the market and its incentives, as discussed in chapters 10. Without inflation and government intervention in the energy market, it is difficult to imagine a free market cause the recent rises in energy prices and the decreasing reliability of grids in places that had mastered reliable grids many decades earlier.

Conflict

The biggest and most devastating cost of fiat lies in the mechanism it uses to achieve consensus on a global ledger, and that is violence. Whereas gold's monetary role was guaranteed by its physical and chemical properties, and verification of its authenticity is possible, fiat's monetary role is entirely predicated on the authority of the issuing central bank and government. *Fiat converts all underlying monetary assets into virtual tokens arbitrarily assigned or deleted by the central fiat node, since it has a monopoly on clearance and issuance of these monetary tokens. Any transaction can be reversed, any balance can be confiscated, and large amounts of these tokens can be conjured out of thin air into any particular balance, by pure fiat. All value and truth in the banking system can ultimately be decided politically.* Fiat makes all domestic and international an extremely high stakes game, because the prize is virtual

control over all economic value, domestically or globally. Further, and as discussed in chapter 8 of *The Bitcoin Standard*, the ability of government to draw on the entire wealth of its population makes it more likely to engage in military conflict, and more likely to prolong such conflict, as the costs can be easily placed on the population. Under the gold standard, governments fought until they ran out of gold and could no longer tax the population. Under the fiat standard, governments can fight until they have appropriated all the value held by their citizens' money. As former American congressman Ron Paul explained, it is no coincidence that the century of central banking was the century of total war. R.J. Rummel estimates that 169,000,000 people were murdered by their governments during the twentieth century. All of these governments were able to carry out these atrocities thanks to fiat money's extremely kille-app: unlimited government finance. The two world wars, and dozens of other wars and genocides have brought about horrors the likes of which the world has never seen. The cost cannot possibly be estimated for the dead and their many loved ones.

Fiat's proof of work relies on violence and the use of physical power to subjugate opponents in the case of disagreement. Fiat is might makes right, and it rewards might with the biggest prize of all, enormously increasing the payoffs for might, and incentivizing humans engage in contests of power rather than economic production. The benefit from running a payment system that allows you to mint money is very high, and people will expend resources they value close to that benefit in an attempt to capture it. Fiat makes violence and power the method for incurring the cost, with an enormous human toll, almost entirely borne by people who stand to gain nothing from any authority capturing the printing press. By making it possible to arrive at consensus between strangers without having to be subject to any political or regulatory common body. Bitcoin cannot end war, but it can significantly dent the state's ability to use inflation to finance war, and perhaps more importantly, it massively reduces the spoils of war by taking the monetary system out of it. Rather than conflict and dominance, bitcoin allows the redirection of monetary energy to the development of cheap and plentiful energy for humanity.

17. Can bitcoin fix this

Perhaps the most common misconception about bitcoin among fiat economists is that they imagine it needs their educated official approval, and a regulatory green light, to be adopted as money. Government control of the monetary system and scientific funding has convinced generations of economists that reality is the product of fiat edict and given them a thoroughly top-down approach to understanding the world, where bureaucrats, scientists, politicians, journalists, and other positions of fiat authority are the enlightened vanguard of society who decide for the plebs how to live their lives. To this day, economists continue to engage in belabored theoretical discussions on whether bitcoin fits their preferred definition of money, whether it is worth the energy consumption, and whether it should be allowed to continue to exist. The longer bitcoin continues to operate, the more these concerns begin to look like the quaint superstitions of primitive tribes on first contact with modern civilization.

Bitcoin's continued successful operation, its ability to perform final settlement internationally without requiring any government oversight, and its credibility at maintaining its monetary policy over 12 years all mean that it operates outside the realm of fiat authority, and delivers a shattering blow to the worldview of those who think reality comes out of fiat. Bitcoin does not need to convince fiat authority of its worth, it just needs to keep surviving on the free market by offering value to its users.

Bitcoin is the world's first digitally scarce asset, and the first liquid asset with strict verifiable scarcity. It offers no yield and is therefore not held for its returns, like stocks. It is instead held for its own value, like cash, which the Austrian economists explain is held because of uncertainty. In a world of no uncertainty, where all your future income and expenditures are perfectly predictable, there is no need to ever hold cash, as you can always place your money in capital markets to earn a return, to be liquidated exactly at the time in which you need them. But in the real world, with uncertainty pervading everything, people do need to hold cash balances to meet their uncertain future obligations.

As discussed in chapter 5, fiat's inflationary nature has eroded its ability to play the function of cash, and as a result people have sought several substitutes to perform this role. People primarily hold government bonds as a way to recreate cash's ability to save value for the future, as well as physical gold, real estate, and equity. Bitcoin is just another asset to be added to this list, with a major difference being that it can be accessed entirely outside the traditional fiat banking system, in a permissionless manner.

Whether fiat authorities like it or not, bitcoin is now in free market competition with many other assets for the world's cash balances, and it is a competition bitcoin will win or lose on the market, not by the edicts of economists, politicians, or bureaucrats. If it continues to capture a growing share of the world's cash balances, bitcoin continues to succeed.

As it stands, bitcoin's role as cash has a very large total addressable market. The world has around \$90 trillion of broad government supply, \$90 trillion of sovereign bonds, \$40 trillion of corporate bonds, and \$10 trillion of gold. Bitcoin can ostensibly replace all of these assets on balance sheets, which would be a total addressable market cap of \$230 trillion. At the time of writing, bitcoin's market capitalization is around \$700 billion, or around 0.3% of its total addressable market.

More than just cash, bitcoin can also take a share of the market capitalization of other semi-hard assets which people have resorted to

using as form of saving for the future, such as stocks, which are valued at around \$90 trillion, global real estate, valued at \$280 trillion, and the art market, valued at several trillion dollars. While there will clearly be stocks, houses, and arts on a bitcoin standard, their valuations are likely currently highly inflated by the need for holders to use them as a store of value, on top of their value as capital or consumer goods. As more and more holders of these assets as a store of value discover bitcoin's superior intertemporal salability, it continues to acquire an increasing share of global cash balances.

Monetary status is an emergent outcome of market choice for monetary assets, and not a result of an appraisal of theoretical monetary properties by economists. Modern economists have never contemplated the possibility that free market competition could apply to money, the holiest of prerogatives for the modern fiat governments that pay their salaries. With every passing day in which it operates to the satisfaction of its millions of users, the full-time detractors and government-paid economists who are constantly attacking bitcoin begin to sound like deranged conspiracy theorists who have very weird reasons for being obsessed with stopping happy customers from wearing a shoe brand they like.

Bitcoin has grown from nothing to around a trillion dollars of market value on global balance sheets in the space of 12 years, without a leader, without corruption, and without governments being able to stop it. In the past 10 calendar years, it has achieved an average annual growth rate of 200%. If it were to experience a similar rate of growth in the future, it would overtake the \$230 trillion benchmark by 2026. If it were to experience annual appreciation of 'only' 20% per year, a tenth of what it experienced in the last ten years, it would arrive at the \$230 trillion nominal valuation around 2050. Rather than argue with ancient textbook definitions from the pre-bitcoin *jahiliyya*, economists would do far better trying to think in practical terms: how much can bitcoin continue to grow, what are the implications of its continued growth, and what can stop it. The rest of this chapter examines several scenarios for bitcoin's continued growth, and several ways in which bitcoin can be derailed. None of these scenarios should be viewed as a prediction, as this author has learned to

have very few strong opinions about the future. They are meant more as thought exercises to try to imagine how certain possibilities can unfold.

Hyperinflation

The most widely held prediction about how a bitcoin economy develops usually involves the entirety of the world economy collapsing into a heap of hyperinflationary misery similar to the one you see in Venezuela today. The dollar, euro, sterling, and all global currencies would collapse in value as all their holders drop them and choose to move to the superior store of value of bitcoin. Governments would collapse, banks would be destroyed, global trade supply lines would come crumbling down. The kind of imaginations reared on watching Hollywood movies can be relied on to run wild with the scenarios here. But there are several reasons to be optimistic that this may not be the case; The move to bitcoin could instead look more like an economic upgrade which replaces manual political central bank policy with ruthlessly efficient modern automated technology, and could in retrospect be an even better deal for humanity than the replacement of horses with engines, or phone line operators with computers.

The hyperinflationary scenario assumes that demand for national currency would collapse, leading to the value of the currency collapsing, regardless of what would happen with the supply. It assumes that even if the supply of fiat money is likely to remain constant or vary only slightly, the decline in demand will lead to the value of the currency collapsing. However (and this is the first important problem the hyperinflation scenario runs into), hyperinflation is always and everywhere a result of the drastic increase in the money supply, and not a sudden decline in demand.

Demand for Rai stones, glass beads, seashells, salt, cattle, silver and various other monetary media discussed in *The Bitcoin Standard* and

elsewhere did drop over time as harder alternatives were introduced, but that would likely have led only to a gradual decline of their value, none of these hard commodities witnessed a hyperinflationary collapse in value unless their supply was quickly inflated. Only as a result of government and central bank increases of the money supply can hyperinflation happen, as a close study of any and every modern hyperinflation would show. Looking at a place like Venezuela today where the local currency has dropped to less than a millionth of its value in just a few years, even if one knows nothing about Venezuelan monetary policy, one can dismiss the idea that the destruction of the Bolivar can be explained by a drop in demand. Venezuela the country is still there, its population at largely the same numbers as before the currency collapse, and still in need of money and demanding more of it. While there is no doubt that demand for holding the bolivar has dropped significantly, it could not possibly have dropped to a millionth of where it was, as Venezuelans still need the currency to settle all their government-related business (an ever-growing occurrence thanks to the socialization of the economy). The only way to understand the collapse in value is as a result of the rapid increase in supply, and any reduction in demand was rather an effect, not a cause, to that currency's value dropping. Therefore, even if Bitcoin continues to increase its share of demand for money as a percentage of government demand, government moneys could avoid hyperinflationary collapse so long as they manage to avoid spiking the rate at which they expand their money supply.

But the more important reason to think bitcoin makes hyperinflation unlikely is the impact that bitcoin has on the creation of money, as outlined in detail in chapter 4 of this book. Fiat is created by lending, while it is destroyed by loan repayment or default. By introducing an alternative monetary asset to debt instruments, bitcoin reduces the demand for the creation of fiat-debt, and thus the creation of fiat. When the value of money is constantly dropping, and interest rates are artificially low, people are incentivized to borrow instead of save, and those who want to hold savings for the future are incentivized to hold them in the form of debt-based assets contingent on repayment from others, such as bonds. But when a new and completely decentralized, depoliticized, and automated

hard new money enters into the economic calculations of the individual today, that individual's relationship with credit is likely to change. With the presence of a hard money that can appreciate in value over time, people's need for credit will likely decline. As those who move to Bitcoin witness its value appreciate, they find themselves able to pay off their debts sooner. As they become debt free with hard savings that nobody can inflate, they're likely to start living off of their savings and accumulating more, rather than continuing to borrow and pay interest. Many bitcoin holders have already gone through this process, and many have been able to pay off all their debts thanks to the appreciation of bitcoin. When people have a healthy store of value that appreciates over time, they're less incentivized to borrow. If bitcoin continues to grow, and more people do this, then the demand for credit from the traditional financial system will likely decline. Perhaps more importantly, the option of holding bitcoin on the balance sheet will reduce the incentive of individuals to lend to others, resulting in a slowdown in the creation of fiat credit, as it replaces the demand for bonds and many other credit instruments.

Debt Jubilee & monetary upgrade

The previous section leads to a very important realization: **bitcoin does not just reduce demand for fiat money, it also reduces the incentive and mechanisms for creating new bitcoin supply.** Rather than a threat that can destroy fiat money, bitcoin may turn out to be the neat technological solution that allows fiat to unwind peacefully. If the fiat monetary system was a house of cards, bitcoin's reduction of demand for fiat, and of the incentive for the creation of the fiat supply can be likened to someone skillfully and neatly unwinding the house of cards into a deck of cards by removing two cards leaning on each other at the same time: the card of fiat demand and the card of fiat supply.

If governments in the advanced economies, which have done a semi-respectable job in managing their currencies over the past few decades, manage this process wisely, they would allow the credit and money

contraction to happen naturally. If they try to react with inflation, they will likely witness quick reduction in the value of their currency. The wiser among them are likely to adopt strict monetary policy, and in that case, rather than go out on a bang, the current global monetary system would just slowly and naturally get downsized into irrelevance as its currencies lose their value slowly next to Bitcoin, but the size of the people using the currency is also being reduced.

The third reason we can expect there to be no hyperinflationary collapse as a result of the rise of bitcoin is that hyperinflation happens when the entire monetary system of a society collapses, thus destroying the complex web of calculations and interactions that coordinate the activities of individuals across a large modern society. A modern society relies on money as the medium in which prices are expressed, and these prices are what coordinate economic activity and allow individuals to figure out what to produce and consume. No modern society, with its sophisticated infrastructure, is possible without a highly complex division of labor dependent on the price mechanism and economic monetary calculation to coordinate economic activity. The collapse of money brings this division of labor crashing down, and makes economic coordination impossible. Prices cannot be expressed in terms of barter, and there are no easy ways for people to calculate the true opportunity cost of their actions or the most efficient use of resources. The entirety of the division of labor of society collapses and life in the modern cities unravels into disaster. But all of this happens when the only monetary system of a society collapses, and in a fiat planet, the local government's fiat is the only monetary system available to people in any given country. As national currencies collapsed, citizens usually have no ability to switch seamlessly to a foreign currency and continue using the banking and financial services they need. When this is possible, such as in the case of the dollarization of Ecuador, the hyperinflation ends and economic production and growth can resume.

Being much harder to ban than foreign national currencies, bitcoin offers a safety net from hyperinflation, rather than being the cause of it. As a national currency collapses, anyone can shift to a growing liquid pool of

liquidity with which they can trade, allowing economic production and calculation to proceed, and averting humanitarian catastrophe. Should bitcoin become widespread enough to destroy demand for government currencies, then these networks will be large enough to support an increasing amount of coordination, trade, and investment. Unlike in a hyperinflation scenario, a move to bitcoin that does not see a large increase in the supply of government money would not lead to a catastrophe; it would be a global upgrade—a peaceful technological upgrade of the monetary infrastructure of society. Anyone who wants to keep using government money can continue doing so, but as bitcoin undercuts both the demand and the supply of government money as discussed above, the government money bubble shrinks and withers away, while the bitcoin economy grows.

Imagine a basic modern wage earner who is in debt for something in the range of a year's income. Imagine he decides to put 1% of his income in Bitcoin every month, and imagine, for the sake of this thought experiment, that bitcoin appreciates on average around 50% per year from now². If this man holds on to his bitcoin and does not touch them, they would appreciate to match the value of all of his debt in less than ten years. If Bitcoin's value rises by 100% a year, it would only take him 7 years to have enough bitcoin to pay off his debt. I would expect that this scenario will become more and more common, provided bitcoin continues to survive, as evidenced by my personal interactions with bitcoiners, who have used their gains over the years to get out of debt and buy the peace of mind you get from not having to be dragged out of bed every morning to work to pay off someone, rather than working for yourself. In such a world where the possibility of saving is available again, you would expect a growing portion of the population to be free of debt and to have enough savings to finance their expenses, as well as to finance their businesses. Fewer people will get into debt for buying cars, houses, or consumer goods, because they can save up for them in hard money. More interestingly, perhaps, will be the shift in business financing, as more people become wealthy enough to finance their own businesses with their own savings rather than from bank credit.

The return to this form of mass capitalism, where capital is widely distributed, rather than centrally-controlled, is one of the themes I discussed in chapter 8 of *The Bitcoin Standard*. Under sound money regimes, a free market in capital emerges. Individuals who are productive are able to accumulate capital and watch it appreciate in value, and so can finance themselves and their businesses. Productivity is rewarded with compounding growth in value over time, allowing the holder more capital, and thus placing more and more capital in the hands of the productive. In large centrally-planned credit markets, such as those that exist under government money, capital is centrally allocated by government bureaucracies that determine who gets new capital, while also devaluing the capital accumulated by the productive members of society. In such a world, being productive is punished over time, and credit financing is more likely to go to those who can afford bracing the bureaucratic hoops of government credit boards. Capital is centrally allocated and the individual has less agency in deciding where to invest it. Capital and firms grow larger to afford lawyers and PR firms to communicate stability to bankers, and smaller businesses become less viable. This is why under the gold standard firms tended to be smaller, and there were far more smaller businesses thriving. It is said that when Britain was the prime industrial force of the world, its average factory had 20 workers. This is what a free market in capital would look like. The centralization of credit issuance rewards bureaucratic and sclerotic growth. It is no wonder that the golden era of innovation³ in the nineteenth century, *la belle époque*, was a world running on a hard money, because that hard money is what allowed all these many inventors and tinkerers the capital and freedom to experiment with outlandish ideas.

A market solution that provides people with the possibility of appreciating money, money whose supply is not responsive to increases in value brought about by high demand—would bring about a decline in the demand for debt. Individuals first, then businesses, and then large corporations would slowly climb their way out of debt and into holding wealth in the form of bitcoin, using that wealth to pay off their debt. You would expect municipal governments to get into these kind of arrangements particularly in more decentralized governmental structures

where local authorities have more sovereignty. As more and more of the money supply shrinks, the damage caused by the fiat economy shrinks, and the number of people under debt slavery is reduced. Eventually, the only part of the economy that remains wedded to government money would be government itself, and the parts of the economy dependent on government money.

As monetary central planning goes, it is possible to underestimate just how effective it can be at manufacturing its own justifications. Just like the Soviet Unions continued to produce very impressive numbers for economic growth into the late 1980s as Russians were going hungry thanks to shortages, the modern government-run central banks can also keep a macroeconomic charade going for a while. Paul Samuelson and William Nordhaus, two of the most important postwar economists in the US, both of whom have won the Bank of Sweden Prize (commonly misidentified as a Nobel Prize), wrote in their 1989 Economics textbook, which is standard issue for most undergraduate students around the world: "The Soviet economy is proof that, contrary to what many skeptics had earlier believed, a socialist command economy can function and even thrive". Modern macroeconomics is no different than Soviet macroeconomics in its blind faith in the ability of high priests with PhDs to divine the working of the economy through models, metrics, and statistical analysis.

You can expect the monetary system to persist for a while in creating an image of success by continuing to present to its subjects improved statistics and manipulating their experience of the world to better tolerate the reality. This become less and less tenable with time as governments are less able to finance themselves through inflation through the threat of bitcoin, and so you would expect these sclerotic economies surrounding governments to begin a slow terminal decline into irrelevance. Ultimately, the structures for these shambles of organizations can remain, but they will just become less attractive to people who see the migration to the new economy as more beneficial. While government connected firms may continue, they will lose relevance and value.

What we would likely see in this kind of scenario is a growing size of the bitcoin-based hard money economy, in which holders of money witness their value appreciate, while the government-based economy shrinks in size and in relative wealth as its lack of productivity becomes more punishing as more of the productive member of society flee to other sectors. The fiat economy will continue to provide people with lucrative careers with alluringly large numbers of monetary units being paid their way. But as the people who actually produce economically valuable goods move away to a harder monetary standard, these monetary units will buy less valuable fruits of others' labor, and will continue to maintain a semblance of value only when being used to purchase mass-produced large-scale economic goods whose production government can manipulate to appear cheap.

You can imagine two new global economies emerging across the world: the easy money centrally-planned economy of which government, media, and academia insist you must be part, with comfortable jobs secured from competition and controlled prices to ensure everyone gets their government-recommended soy and high fructose corn syrup rations. On the other hand, a growing, innovative, and apolitical economy which draws in the most ambitious, creative, and productive people in the world to work hard on providing goods of value to others.

It is true that in the long-run this is not sustainable, but the long-run might take a long time to arrive, because contrary to popular belief Bitcoin is unlikely to cause a collapse in the value of fiat money, by undermining the money creation process, and thus limiting the possibility of hyperinflationary collapse.

The only way to peacefully end credit money is to pay it all off, which looks like yet another nifty killer app for a digital apolitical harder form of money that appreciates and encourages saving, capital accumulation, and long-term orientation.

Speculative Attacks

A counter-point to consider to the preceding two sections' analysis is the impact of the strategy of borrowing dollars to buy bitcoin. While many people would be tempted to exit fiat debt entirely and shift to holding hard bitcoin savings, the continued existence and wide availability of fiat debt will offer a strong incentive to borrow fiat and use it to accumulate bitcoin. One of the smartest and most far-seeing analysts of bitcoin, Pierre Rochard, had identified this phenomenon as early as 2013, outlining how bitcoin allows investors worldwide to carry out a speculative attack on all national currencies similar to what George Soros and beneficiaries of low interest rate lending have been doing to weak national currencies for decades, with spectacular success. The speculative attack strategy is to borrow the weak currency, and use the proceeds to buy the stronger currency. As the borrowing of the weak currency causes an increase in its supply, selling it to buy the strong currency causes a decrease in demand for it, and results in the decline of its value next to the stronger currency. This reduces the value of the loan the attacker owes, and increases the value of the currency he holds, a highly lucrative combination. With bitcoin a harder currency than all national currencies, it could serve as the perfect launchpad for attacks against national currencies. It is a natural evolution of the interaction between the two forms of money: hard bitcoin is optimized for appreciating as it is held, while fiat is optimized for devaluing as it is inflated and lent. The likelihood of speculative attacks casts doubt on the monetary upgrade scenario discussed above. How long can fiat survive if people can keep inflating its supply by borrowing it to buy harder bitcoin? We have never seen a similar situation and it is hard to estimate how this will unfold.

One potential weapon fiat authorities can deploy to fight bitcoin speculative attacks is to place restrictions on credit issuance to bitcoiners. While the ship has probably sailed when it comes to complete bans on bitcoin in major economies, restricting borrowing by bitcoin owners might be an effective weapon deployed by fiat authorities to stall the quick rise in bitcoin.

The monetary vigilante

A fourth scenario is that bitcoin continues to survive without ever becoming a mainstream global monetary system, but remains as a fringe alternative which people only resort to in times of economic crisis. Its continued existence would provide citizens with a quick way to exit from their local currencies and still have a monetary system to use to trade with others, in case central banks mismanage the supply of their currency. This credible threat, in turn, would make central banks far more careful about managing their currencies and would force their hands into limited inflation and into reigning in the credit creation mechanism of their financial systems. Perhaps it will take another example of hyperinflation happening and the local population switching significantly to bitcoin to make other central banks aware of the threat. In this scenario, Bitcoin would lead to an improvement in monetary policy around the world as countries need to adhere to harder monetary policy to ensure their survival.

Bitcoin, for all the talk about its growth, still requires a significant amount of time and attention to understand and operate safely. It is something that a very large number of people will find very hard to navigate reliably. Technology will be built that will make dealing with bitcoin easier, but the logistics of dealing with a private key and public key are likely to remain, and these are challenging for most people. There is a significant advantage to the familiarity of what has worked for a while, and this could hamper bitcoin's growth. A good way of understanding the difference is that in the personal desktop market, even though Linux is a free alternative, most people prefer the comfort of using a proprietary platform like Windows or iOS. Perhaps Bitcoin will remain in this state for many years, with not enough of a critical mass of users developing to create momentum for a comprehensive shift.

In this scenario, Bitcoin would increase the possibility for exit from the current financial system, but either through its own limitations, or through the many advantages that governments can bestow on their monopoly

monetary systems, the current monetary system would continue surviving. Bitcoin would remain as a monetary vigilante in the shadows of every monetary system. As soon as credit creation increases in a way that brings down the currency value significantly, wealth begins to find its way to bitcoin. Seeing as bitcoin is hard money, it is not possible for anyone to increase bitcoin production as a response to this increase in demand, and so the value of bitcoin would likely appreciate, making this an increasingly attractive prospect for citizens. Some currencies may collapse, but perhaps the long-run effect is that current central banks will reform their monetary policies enough to ensure these kinds of periods happen less and less frequently, and that the familiarity and the legal and tax requirements for using the current monetary system maintain its advantage over bitcoin in the long-run.

In such a scenario, bitcoin may have failed in becoming the global monetary standard, but it would have undoubtedly succeeded in its real mission of building a sound global monetary system. It would remain like a vigilante, in the shadows of every society, ready to heavily punish any diversion away from a gold standard by rewarding heavily those who defect from it. That threat in turn could deter governments from trying it enough times to force everyone to adopt bitcoin.

I find this scenario unlikely because hard money cannot stay niche. It is an all-pervasive economic force that affects everyone, providing its users a significant economic advantage over others, forcing others to jump on board or continue to get poorer. Whatever impediments to the spread and use of bitcoin exist are no match to the enormous benefits of holding the harder money. Just like people learned to deal with gold in the nineteenth century, and just like people seek out the dollar in the most adverse economic environments in the twentieth century, I imagine people will find their way to the hardest money that exists.

Central bank adoption

Could central banks adopt bitcoin as a reserve asset? There is nothing wrong with bitcoin in principle that would make such adoption impossible. The case for it is clear: if Bitcoin increases in price, any country that uses it as a reserve will witness its international cash reserve account rise in value, which would make it less likely for their government or central bank to run into balance of payment problems. The more the reserves appreciate, the more leeway the government has with its own spending and international payments. Further, adopting bitcoin allows central banks to engage in international payment settlement with other central banks, financial institutions, and foreign suppliers of imports without needing to resort to the US Federal Reserve's global payment settlement infrastructure, avoiding the risk of sanctions and confiscations. This is likely most appealing to countries at odds with US foreign policy.

Should one of these countries announce the replacement of even a small amount of reserve assets with bitcoin, the impact on Bitcoin's price would likely be massive and that small portion would grow into a not-so-small portion. Other countries could follow suit in an attempt to replicate the first country's success; the likely effect would be a significant drop in the value of national currencies used as international reserve assets, as each central bank scrambles to sell some of its international reserve currencies for the quickly-appreciating bitcoin to back their own currencies and preserve their value. The more this happens, the more precarious is the position of any central bank lagging behind, as they witness the demand, and thus the value, drop for the international reserve currencies held in their own reserves (leading to their own currency becoming increasingly worthless). Currencies lagging behind and with low bitcoin backing would be subject to speculative attacks by large bitcoin holders scenting blood in the increasingly weak international cash balances. Even countries with moderate bitcoin holdings would be vulnerable to these attacks until their currency is entirely, not just partially, backed by bitcoin. The end result of such a scenario is that the only currencies that survive will be the ones fully backed by bitcoin.

Yet there are several reasons to see this as an unlikely possibility. The first reason is that if we understand bitcoin as an alternative to central banking, as I argue in *The Bitcoin Standard*, then central banks are clearly the last people to need it. Central banks are the institutions that provide the services that are most closely approximated by bitcoin, and so they will likely remain the last to see the value to an alternative to their services.

The second reason is that while countries like China, Russia, Iran, North Korea and others may hate the US Dollar-based world financial system, they love having their own fiat currencies far more than they hate the dollar. While not inevitable, it is quite possible that the first central bank that moves to use bitcoin as a reserve asset will trigger a central banks' "reverse bank run" on buying bitcoin, the end point of which is that only currencies that survive are the ones fully backed by bitcoin. It might just not be possible to bite from the apple of bitcoin hard money reserves without falling from the governmental Garden of Eden of fiat money. The dearness with which central banks treasure their ability to inflate the money supply could act as a strong constraint against any suggestion of moving to a bitcoin standard.

China, Russia, and Iran may like to make a lot of noise about the unfairness of the US Dollar global monetary system, and how it privileges the US internationally, but these governments are not run by sound money Austrian-school educated economists who would like to see a return to the 19th century gold standard. Decades of western cultural imperialism mean that even these countries are ruled by the kind of leftist, socialist, Keynesian, and similarly inclined economists who idolize inflation as the key to solving all of life's problems. These governments do not hate the US Dollar for being fiat money, but rather merely for being another government's fiat money. They recognize and understand that their extremely elaborate states and bureaucracies, with their far-reaching control of their citizens' lives and large monopoly industries to benefit them and their cronies, are utterly dependent on their ability to continue creating their own money. Without easy money, these governments and their powerful cronies would be neutered.

We can know this because while these countries have long talked about shifting to gold for international payment settlement and as a reserve asset, they have never done it. While they've accumulated gold as a hedge against their dollar reserves, they refuse to settle their own trade using gold and continue to rely on dollar networks. As much as they would like to dethrone the dollar, they cannot dethrone it by replacing it with one of their own currencies; none of the other countries want to get rid of the dollar only to have another government introduce something identical. They certainly don't want gold to replace the dollar, as that would force them to operate under a gold standard and neuter their governments and the plutocrats who control it. Bitcoin poses a similar risk in that regard, and they're highly unlikely to even take the first step of using it as a reserve asset because, unlike gold (which has had this role for thousands of years), a central bank's purchase of bitcoin would quickly boost its appreciation and monetization.

Aside from the self-interest of the ruling elites in these countries, US power is another important factor that may stop them from adopting gold. The IMF, which is a tool of US monetary policy, has long banned its members from tying their currency to gold. The US still has the world's strongest military and the strongest currency, and any global financial crisis that happens, while having its root causes in the dollar, is likely to only make the dollar stronger, not weaker, as happened in 2008. For all its flaws, the dollar is still the most liquid of all national currencies, and the one with the least default risk behind it, since all other countries have obligations in the dollar which none of them can print. Unlike Bitcoin, central banks are centralized, and so are the governments behind them. Any country that chooses to dabble with Bitcoin as a reserve currency is highly likely to risk arousing US foreign policy's interest in bringing it democracy and regime change. It will most likely never come to that however, because central bankers today have only managed to obtain their jobs by being so completely and thoroughly inculcated with Keynesian and statist propaganda versions of economics that they'll be the absolute last in the world to understand the significance of Bitcoin and how it's a viable alternative to what they do. The [recent report](#) by the Bank of International Settlement, and [this interview](#) with their chief economist, make it pretty clear that central banks thinking about bitcoin today is

largely a recycling of 2015 nocoiner propaganda and concern trolling over fees for buying a cup of coffee, along with the obligatory claptrap about the disruptive potential for blockchain technology. They are completely oblivious to the possibility of second layer scaling solutions being introduced onto Bitcoin to make it function more like a settlement network among banks, i.e. a replacement for central banks. The fiat mental baggage makes the central banker the last person capable of understanding that money does not need the state, and the last person to get the significance of bitcoin.

Finally, to understand Bitcoin's value proposition as a long-term store of value despite its short-term fluctuations requires a certain degree of low time preference, which you can't expect to find in abundance in modern government bureaucracies. The uncertainty and short-term nature of democratic rule instills a short-term orientation in these bureaucrats and all but guarantees that politics is a short-term power and money grab. Politicians or bureaucrats can be expected to rationally prioritize their self-interest in short periods in office over their constituents' long-term future. Chapter 1 in Hans-Hermann Hoppe's masterpiece, [Democracy: The God That Failed](#), contains an excellent discussion of this point.

The mental models that govern rulers and bureaucrats and central bankers all over the world, the self-interest of these elites in maintaining inflationary money, and the threat of US military and economic power against any defections from the dollar standard all lead me to be highly skeptical of the possibility that central banks will adopt Bitcoin any time soon. It's far more likely we'll see a Bitcoin Standard develop as described in the subtitle of my book: a highly compelling decentralized alternative to central banks and a global payments settlement layer that runs on the hardest money ever invented, operating outside the purview of modern states. Best of all, this system is likely to continue to grow for a long time before the powers that be even notice its true significance or understand the devastating implications for their careers.

Government attacks

The most commonly discussed scenario for Bitcoin's death is a government attack. Anyone who's lived in the twentieth century has been conditioned to assume that anything government doesn't like will be banned, and initially there's little reason to suspect Bitcoin will be different. This was the cause for my skepticism toward Bitcoin for years.

The form of government attack or ban can come in many varied forms, some of which were discussed in *The Bitcoin Standard*, and are not the focus of this bulletin. Rather than discuss the technical feasibility of these individual attacks, I will focus on what I view as the deeper underlying economic incentives that make these attacks unlikely to succeed.

Bitcoin, at a functional level, is an extremely basic technological implementation that performs a very simple and easy task: the propagation of a block of transaction data usually of 1MB in size (although it can go up to 3.7MB), roughly every 10 minutes to thousands of network members worldwide. To be a peer on this peer-to-peer network, which allows you to validate your own transactions in accordance with the protocol's consensus rules, all one needs is a device capable of receiving up to 3.7MB of data every 10 minutes. To merely send or receive a transaction, without one's own node, only requires a device that can send a few hundred bytes of data.

As such, Bitcoin is a far simpler and lighter program than Amazon, Twitter, Facebook, Netflix, or many of the popular online services that involve more extensive interactions and operations. The technical requirements for sending a few megabytes of data around the world continue to get cheaper, simpler, and easier with the development of technology and the large accumulation of capital in the computer and communication industries. Currently, there are tens of billions of devices worldwide that are capable of sending and receiving data, including practically all the world's personal computers, smartphones, and tablets.

The common misconception many nocoiners have about how the internet works is that all these computers need to connect to some central server in order to access the internet, but that's simply not the case. The Internet does not have a central location that distributes content; the Internet is simply a protocol that any computer can use to connect to other computers. As long as two devices can be connected to one another physically or through various mechanisms to transmit data, then the Internet survives, and so can Bitcoin. Had the Internet been a centralized institution, then shutting it down would be straightforward, but while governments can certainly destroy or disable much of the globe's Internet infrastructure and inconvenience users, they cannot stop computers from communicating with one another. Because Bitcoin's computing requirements are as low as they are, and the value held in it is large enough to motivate people to try their best to maintain the network, it's likely that bitcoin transactions and blocks would continue to be generated through any kind of ban.

As Bitcoin continues to grow and attract more attention from the technical community, developers are innovating even further on the different ways to transmit Bitcoin data quicker and at lower costs. [Mesh networks](#) and [radio waves](#) are two of the most interesting examples, because they allow the use of the network even without a connection to the Internet. Even the absence of Internet capable devices is now not much of an impediment, as it is becoming easier to join the network with any device that can send and receive data. With the introduction of Bitcoin-specific satellites, the scale required of a government-sponsored attack continues to get exponentially larger.

Bitcoin has found a way to make access to a hard form of money globally available at a much lower cost than the previous alternative, gold. Since hard money is a hugely important and beneficial technology, people also have a strong incentive to meet the costs to be able to use this hard money. As time goes on, the liquidity and utility of bitcoin only increases, raising the incentive for people to use it and allowing them to overcome more and more serious barriers.

Ultimately, if Bitcoin provides value to its users, they will make the effort to ensure they are able to access it; that motivation, more than any technical aspect, is the real impediment to government attacks on Bitcoin. History provides many wonderful illustrations of the power of economic incentives and their ability to repeatedly overcome government regulations. A good introduction to this can be found in the great [book *Forty Centuries of Wage and Price Controls: How Not to Fight Inflation*](#). History clearly shows how such attempts fail, because government edicts cannot overturn economic reality; all they can do is change the economic cost/benefit to specific actions, and cause people to adjust their behavior accordingly to still get the benefits while trying to avoid the costs. This is why price controls lead to shortages, black markets, queuing costs, and conflict, but can never lead to a reduction in prices that the government purports to intend.

Far from an effective way to destroy Bitcoin, a government clampdown would arguably strengthen it by blatantly advertising its real potential and value proposition to the world. Government attacks on Bitcoin can only happen with restrictions on individual and financial freedom, which are the best reasons to buy bitcoin. The simple statist mind assumes that reality is subject to government orders: if government bans X then X ceases to exist. In reality, it just makes the provision of X much more profitable, and increases the levels of risk that people are willing to undertake in order to provide it. For example, a government order to stop banks from allowing their clients to use their balances to buy bitcoin might hurt Bitcoin in the short run, but it would be a great advertisement; it would clearly communicate to people that the money in their bank accounts is not theirs to spend as they please, and instead is the government's money which is limited to only government approved uses. As this reality begins to sink into people's minds, more and more will want to hold on to a monetary asset whose value is independent of government preferences and whims, and so the demand for bitcoin will likely rise (along with the profitability of supplying it).

An example of the counter-productivity of bans can be found in the drug war. For almost fifty years, the US government has killed and incarcerated millions of people in the US, Mexico, Colombia, Afghanistan, and many

other places in the world in a feeble attempt to stop drugs that can still be bought on the street of every US city. Drugs come from plants that need to be grown under the sun, then processed and shipped around the world through a long network of suppliers before reaching the end consumer. Drug distribution is a far more complicated and demanding task than distributing Bitcoin blocks, which don't need physical supply lines and can be transmitted over the simplest data transfer technologies available. While drugs give their users a large incentive to consume and pay for them, it is still arguably not as strong as the monetary and economic incentive to use bitcoin, which can be a matter of life and death for many people. With a stronger incentive than drugs, and an infinitely easier distribution mechanism, any government that tries to ban bitcoin has a seemingly impossible task.

Another non-trivial obstacle for a government attack to overcome is that Bitcoin has arguably become too politically ingrained to be the subject of a clampdown. I think this tipping point was reached during the bull market of 2017, when the mainstream of American society really started buying and holding bitcoin. This point was driven home to me during [the testimony of CFTC Commissioner Christopher Giancarlo to US Congress](#), when he explained how his niece was a hodler. It is extremely unlikely that members of Congress are going to pass laws that sic law enforcement against their own family and friends. Even the bankers that viscerally and rabidly hate Bitcoin are watching helplessly as their children's interest in it grows. As JP Morgan, one of the US government's largest welfare recipients, enters the world of shitcoinery, it is worth remembering the hysterical episodes their CEO had during 2017 every time he was asked about Bitcoin. In particular, it's worth remembering how clearly agitated he was when recounting that his daughter had bought bitcoin, likely at a time when its returns exceeded those of her father's own portfolio. While you would not put much past Dimon, it's safe to assume that using his political influence to have people like his own daughter thrown in jail is a stretch too far.

What this all means is that Bitcoin now has a motivated and very vocal small minority of the population interested in it. A motivated and organized minority is likely to get its way in US politics for the simple reason that it

cares more than other groups about its own issue, whereas the rest of the voters and special interest groups care about other issues. While people think of democracy as the rule of the majority, it is more accurate to think of it as the rule of the organized minorities. Corn farmers, for example, are a tiny fraction of the total population of the US but still manage to get enormous subsidies. Although these subsidies are a cost to everyone else in the US, they're a small cost to everyone; conversely, the benefit to corn farmers is massive, and they have every incentive to make it their prime voting and lobbying issue. From a politician's perspective, going with the corn lobbyists will get you votes and money, but going against it will only get you enemies and no supporters, because almost no one is hurt so much from corn subsidies to base their vote on it.

Bitcoin's motivated minority is growing into this kind of force in political systems worldwide. Any politician that attempts to clampdown on Bitcoin will be faced with indifference by the vast majority of the population, and strong opposition from bitcoiners.

My personal view is that in the last few years Bitcoin is a genie that has grown beyond the ability of governments to put it back in its bottle. The secret is out, and millions of people worldwide have heard of it and are interested in using it. They are willing to invest time and effort into ensuring it continues to be available for them. Government clampdowns may inflict suffering on individual bitcoiners, but I doubt that it will be able to kill Bitcoin itself.

Software bugs

Back in September of 2018, a bug was found in the code of Bitcoin Core versions 0.14 to 0.16.2 which could have allowed for increasing the total supply of bitcoins above 21 million. Had the bug been discovered by a malicious actor, they may have been able to use it to attack the network. [Jimmy Song has provided a great analysis](#) of this incident, and he

suggests that although the likely ramifications of exploiting this bug would have created problems for the network, it was unlikely to have been fatal.

Nonetheless, the episode made vivid one more type of threat afflicting bitcoin: malfunctioning code, or software bugs. Whether through an innocent mistake in the coding, or through the malevolent design of an attacker, it is not inconceivable that there could be problems with the Bitcoin code that could cause it to malfunction.

The threat of bugs and malfunction is far more serious for Bitcoin than for most other computer programs, because Bitcoin's value proposition depends on its immutability, reliability, and complete predictability. If it is evolving to fulfill the role of digital gold, then the most important characteristic Bitcoin needs to copy from gold is its constant reliability and predictable supply. A bug that hinders the operation of the software or allows some users to create more coins will severely compromise the network and the likelihood that it would continue to succeed in that digital gold role.

Rather than focus on the technical details of this bug and how it was fixed (which Jimmy's article discusses), I would like to focus on how Bitcoin's open source development counters this threat, and how individual users could help reduce the likelihood that it could affect them.

Linus Torvalds, the original creator of the Linux operating system, famously said that "with enough eyeballs, all bugs are rendered shallow"; and that is a great explanation of the prime value proposition of open source software. While open source software usually relies on the efforts of volunteers that are not paid to be fully focused professionally on the software, its collaborative nature can attract many people to review the code and improve it, which helps prevent critical bugs from emerging. This has proven a surprisingly successful and robust model. Whereas proprietary software development resorts to employing a few full-time highly focused individuals, open source development allows anyone to contribute and gives all users of the software the choice to adopt anyone's contributions. The process of constant innovation variation and user

selection creates a strong evolutionary pressure that drives the code's improvement.

Open source development is also a wonderful example of [Friedrich Hayek's concept of Spontaneous Order](#), or order that emerges not through any preconceived individual design, but through human action. [Vernon Smith builds on Hayek's work](#) to differentiate between two types of rationality in human affairs: constructivist rationality, and emergent rationality. Constructivist rationality refers to conscious human design to bring something into being; it is similar to designing a car, a house, or any technical object that requires top-down design. The triumph of enlightenment thinking and industrial revolution, while being enormously beneficial to humanity, has nonetheless created a bias in the mind of the educated to view everything as the result of constructivist rational design. But the majority of market and societal institutions were never top-down designed by one designer, they emerged over many years through the actions and interactions of individuals. Hayek argues that the majority of the human institutions that shape our lives, from language, to customs, to economic institutions, ethics, and manners, are all emergent products of human action, and not the conscious effort of human design.

This simple but powerful concept is pivotal in understanding how human society functions; it is also something that victims of state education have the most trouble comprehending, as statist education relies on convincing students that everything needs to be rationally planned and controlled. It is also essential in understanding how Bitcoin has continued to evolve after Satoshi left the project with nobody in charge of it. In the 8 years or so since he has disappeared, the bitcoin software has improved significantly, and yet no single individual can possibly be viewed as responsible for these changes. While each individual change to the software can be viewed as a product of rational design by one or a few programmers, the choice of which changes get adopted by users, how the changes build on one another, and the general direction of open source development are a complex and emergent result of the interaction of variations and individual choices.

This is one of the most infuriating aspects of Bitcoin to statisticians and people who have no familiarity with Austrian concepts of spontaneous and emergent order. Lawyers, Keynesians, and all manners of people in thrall of their powerful government are constantly seeking out the person in charge of Bitcoin, and try their best to demand someone be held legally responsible for it, attempting to corporatize Bitcoin's structure and have clear chains of command and responsibility. These people simply cannot understand the concept of voluntary collaboration, and that a user who downloads open source software does so at their own discretion, not at the responsibility of the person who volunteered their time to building it.

Bitcoin's lack of central control, and the absence of a constructivist rational approach to its programming, is far from a disadvantage; conversely, it is the most effective way for it to remain predictably neutral. This lack of central control also offers a huge edge for dealing with software bugs, because a wide variety of eyeballs from all over the world examine the code and try to find mistakes within it. This is the process that keeps all manner of open source software running, as mentioned by Linus, and in the case of Bitcoin the process is put on the powerful steroids of economic incentive of thousands of people who have a vested interest in Bitcoin succeeding.

In other words, what protects Bitcoin from software bugs, ultimately, is the economic incentive for its users to remove and deal with bugs as quickly as they emerge. And the recent bug is a good example of that. While it might have been theoretically possible for a well-funded attacker to exploit the bug, realistically it was highly unlikely due to the economic incentive for all Bitcoin users to detect these bugs before they can be exploited. Attacking Bitcoin offers very little economic reward, and so is unlikely to attract the same number of motivated eyeballs. An attack on Bitcoin is destined to be a top-down design with a few focused highly skilled individuals trying to execute it. Bitcoin's defense consists of many thousands of users and coders constantly vigilant and defending against anything bad happening.

As Jimmy concludes:

Bugs will always exist, but the important thing is to have a robust process for dealing with them. Open source software development has shown itself to be more reliable in the long run. Bitcoin adds to it strong economic incentives for many economic parties from developers to businesses to invest heavily in this process as well.

It is impossible to conclusively prove the absence of bugs in a piece of software, because one can only ever dismiss the bugs they can imagine, while the potential bugs are always larger than a single analyst's brain. It is nonetheless possible to have strong economic incentives for managing and dealing with these bugs. Beyond that, Bitcoin's extremely conservative and meticulous design itself ensures there is another layer of safety for dealing with any critical software failures: the ability to roll back the chain and return to the historical state before the bug had struck. This would likely mean that any critical bug will be temporary rather than permanent. If one were to compare this to aircraft maintenance, it would be akin to having a function that allows you to return a crashing flight to its pre-crash state and perform maintenance on it, inconveniencing the passengers rather than leading to their death.

The second point to take from this incident is about the speed at which Bitcoin software upgrades happen. For a project whose main value proposition is immutability, a case could be made that the current speed of upgrades and iterations in Bitcoin development is a little too fast; users might benefit from being slower with their upgrading, letting newer versions of software get tested slowly and gradually on progressively larger sections of the network nodes before they are widely adopted and accepted as stable.

There is currently no pressing need to upgrade Bitcoin or improve its capabilities. For what it does, it faces no serious competition from any digital currency. Its only competition are central banks and global gold shipments. It is far cheaper than both for what it does, and its current capacity for final settlement is unmatched.

Even by Bitcoin's proven existing capabilities of only half a million transactions per day, which it demonstrated it could safely carry out in December 2017, and even with transaction fees that are 10 times higher than the maximum they reached last December (i.e. even with a \$500 transaction fee), it is still a huge bargain for what it does; it could find significant demand either as a direct network for international payments, or as a settlement layer for a large network of Bitcoin full nodes that carry out the function of banks (either digitally or in physical locations).

There is no scaling crisis for these significant use cases, there is no impending technical threat that is likely to doom Bitcoin, and as such there are no compelling reasons why Bitcoin should change drastically from what it is currently. This is why, for users, it probably makes sense to be lagging adopters on minor updates, and to select for software versions with less frequent upgrades.

For bitcoin to succeed, it needs another, say, twenty years of functioning exactly as reliably as it has (and not necessarily at any larger scale) in order for it to be implanted in the mind of most adults as a simple and reliable boring piece of open source software that anyone can use in predictable ways. It will take a generation that has come to hear of the idea of a form of money that is not controlled by governments. It will, sadly, take the death of the most bitter elder nocoinsers, who amassed their wealth and credibility in the constructivist rational monetary policy era and who are wholly unwilling (and in many cases, incapable) to understand the certainty of hard digital money.

When people talk about the slow rate of bitcoin adoption, the limitation is never in software capabilities or scaling capacity. The market has shown consistent capacity for scaling solutions, both on-chain and off-chain. Demand for block space is an extremely competitive market, and geniuses are constantly innovating ways of utilizing it more efficiently. Even if Bitcoin successfully serves as a base layer for settlement, and secondary layer solutions develop on top of it, it would still be an enormous improvement over the current monetary system because it would be far more decentralized and harder to capture by government.

There is no pressing need to risk Bitcoin's progress toward fulfilling that use case in order to upgrade its technical capabilities.

Provided Bitcoin continues operating successfully, the delay in bitcoin adoption is purely a matter of time needing to do its inevitable thing and pass. It's the same reason any technology takes time to spread. Most users will never become technically competent enough to understand all the nuances of its functioning. But time is needed. People need to see the technology operating successfully, safely, reliably, and consistently for a significant period of time. Most people eventually got on airplanes not because they studied jet aviation, but because they had seen and heard of airplanes operating reliably for years before they got into them. Similarly, people will start to trust a digital form of storage not due to an extensive study of bitcoin and cryptography, but rather after seeing it work reliably for years for others.

The critical thing, then, is not scaling, privacy, or user-friendliness, the critical thing is Bitcoin's survival. The major milestone for Bitcoin is its ability to continue as one chain of undisputed transactions among its holders. This would mean that Bitcoin's governance and security system has succeeded at all times in achieving consensus among its participants on the validity of the ledger of transactions.

Failure of economic incentives

The Bank of International Settlement has recently [published a report](#) in which it concludes Bitcoin's incentives model is unsustainable and likely to lead to security failure if Bitcoin were to grow in economic importance. The report is largely based on a [recent paper by Chicago School economist Eric Budish](#), which finds that bitcoin's security model will be vulnerable to attack as the block reward shifts from offering mainly new coins, as is the case now, to consisting mainly of transaction fees, as is expected in the future.

The BIS fundamentally fails to understand that economics is based on a subjectivist conception of value, and not on an objectivist conception of value. This is the starting point of all disagreement in economics, and the underlying difference between correct Austrian economics and the fiat economics taught at universities and popularized by bureaucracies like the BIS.

As elucidated by the father of Austrian economics Carl Menger, all value is subjective and cannot exist outside of human consciousness. Objects have no value intrinsic to them, it is only human consciousness that prescribes value to them. Value is not an objective attribute of objects that can be calculated like mass, temperature, or volume. It cannot be computed objectively because it is constantly shifting in the human consciousness as time passes and conditions change. Value is determined at the margin, at the specific time and place that the valuing individual is making the decision.

On the contrary, all the main non-Austrian schools of economic thought hold value to be objectively determined. The Marxists think value is determined by labor inputs, while most other mainstream economists think of it as a function of production costs. These schools of thought conflate value with price, and thus assume that both are determined by the cost of production.

From the mainstream perspective, producers produce things at a certain cost, and consumers then need to pay that price to compensate them for these goods. From the Austrian perspective, humans subjectively value things, and producers try to supply them at that price.

Unsurprisingly, the BIS bases its critique on the work of a Chicago school economist. While Chicago economists are generally viewed as pro-free market, their strictly objectivist and positivist methodology has very little in common with the Austrians.

The paper makes the classic mistake of putting cost before value. In reality, there is no fixed bitcoin security expenditure that is needed for proof of work to successfully protect the network. It is the very fact that

people subjectively value bitcoin that creates demand for holding it and for transacting with it. The bitcoin asset cannot be owned outside of transactions confirmed in bitcoin blocks, which inevitably creates a market for this scarce block space. Bitcoin's difficulty adjustment algorithm ensures the scarcity of this block space (and thus the bitcoin token itself) by raising the hash power, and thus the cost, required to produce these blocks. The cost to produce bitcoin blocks is merely a reflection of the market's valuation of bitcoin, which is ultimately the subjective value people place on it when transacting with it on the market for other moneys or goods and services.

If the market places a value on bitcoin block space, an economic incentive will exist for miners to provide this block space securely. The manner in which users will pay for this block space may differ, but the cost is real nonetheless. In all markets, the presence of demand incentivizes entrepreneurs to find the most effective ways to provide the good that people want; the costs and the methods of payment can differ widely, but if the demand exists, the good will be supplied.

Consequently, if there is enough demand for holding bitcoin, then demand will exist for transacting it widely and people will pay the transaction fees necessary to get their transactions into blocks. The notion that block space will go unbid despite their desire to obtain and hold on to their bitcoin is absurd. The BIS emphasizes its deep ignorance of economics and prices when it presents a scenario in which demand for bitcoin is so high as to necessitate massive security expenditure, while demand for block space is nonexistent. In reality, the opposite is always the case. Block space is very scarce and people are constantly finding new ways to use it more resourcefully. This demand is inextricably linked to demand for bitcoin: if demand for bitcoin increases, transaction fees will go up and push scaling solutions onto the second layer, making on-chain transactions more valuable settlement transactions which can pay higher transaction fees.

Due to the difficulty adjustment algorithm, the cost of making a bitcoin block is always going to hover around the value of the total reward offered by the block (including the block reward and transaction fees). Given that

the average block today is around 1 MB of data and has a total reward of around \$200,000, the going rate for a single byte of data on the bitcoin blockchain is around \$0.2, making it the most expensive byte of data in the world. By comparison, a byte on a commercially available hard drive costs less than a trillionth of that.

Should demand for bitcoin exist, then demand for bitcoin blocksize must exist because it is the only way in which bitcoin can be owned and transacted. It is perfectly feasible, of course, that demand for bitcoin might one day decline, or even collapse. In such a case, it necessarily follows that bitcoin's value will decline enormously, and the value of its block space will follow. The network could fail due to a collapse in demand, as discussed in the sections below, but that is irrelevant to whether the mining is being rewarded mainly through inflation or transaction fees.

As it currently stands, compensation is incurred in the inflation that will dilute the value of your coins as a percentage of total bitcoins. Even if they don't think of it that way, it is happening. New coins come on the market every day and depress the price of existing coins, effectively devaluing holders' coins. In the future, the majority of the cost will shift toward the transaction fee needed to obtain your coin, and there is no reason to presume that the market participants who desire the block space necessary to own bitcoin would not pay for it using this other method. There is a real cost to bitcoin which holders are happy to incur because bitcoin is still useful even after taking these costs into account.

If users don't pay transaction fees, then miners won't solve the proof of work problems and transactions won't confirm. This will put pressure on coin owners to pay transaction fees so their transactions get confirmed, and fees will rise.

We already have evidence that strongly suggests bitcoin users will be happy to pay transaction fees. In December 2017 during the last bitcoin bull market, fees rose to around \$50 per transaction. Yet despite this increase, there was still very high demand for transactions, which suggests that if people want to hold hard money the transaction fee has a

lot of room to grow. If one were to look at the exchange fees people usually pay to buy bitcoin around the world, we find that they are usually much larger than the on-chain transaction fees. Bitcoiners still have no problem paying these extra fees, so it is hard to imagine them giving up on bitcoin because on-chain fees have increased. Premiums for buying bitcoin in places where exchanges do not operate are even higher, and it is not uncommon for buyers on localbitcoins to accept a 10 or 15% markup.

If my contention is correct that bitcoin is the hardest form of money ever invented, it is absolutely inconceivable that demand for it will be destroyed by people's realization that they cannot use this technology for free. Every form of money transfer will involve some transaction cost and bitcoin is no different. If people value bitcoin, the economic incentives of the system have proven resilient enough to motivate people to spend the resources needed to keep their network secure. If Bitcoin dies, it will not have died because of misaligned economic incentives (high transaction fees). It will have died because the demand for it has declined.

If demand for bitcoin declines or disappears, then the price will likely crash and Bitcoin will collapse and/or be attacked, regardless of if the miners are being paid in inflation or transaction fees. But if bitcoin continues to appreciate for the next 20 years, even at a rate no more than one tenth of its historical growth rate over the past ten years, it will become a global settlement network with value in the trillions of today's dollars. Would people not be willing to pay for the daily settlement of hundreds of billions of dollars across the world?

The best way to gauge the willingness to pay for these fees is to look at settlement costs across the world today. The only real alternative to a bitcoin payment, as a form of hard cash whose value isn't the liability of a government, is the settlement of gold cash reserves, a hugely expensive process. Bitcoin transaction fees are an inconsequential rounding error compared to gold transaction fees. Given the unique service it provides, there is enormous scope for the growth in transaction fees on top of the bitcoin network, which makes the BIS' concern trolling sound quite misplaced, if understandably motivated.

One counter-argument here is that transaction fees might provide some money to miners, but they will not be sufficient to attract enough mining hashpower to protect the network. The mistake here is to assume that a fixed amount of electricity or hashrate is needed to secure the network, when in reality no such stable level can exist because computing is a highly competitive industry where the cost of hashpower is always declining. The network hashpower that successfully protected Bitcoin from attack in 2014 is a tiny fraction of the total network hashrate today, and yet it was sufficient in 2014.

To be secure, Bitcoin does not need a fixed sum of electricity or hashrate; instead, it needs to create a liquid market in electricity and hashing power that constantly attracts a serious amount of capital infrastructure to produce mining hardware. By simply providing a highly liquid instrument as a reward for expending electricity and processing power, Bitcoin continues to attract the most efficient producers of electricity and processing power to monetize their resources. As long as this unique market continues to exist and offers valuable rewards, it will make any attack considerably expensive and unlikely to succeed. In particular, Bitcoin's unique impact on the electricity market, means that Bitcoin is an insatiable buyer of any cheap electricity that exists anywhere in the world. Whereas any attacker will need to mobilize enormous amounts of expensive energy in centralized locations to try to attack the network, Bitcoin can draw on the cheapest sources of energy in many locations worldwide by offering rewards for selling electricity that producers would not be able to sell elsewhere.

According to the BIS, the limit in bitcoin transaction fees is a result of bitcoin's inability to scale. The BIS divides an incorrect estimate for security costs by the number of transactions that bitcoin can perform to calculate the fixed cost per transaction. Since the bitcoin subsidy is scheduled to run out, they reason that the cost of securing the network will have to be divided by the number of transactions and that only if people pay that transaction fee will Bitcoin survive. This narrowly defined formula itself (let alone the incorrect cost estimate as discussed above) clearly shows that the BIS is unfamiliar with Bitcoin's layered scaling approach. The number of on-chain transactions is not a meaningful limit

to how many transactions can be carried out with bitcoin, because as explained in *The Bitcoin Standard*, Bitcoin's scaling will likely happen on second layer solutions, in a way somewhat similar to how gold banking scaled. Under a gold standard, not all transactions took place through physical gold moving hands. Physical gold was largely stored in banks, and for each movement of physical gold used to settle many transactions between financial institutions, financial instruments backed by that gold would change hands many times more. There is no reason why Bitcoin cannot scale like that, and in that case, each bitcoin transaction cannot be compared to individual consumer payments, but to large settlement payments between financial institutions. If each on-chain bitcoin transaction is settling for many thousands of individual consumer payments, then even infinitely tiny transaction fees on consumer payments could add up to very large fees for individual on-chain settlement payments.

The BIS here is making the mistake that many bitcoin purists often commit, which is to suppose that bitcoin can only succeed and operate if every interaction with it is entirely trustless and decentralized, and if every user is able to make a completely trustless permissionless payment on its main chain. While this sounds nice in principle, in reality the level of security of a bitcoin transaction is absurd overkill for the vast majority of transactions that humans conduct in everyday life, for which less reliable systems are acceptable (even with the occasional security failure). There is no need for a coffee salesman to require on-chain verification of your payment, and the current credit card payment system is much cheaper and faster; even with a regular amount of small fraud, it continues to be a more effective solution for small consumer payments. The value of Bitcoin's decentralization is not in that every consumer purchase is uncensorable and trustless, but rather that it helps the network resist government attack and capture. Some purists seem to think the choice we have is between a world in which everyone is able to trustlessly use Bitcoin's on-chain base layer for all their transactions (no matter how trivial), and a world in which only the base layer of bitcoin is trustless and other layers involve trusted third parties. If that indeed were the choice, any bitcoiner would of course prefer trustlessness for all. However,

engineering reality seems to suggest that the choice is actually between Bitcoin being trustless only at the base layer, or a fiat monetary system which is government-controlled at all layers.

If Bitcoin's "only" contribution is to make the world's monetary system's base layer and the money supply free from government control, that would be more than enough. The world of payment processing will vastly improve with a free market in banking and money, but even if nothing improves in it, bitcoin would still be a world-changing success.

Trustlessness and immutability are not simple engineering features that can be copied and replicated, and the only proven example of a trustless system we have so far is Bitcoin's on-chain transaction, with a capacity of around half a million transactions per day. The idea that we can scale that level of security is becoming less tenable with time, but that is not really a problem that hinders the core proposition of bitcoin. The level of security bitcoin provides is only really necessary for the most important transactions in the world, while current security arrangements are ok for most coffee purchases.

Beyond the economic incentives for mining bitcoin, the deeper web of economic incentives to run and maintain bitcoin is what makes such a failure unlikely, even if the BIS' economic analysis were correct. If Bitcoin's proof-of-work were to prove compromised after block subsidy diminishes, and if mining hashrate began to decline as the cost to the network of hashrate became more expensive, it would be a clear threat to bitcoin; in such a case, it should not be very difficult to get bitcoiners to agree on a fork that corrects this. Forks are extremely hard to implement with bitcoin for upgrades, but that would likely change in the case of emergencies.

Ultimately, doomsday scenarios in which Bitcoin fails due to a technical design glitch don't take into account the economic incentives to keep the system successfully running. As long as demand for digital hard money exists, many millions of people around the world are motivated to find solutions to continue to make it exist. Bitcoin has a very straightforward

technical requirement to operate, and it performs a very simple job that requires very little and has enormous incentives backing it.

Sound monetary policy

As discussed briefly in *The Bitcoin Standard*, the government policy that would likely be the most destructive to bitcoin would be implementing a gold standard similar to that of the end of the nineteenth century. All government restrictions on bitcoin are restrictions on financial freedom, and these are exactly what create demand for bitcoin, creating more incentives for people to use and hold bitcoin. Given that the technical requirements for operating bitcoin are increasingly simpler to attain, the government activities that aim to restrict bitcoin will inevitably result in more incentives for people to overcome these restrictions.

Contrary to the statist instinct to want to ban anything that sounds objectionable, the more effective path for governments to undermine bitcoin would be to undermine the economic incentive for people to use it, which would mean increasing the financial and monetary freedoms that individuals have. The monetary system that would allow governments to maintain some form of monetary control while allowing the largest margin for free market in money would be the adoption of the gold standard. While theoretically a government could introduce a hard money standard with its own currency, and commit to not increasing the supply beyond a specific percent, such a commitment will never be as credible as using gold as money and allowing redemption of government money into physical gold, offering everyone the ability to verify the gold backing, and tying government's hands. A government commitment to low inflation and relative financial freedom would likely prevent mass adoption, but actually returning to a gold standard could have more serious ramifications for bitcoin.

A world with a gold standard would look very different from today's world, particularly in terms of the role of government and the extent to which it

would intervene in its citizens' lives. If one thinks of the main drivers of bitcoin adoption, none of these existed under the gold standard.

Under the gold standard, there were no examples of hyperinflation or high inflation as we witness across the world today, driving significant demand for bitcoin. Governments were highly unlikely to impose high taxes that would provide a very large incentive for storing wealth in moneys outside the reach of the state. The notion of a war on drugs or chemicals was an absurd idea at that time, as governments could not finance such ridiculously unproductive nanny policing and the heavy cost it inflicts on society. Arguably, as discussed in Chapter 8 of *The Bitcoin Standard*, it is the absence of a politically-neutral market-chosen medium of exchange, that is at the root of financial markets becoming highly volatile markets for short-term gambling rather than a mechanism for the long-term allocation of capital, as it was in the gold standard era. I would argue that a move back to hard money would even seriously curb the gambling instinct that has driven much of the demand for bitcoin. In a society with hard money, people are likely to be far more discerning with allocating their hard money and as a result, the demand for experimental highly volatile digital cash is likely to be lower.

A move to a gold standard would undermine all of these drivers of bitcoin adoption, and it remains an open question whether in such a world demand for bitcoin would be enough to prevent attacks and secure the network.

While many bitcoiners are dismissive of the monetary role of gold as being an analog heavy inefficient version of bitcoin, I would urge them to be more cautious, as gold has been written off many times before, and yet it has been playing a monetary role for thousands of years, and there are good reasons to still believe its days are not over yet.

Gold currently has a far larger liquidity pool than bitcoin. The value of all the mined gold stored and held is in the range of around \$10 Trillion, more than 10 times larger than the value that is stored in all the bitcoins currently in circulation. This very large pool of liquidity means gold currently has more salability than bitcoin. In other words, for someone

looking to buy or sell something, the probability that they will find a counterparty for that trade willing to pay or accept gold is far larger than the chance of finding someone willing to pay or accept bitcoin. A move to gold would be far more palatable for the majority of the world's population, since they either own gold or currencies backed by gold.

Gold also has a 6,000 year first mover advantage over bitcoin, it is easier and more intuitive for people to understand trade in gold coins or gold-backed assets. Handling private keys securely is not exactly very easy, and is arguably outside the scope of technical competence of many, if not a majority of, people alive today. Such objections have been leveled at every new technology, of course, but in many cases people have learned to use difficult new technologies like cars, computers, and phones because it was very useful. Bitcoin might well turn out the same, over time, but there is one factor that makes this trickier: competence in the use of bitcoin is related to competence in programming, a highly specialized field in which the highest levels of competence are concentrated in a very small number of people. The hierarchical nature of this knowledge means the vast majority of people will always be at a strategic disadvantage compared to a small number of people with much better technical skills. Even though the code is open source and people can verify it before they run it, the ability to understand and operate the code will never be equally distributed. It might just be the case that this kind of asymmetry in knowledge and competence will lead to the constant proliferation of scams, thefts, and hacks that prevent the widespread adoption of bitcoin and keeps it on the fringes. The sounder the government-offered monetary alternative, the less likely such burdens are to be overcome. A return to the gold standard offers the best chance for a government-controlled monetary system to survive the threat of bitcoin.

A gold standard would curtail the ability of government to intervene in the banking system and protect incumbents from outsiders, which would likely unleash innovation and experimentation in financial systems. With free market competition and innovation, it is not difficult to imagine the development of highly convenient payment technologies backed by gold. There is no reason that any of the modern payment innovations

developed over fiat money and digital currencies cannot be implemented on top of gold, with 100% reserve backing.

How realistic is this threat to bitcoin? For starters, even if this were to all come to pass, it might just delay the adoption of bitcoin, but not change the long-term reality that would arguably be dictated by the higher stock-to-flow ratio of bitcoin. Even if new adoption of bitcoin slows down considerably, and there are significant crashes in the price, the slow increase in the supply will still make bitcoin likely to recover and appreciate in the long run and hold value better than more inflationary alternatives.

Is there a possibility of a return to the gold standard? Politically, democratically and intellectually, no. Modern political institutions, academia, media, and public opinion are largely shaped by Keynesians and statists. The monetary role of gold is viewed with scorn and disdain among the vast majority of the educated and influential members of society. There are simply too many Kenneth Rogoffs, Paul Krugmans, and David Graebers selling people the delusion that government control of money and banking is an improvement over having the free market select the hardest money. Those people will never believe in gold, and will continue to shape public opinion and political power toward centralization and political control and monopolies over money. The corporate interests that benefit from easy money are far too strong to imagine any kind of monetary reform emerging from the political process.

Failure on the free market

While bitcoin is indeed free market money, it does not necessarily follow that bitcoin would succeed on a free market for money. The longer I think of this, the more I begin to consider the possibility that bitcoin is a free market solution to the problem of government control over money, but it is not necessarily the money that would be chosen on a market free of government control. For as long as governments place restrictions on

money, bitcoin can thrive as a method of going around them, but if these restrictions are eased, that might deprive bitcoin of the oxygen it needs, demand for going around monetary restrictions.

Bitcoin is a technology built and optimized for one design consideration: resisting government capture, and nothing else. Bitcoin is not optimized for user experience, convenience, or speed of use; it sacrifices all these considerations to achieve immutability and resistance to censorship. This is extremely valuable in a world in which governments restrict individuals' monetary freedom, but how valuable is it in a world in which they do not?

The problem of bitcoin adoption is different from the adoption of any other technology or application in that bitcoin's adoption involves decisions about liquidity and cash balances. People cannot just wake up one morning and decide to only deal with bitcoin, they have obligations to pay or be paid in different currencies, and they have savings accumulated in different currencies. They want to maximize their chances of being able to pay the money that their sellers want in exchange for their goods, and to be paid the money that buyers want to pay them. An individual's choice of medium of exchange is primarily determined by the differing liquidity pools around them, or the different degrees of salability for different moneys, as explained by Menger and discussed in more detail in *The Bitcoin Standard*. An individual's choice of money is likely to be the money that has the largest pool of liquidity, allowing the individual the largest number of trading opportunities, and providing them the best chance of exchanging their goods with the least loss of value.

Salability is also a self-reinforcing trend, as was illustrated by gold and silver in the nineteenth century, and also explained in *The Bitcoin Standard*. A money with larger salability will be likely to be more attractive as a store of value than a money with less salability, and that in turn will lead to the more salable money becoming even more salable, while the less salable money continues to lose its salability.

Consider for a moment the possibility that bitcoin does indeed succeed in destroying government fiat currencies through speculative attacks, in a manner similar to the second scenario discussed above. Or consider the

possibility that governments move toward freer banking and a competitive monetary system, without moving to a gold standard, but by allowing individual enterprise to provide consumers with a wide variety of choices in their monetary medium. In other words, imagine a completely free market in the choice of money, and try to imagine the consequences it would have for bitcoin.

In such a free market, individuals will choose the money which they find to be the most saleable, and most likely to be exchanged for other goods and services. As it stands, the total value of over-ground mined gold, or the global liquidity pool of gold, is around 100 times larger than the total value of mined bitcoin, or the global liquidity pool of bitcoin. This is a natural outcome of gold's huge 6,000-year first-mover-advantage over bitcoin. Gold has been produced all over the world for millennia and is an indelible part of all human cultures that have viewed it as precious. Today it continues to be held by central banks, but also, is widely used as a store of value and medium of exchange all over the world. Gold is still the dowry necessary to get married all over the world. The majority of humans own some gold, either in the form of coins, bars, or jewelry. In a situation in which alternatives collapse, people are far more likely to go back to trading in gold because of the properties that gave it its monetary role in the first place, but more importantly perhaps, because of the very large pool of liquidity that has been accumulating over thousands of years.

The implication of this is that for the average individual who wants to sell a good or service in a post-fiat world the likelihood that their counterparty will have gold to pay is roughly 100 times the likelihood that they would have bitcoin to pay. That makes each individual far more likely to want to accept gold as money than bitcoin, and that, in turn reinforces the same trend with all other individuals.

As it stands, a free market in money is not likely to be beneficial to bitcoin, because in the one metric that matters most, liquidity, bitcoin is incomparable to gold. Bitcoin needs government controls and restrictions to drive demand for it. The freer the global market for money, the more likely that any monetary competition will lead to gold winning in a winner-

take-all scenario similar to how the nineteenth century competition between gold and silver unfolded. For bitcoin to have a chance, it needs government laws and restrictions to continue to drive people to look for hard money alternatives, thus increasing its value and the size of its pool of liquidity.

Beyond liquidity, and when it comes to issues of ease of use, many bitcoin promoters seem a little too enthusiastic in their assumptions on the ease of using bitcoin, and how willing people are to learn them. While I entirely agree that these technical barriers will be overcome by people who need to get around government restrictions, I am not sure there is a strong enough motivation to learn them in a world where these restrictions don't exist and people can default to using gold in all its tried and tested familiarity.

The non-digital nature of gold, and its physical heft and high cost of transfer compared to bitcoin are not serious obstacles for gold regaining a monetary role on a free market, they are only obstacles to the extent that they allow governments to prevent a global banking system to emerge around gold. In a free market, there is no reason that the most advanced payment technology implemented over fiat money or bitcoin could be used on top of gold. Instant digital payments with very few settlement transactions in physical gold are pretty straightforward to build from an engineering perspective, the real barrier to their development has always been political. In a world in which government restrictions on money disappear, the development of a gold-based financial infrastructure is likely to be faster and more advanced than a bitcoin-based financial infrastructure, because of the larger liquidity of gold attracting more development and investment.

Ironically, it appears that bitcoin is dependent on the governments it was built to counter for its survival. A world without government abuse of money is a world in which bitcoin is superfluous, and monetary tradition and history will likely move us back to a gold-based monetary standard. For bitcoin to continue to succeed and grow, it requires governments to continue to follow bad monetary policies that drive people to hold more

bitcoin, raising its price, increasing the pool of liquidity, making it more likely for others to join this pool of liquidity.

The longer that bad government monetary policy continues, the more liquidity bitcoin is likely to amass, the closer it gets to gold's liquidity, and the better its chances of unseating gold as humanity's prime money in a free market. The more governments reform their monetary policies and allow their citizens financial freedom, the less demand there is for bitcoin, and the less likely bitcoin's network is to grow.

Bitcoin's survival and success is more likely in the scenarios in which the world's central banks' policies are similar to those that have prevailed over the past few decades, not much worse or better. Improvements in central banks' monetary policies, lower inflation and fewer business cycles would likely reduce demand for bitcoin. A severe worsening of monetary policy which would lead to more widespread collapse of national currencies could also jeopardize bitcoin if it results in more free market competition between monetary alternatives without government intervention, at a time when bitcoin still has very little global liquidity. The good news for bitcoin is that the most likely courses of action for governments for the foreseeable future are in its favor. The bad news for bitcoin is that by being built to resist government control, it is inevitably and inextricably affected by how governments behave, and might in fact be reliant on their monetary policies not improving or deteriorating too much for its survival.

THE END