

Split Rock Capital Management

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March 31st, 2018

To: All Investors

Re: Annual Letter 2017, Letter to Investors

Dear Investors:

In 2017 Split Rock Capital Management returned 18.47% net of fees.¹ Our annualized return since inception is 14.79% vs 17.06% for the S&P 500 during the same time period.

Year	S&P 500 ²	Split Rock (Gross)	Split Rock (Net) ³
2015 ⁴	1.18%	(0.42%)	(0.47%)
2016	11.96%	13.19%	12.19%
2017	21.87%	19.47%	18.47%
Cumulative Return Since Inception	38.05%	34.66%	32.61%
Annualized Return Since Inception	17.06%	15.65%	14.79%

**Please refer to the disclosures (1, 2, 3, and 4) at the end of this letter as well as the disclaimer on the page 81*

**All results have not been audited*

As this letter is quite long (main body is 50 pages -- 80 pages when including footnotes!), we have provided a **one-page** summary of this letter on the next page. We have also included a table of contents for your convenience.

Summary

“I have studied [liquidity traps](#) for years, but they still confuse me. I sometimes think that monetary policy in a liquidity trap is the hardest thing to understand short of quantum mechanics” – Scott Sumner⁵

We start off our letter by covering the basics of money printing, helicopter money, debt reduction, the interaction between the Federal Reserve and the Treasury, as well as a brief discussion of past monetary regimes (specifically the gold standard). We next move on to topics we covered in our [2016 Annual Letter](#). In that letter, we predicted that interest rates will remain low and asset prices (P/E multiples) will remain high and potentially even increase. We haven't changed our conclusions; however, we've refined our reasoning a bit. In our 2016 Annual Letter, we noted that the high level of debt around the world is keeping interest rates low.⁶ We've evolved our reasoning a bit since then: while these debt levels are critical factors in causing the current low interest rates, other factors are potentially *more* important. In this letter we explore some of those other factors. In particular, we look into the idea of replacing the Fed's dual mandate with an N.G.D.P. level targeting regime and how such a regime could potentially let the Fed override any deflationary forces being caused by the debt overhang. In particular, we note that the Fed has been too tight with its monetary policy for much of the last decade and, as a result, has inadvertently kept interest rates low. It is our contention that rates are low, not because of the excess money the Fed has printed, but because the Fed hasn't printed enough money. Furthermore, rates are low because the Fed has not been clear about its future intentions. If *more* permanent money had been printed, then growth rates and interest rates would be higher.⁷

For much of the past decade, whenever the Fed has tightened, we've seen bond yields fall on the long end of the curve. This is because the Fed is tightening too quickly relative to economic conditions, and the market (correctly) sees that this will likely lead to slower economic growth going forward. On one extreme: if QE had *not* been implemented, the U.S. economy would've experienced a severe depression and long-term rates would've fallen much lower than they did. QE certainly did some good. It got the U.S. into the positive interest rate territory of around 2% to 3%. That said, on the other extreme: if there was *even more QE*, and it was implemented with the notion of keeping the money printing *permanent*, then ~5% N.G.D.P. growth and ~5% interest rates could have been achieved. Growth would be higher and debt levels would've been reduced. We would prefer: 1) faster earnings growth, higher interest rates and *lower* multiples (akin to our 5%/5% scenario above) over 2) lower earnings growth, lower interest rates and *higher* multiples (i.e. what actually occurred in the 2008 to present period).

In this letter, we also explore the contrarian concept that the Fed's recent tightening is actually leading to *higher* multiples (i.e. higher P/E ratios). Our logic is as follows: tightening reduces future economic growth, which in turn leads to lower long-term interest rates, which in turn leads to higher multiples. If the Fed had kept conditions looser, then economic growth would have increased, interest rates would have increased, and multiples would have decreased (though stock prices could still rise via earnings rising in tandem with the higher economic growth). The Fed is potentially causing asset bubbles by prematurely unwinding its balance sheet. We believe the Fed will likely remain too tight in the future and therefore we expect elevated multiples (or even higher multiples) to persist.⁸ We remain fully invested in equities.⁹

In the final sections of this letter, we cover a plethora of topics including: debt levels and monetary policy in both Japan and the EU; a historical look at the last time the Fed significantly expanded its balance sheet during the Great Depression and World War II; the basics of the capital ratio and its effect on the safety of the banking system; a look at the causes of the 1970s inflation and whether a repeat of higher inflation is likely in the near future; and finally, a look at our preferred metric of human wellbeing: real G.D.P. per capita, as well as factors that affect this metric.

We are indebted to the original thinkers who came up with these ideas. Very few of these ideas are our own. In particular, we'd like to thank [JP Koning](#) and [David Beckworth](#), who both lent out personalized advice that contributed to many of the ideas in this letter. We are thankful for their services and recommend their writings.

Sincerely,

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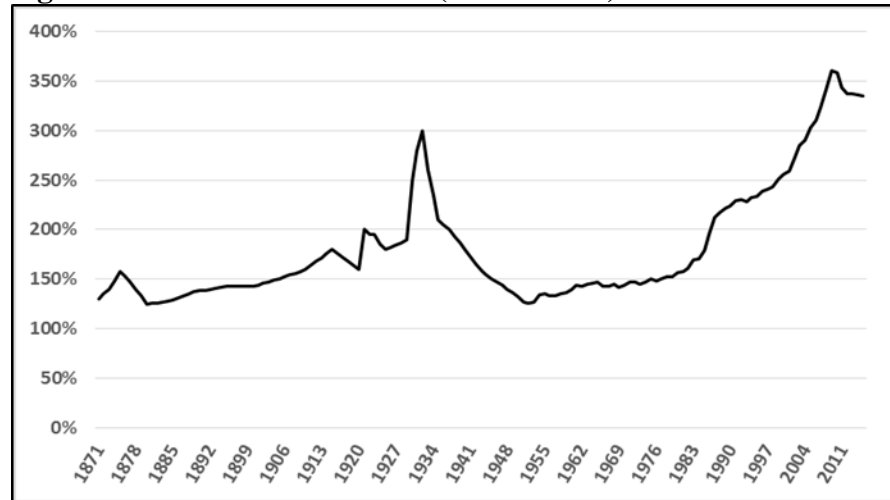
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Chapter 1: Debt Reduction and Money Printing

We begin by re-posting the total debt-to-G.D.P. chart we first introduced in our [2016 Annual Letter](#). This total debt number includes both the “government debt” figure as well as the less cited “private debt” figure.

Figure 1: Total Debt-to-G.D.P. (1871 – 2016)¹⁰



The first thing to note is that the U.S. has had two peaks in the debt cycle in the last century. The central message of our 2016 Annual Letter was that these high levels of debt tend to keep growth rates low and interest rates low.¹¹ In recent years the propensity to save has increased and the propensity to invest has decreased. Both of these phenomena are related and are driven, at least partially, by the high levels of both private and public debt existing throughout the world. In this letter, we will explain possible ways in which these debts may be reduced.

Paying down debt is accomplished in one of three ways: 1) austerity/savings 2) debt write-offs or 3) money printing. We should note that it is not always clear whether a given policy falls solely into one of the three categories. For example, it is possible for a policy to have elements of austerity, debt write-offs and money printing. For ease of discussion we draw clear distinctions in the explanations below. In practice, implemented policies are rarely as clearly defined.¹²

- 1) **Austerity:** This method of debt reduction is accomplished by spending less than one's income and putting the balance toward paying down debts. It should be noted that austerity becomes difficult and impractical as absolute levels of debt continue to rise. Paying down debts of \$10,000 on a \$50,000 salary is reasonable. The consumer spends \$48,000 per year and puts the remaining \$2,000 toward reduction of the \$10,000 debt. In five years the debt is fully paid off (to keep our example simple we'll ignore interest payments). Conversely, paying down debts of \$10,000,000 on the same \$50,000 salary is not practical. Assuming the consumer dedicates his entire salary towards debt repayment, it would still take 200 years to repay his debt! The U.S. economy is somewhere in between these two extremes.

One of the negative aspects of austerity for a national economy is the possibility that the debt-to-G.D.P. ratio may *rise* if too much austerity is applied too quickly. Under extreme austerity, while the numerator (debt in dollars) may stay the same or drop, the denominator (G.D.P.) may drop at a *faster* rate than total debt. In this case, the debt-to-G.D.P. ratio will actually *rise*, despite a reduction in the nominal dollar amount of debt. An example of this scenario occurred in late 2008 and early 2009. Total debt in nominal terms essentially stayed flat, changing from \$52.99T in 2008 Q3 to \$53.02 trillion in 2009 Q2. However G.D.P. *dropped* from \$14.84 trillion in 2008 Q3 to \$14.34 trillion in 2009 Q2.¹³ This led to a *rise* in the debt-to-G.D.P. ratio despite nominal debt levels remaining *flat* (357% debt-to-G.D.P. in 2008 Q3 vs. 369% debt-to-G.D.P. in 2009 Q2). The Great Depression was an extreme example of debt-to-G.D.P. rising in a deflationary environment. While nominal debt levels dropped approximately 33% from 1929 to the end of

1932, G.D.P. dropped a staggering 43% which led to an *increase* in the debt-to-G.D.P. ratio (less than 250% in 1929 vs. 300% in 1932).¹⁴

These examples illustrate the practical limits of austerity. It is a reasonable solution if applied slowly over many years or decades. In addition, the government usually needs to step in and *increase* its debt in order to partially offset the concurrent reduction in private debt. In 2008 the U.S. government did just this. Before the crisis, in 2008 Q1, Private debt was 289% of G.D.P., and public debt was 63% of G.D.P. Currently, private debt is 230% of G.D.P., and public debt is 99% of G.D.P.¹⁵ Without this increase in government debt, it is likely that the U.S. would have experienced another depression on par with the Great Depression of the 1930s.¹⁶

- 2) **Debt write-off:** Debt write-offs involve the cancelling or restructuring of debt. The consumer in our previous example (with \$10,000,000 in debt on a \$50,000 salary) would likely either: 1) renegotiate with the creditor or 2) declare bankruptcy (which, in a sense, is forcing the creditor to renegotiate since he will receive only a small fraction of the original loan). Both the creditor and debtor realize that full payment of the debt is not possible and therefore it is in both parties' interest to arrive at an agreement that allows for at least partial re-payment of the original debt. In theory, there are few limits to how much debt can be written off and, while the mechanics of writing off debt for a national economy are more complicated and unclear, it remains a possible path forward for debt reduction.
- 3) **Money Printing:** The third method of debt reduction is for the government to print money. Since most U.S. debts are owed in fixed dollar amounts, the U.S. government could print new money and hand it directly to the public. It is hoped that the public will use this newly printed money to reduce their private debt burden.¹⁷ The knock-on effects of the reduction in private debt could potentially set the stage for higher growth rates and higher interest rates going forward.

For the purposes of this letter we are going to divide money printing into two categories: 1) temporary money printing and 2) permanent money printing.

- 1) **Temporary Money Printing:** Imagine a scenario where the government promises to print \$15 trillion dollars and spread it out equally amongst every citizen in the country. However, in addition, the government also mentions that in one year's time, this money will be removed as every citizen will be taxed an equal portion of their share of the \$15 trillion. Would any inflation result? Would citizens use any of this money to pay down debts?

It is our contention that most citizens would save (and not spend) the money in order to pay the taxes that come due in one year. This example illustrates that only looking at the amount of money printed doesn't necessarily say much as to the likelihood of future inflation. In this example, any money that was printed is unlikely to be spent (or used to pay down debts). Money that goes unspent has very little effect on inflation. Alternatively, if the government increased the money supply by \$15 Trillion but then immediately buried it in the ground forever, then here too, inflation would be unlikely. Again, inflation only results if spending increases.¹⁸ Under many circumstances, an increase in the money supply also increases spending, but not always (as we've seen since 2008).¹⁹ Therefore, in order for the public to begin spending more money they must *believe* that any new money that is printed will be permanent. If they believe an episode of money printing will only be temporary, then no increases in spending will occur, and therefore, no rise in inflation is likely to occur.

In the United States, the public has indicated that it does *not* believe that QE will be very permanent (and they've largely been proven right). While the Fed's balance sheet has increased substantially, the Fed has already begun the unwinding process. It remains unclear how much of QE will be permanent, but it is clear that a nontrivial portion of the printed money will indeed turn out to have been temporary.

- 2) *Permanent Money Printing* – Using our example above, if the Fed printed \$15 trillion but this time made it clear that it would leave all the money in the system permanently, then inflation would likely result rapidly. Such a large increase in the money supply would immediately reduce the demand for money and increase spending/debt repayment as velocity increases and citizens spend more freely in anticipation of higher inflation (and as they spend, they help create the inflation they are anticipating resulting in a spending/inflation feedback loop). Again, the Fed must make it clear that the money printing will be permanent in order for inflation to ensue. If it is in fact temporary, then extending the length of time that money is left in the system could have marginal effects on inflation. That is to say: money left in the system for 20 years will tend to increase inflation more than money left in the system for 1 year. However true permanence is what is needed to really stoke inflation. We saw this when FDR permanently devalued the dollar vs gold in 1934. It was clear that there was no going back to \$20.67 per ounce of gold, and that \$35 per ounce was the new standard. This had the almost immediate effect of rising the inflation rate.

A Note on Fiscal Policy and Helicopter Money

Fiscal policy can sometimes be considered money printing, but this is not always the case.²⁰ Under fiscal policy stimulus, the government increases its debt outstanding by selling treasury bonds to the public and spending the proceeds on various government projects/expenses (which has a stimulative affect).²¹ However, here again, whether the public believes the fiscal stimulus will be permanent or not has a large effect on growth rates.²² If the public is confident that a large part of this newly issued debt will be monetized by the central bank (making the fiscal stimulus permanent) then inflation will likely rise. However, if the central bank makes it clear that it will not monetize the government debt, then the government will have to pay down the debt via austerity at some point in the future, thus rendering the fiscal stimulus as temporary.²³ This will keep inflation and growth expectations muted.²⁴

Under one version of helicopter money, the Fed would print money and give it directly to the citizens (we cover the basics of the Fed, Treasury, open market operations, QE, etc. later in chapters 2 through 4).²⁵ This would remove the banking system as an intermediary and could potentially increase the effectiveness of money printing especially when compared to standard monetary policy implemented via open market operations. Under an alternative (and more likely) plan, the Treasury could also give money directly to the citizens via a tax refund, etc.²⁶ While helicopter money is an interesting concept, the main driving factor influencing the effectiveness of helicopter money is whether the public believes the money will be permanently left in the system.²⁷ The method of money printing (whether it is open market operations, quantitative easing, helicopter money, or fiscal deficits) is of secondary importance.²⁸ Open market operations/QE has the capacity to create an unlimited amount of money and would be our first choice for most forms of money printing.^{29 30}

Chapter 2: Central Banks, Treasury Departments and How Money is Created

We will start this chapter with the high-level concepts of money printing and the economy and get into progressively more detail in later chapters. We begin by outlining the often confusing and complicated interaction between the Federal Reserve and the U.S. Treasury. In addition, we explore how this partnership creates money and of inflation.

We will start with a very simple example economy. Let's assume we have an economy that produces 100 widgets a year and has \$100 in currency floating around in its economy that its citizens use for transactions. If each dollar is used once a year to buy a widget, then each widget would cost $100 \text{ widgets} / \$100 = \1 per widget.³¹ Now let's add in some growth assumptions. We'll assume the population of workers who produce these widgets grows at 1% a year. In addition, because of advances in technology, best practices etc., the economy increases its *per worker* production of widgets by 2% a year (referred to as productivity growth and commonly approximated by the "real G.D.P. per capita" metric). Adding these two together means our economy will produce widgets at an annual rate of about $100 * 1.03 = 103$ widgets after one year, $103 * 1.03 \approx 106$ widgets after two years, etc. Assuming no new money is created, the price of these widgets would be $\$100 / 103 \text{ widgets} \approx 97$ cents per widget after the first year and $\$100 / 106 \text{ widgets} \approx 94$ cents per widget after the second year, etc. This scenario outlined here is **deflationary** in nature, meaning the prices of goods are dropping in terms in dollars.

If we want **flat prices**, we would want the money supply to match the number of widgets produced. In this case, we would need to increase money production by 3% every year to keep the price of one widget constant. With a 3% per year increase in widget production, we would need a total money supply of \$103 dollars after the first year ($\$103 / 103 \text{ widgets} = \text{constant } \1 per widget) and \$106 dollars after the second year ($\$106 / 106 \text{ widgets} \approx \text{constant } \1 per widget), etc. The period from 1800 to 1900 in the United States closely matches this scenario, with the dollar linked to gold and with the gold supply growing on average 1% and 3% annually. For the one obligatory cryptocurrency reference in our letter: It is important to note the differences between gold, which does not have a fixed supply and something like Bitcoin, which has a fixed supply of 21 million coins. In the (unlikely) event that Bitcoin became a national or global currency, any economy using Bitcoin would not experience the leveling of prices that we saw under the classic gold standard in the 1800s.³² Instead prices would drop by approximately 3% a year (2% productivity +1% population growth) as we explained in the "deflationary" paragraph above.

If we wanted to demonstrate the **inflationary** scenario most of us are familiar with, we would want the annual increase in money production to be *larger* than the annual increase in widget production. The U.S. has averaged about 3% annual inflation for the past century. To approximate this result, we would want money production to average about 6% annually. After the first year, widgets would cost $\$106 / 103 \text{ widgets} \approx \1.03 per widget. After the second year, widgets would cost approximately $\$112 / 106 \approx \1.06 , etc. Again, every year 3% more widgets are produced than the year previous, the prices per widget are also rising approximately 3% per year, and therefore the total money in the economy is rising at about 6% per year. In this case, the total spending growth in the economy of 6% per year is analogous to nominal G.D.P. growth for larger economies.³³ While this example is overly simplistic, the annual percentage increases in population, productivity and money supply closely approximate the situation in the U.S. over the past century.

We should also note the differences between the flow of money (G.D.P.) vs total wealth. In general, G.D.P. measures the flow of money in the economy whereas wealth is calculated by subtracting the total liabilities from the total assets from the economy as a whole.^{34 35} In our "inflationary" example above, after year 3, the economy is producing at an annualized rate of $1.03^3 \approx 109$ widgets per year, with a price per widget of about \$1.09. Assuming all of these are sold immediately, the G.D.P. in this case would be $109 \text{ widgets produced} * \$1.09 \text{ per widget} \approx \119 . For simplicities sake, we will assume that the widgets last for a long time (don't depreciate), and that no widgets are lost or destroyed. With these assumptions, we can calculate the net wealth of the society at the end of year 3. Over the entire three-year period, approximately $100 + 103 + 106 = 309$ widgets have been made in total, with each widget being worth about \$1.09. Our total wealth in this case would be $309 * \$1.09 \approx \338 .³⁶ Our wealth to income ratio would be $\$338 / \$119 = 2.8$. For reference, current US G.D.P. is about \$19.7 trillion, whereas total wealth is \$98.7 trillion, resulting in a wealth to income ratio of about $\$98.7 \text{ trillion} / \$19.7 \text{ trillion} = 5.0$.³⁷

The Treasury

We will add the next level of detail to our simple economy and address how this 6% annual increase in money supply will be achieved. Let's first add an assumption that our economy has a government that provides basic services. Let's also assume this government spends about 20% of G.D.P. on these services, which works out to \$20 of government spending in the first year. By the second year, government spending has increased in proportion to the increase in nominal G.D.P. and therefore the government spending in the second year is $\$20 * 1.06 = \21.20 .

Included in our government, is a department that is responsible for money production. We'll call this department the Treasury. Every year, the Treasury is assigned the task of producing 6% more pieces of paper currency than the year prior. Since our economy is relatively simple and has no major fluctuations, their job is relatively easy.

Most of the time, 3% per year inflation is an acceptable level of inflation for most citizens. In developed countries, more extreme numbers such as 20% annual inflation have been shown to *not* be generally accepted among voters. In theory, while governments could tax at 10% of G.D.P. and spend at 30% of G.D.P. (which would likely, though not certainly, result in $\approx 20\%$ per year inflation), the citizens of most developed countries usually vote out of power any government that consistently has annual inflation rates of above 3% to 5%.^{38 39}

In addition to the printing of money, the Treasury is also able to temporarily increase government spending by taking on government debt. In our simple example, let's assume that the government has a special project that will have a one-time cost of 10% of G.D.P. The citizens are unwilling to have a sudden one-time bump in taxes amounting to 10% of G.D.P. Instead they want to pay for the project over a 10-year period. To finance the project, the government takes out a loan, which is accomplished by the selling of Treasury bonds to the public. By selling these bonds, the government receives dollars in the amount of 10% of G.D.P., up front to pay for the project. By increasing taxes only slightly (1% to 2% of G.D.P. per year for 10 years), the government can smooth out tax payments for the population and pay for the project in a more orderly fashion. Government debt will increase to 10% of G.D.P. at the beginning of the project, but this debt is gradually reduced as the annual net positive balance of tax receipts is used to pay down the debt over the next decade.

The fact that the debt must be repaid leads to the important point that it is not necessarily government debts that directly cause inflation. The only cause of long-term sustained inflation is the monetization of government debts. How government deficits are financed is important. If the government issues \$1 trillion in new bonds to pay for expenses, but the public is the only buyer of these bonds, then very little inflation will result, despite the federal debt increasing. However, on the other extreme, if the \$1 trillion in bonds is bought completely by the Federal Reserve (As explained in the next paragraph, when the Fed buys these bonds it must print money to pay for them) then inflation is much more likely, especially if the Fed plans to hold these bonds permanently. Fiscal Deficits and government debt are not necessarily a sign of upcoming inflation. It is the permanent monetization of these debts, by the Fed, that is the primary cause of inflation. Again, if the public is the only buyer of these treasuries, then less inflation is likely to occur.⁴⁰

The Federal Reserve

In our example thus far, we've established a basic government that can print money as well as take on debts to cover expenses. However, after a few years, the government realizes that while inflation is under control at present, it might be a good idea to implement another check on the Treasury's ability to print money and further ensure that the printing presses aren't abused in the future. To this end, the government decides to separate the ability to print money from the organizations responsible for spending money. This is accomplished through the establishment of an independent central bank which we will call the Federal Reserve. It should be noted that there are other reasons why central banks are created, such as a lender of last resort during a crisis, acting as a central clearinghouse, etc. We explore these more in the footnotes.^{41 42}

In our example, the currency previously created by the Treasury is replaced with a new currency printed by the Federal Reserve called Federal Reserve Notes (notice that the dollar bills in your pocket read "Federal Reserve Note" and not "Treasury Note" – though in the 1800s they did read "Treasury note").⁴³ The Treasury is still responsible for government spending, issuing bonds and controlling the amount of government debt. However, the perverse temptation for the Treasury to either: 1) finance government spending directly via irresponsible amounts of

money printing and inflation or 2) take on debt and then pay for it later by printing money, are both reduced. Instead the Federal Reserve is responsible for maintaining the money supply. If the Treasury takes on too much debt, the Federal Reserve can refuse to print the money necessary to pay for this debt.⁴⁴ With no other option available, the Treasury is (hopefully) pressured into borrowing responsibly.⁴⁵

If the Treasury does *not* borrow responsibly, investors will potentially demand higher interest rates on government bonds if these investors believe the Federal Reserve is unlikely to bail out the Treasury (rates could also rise even if the Fed bails out the Treasury, as investors would worry about future inflation). Investors may begin to worry about whether the loans will be repaid.⁴⁶ Again, ideally all this should be a rare occurrence as the Treasury knows the Fed's reluctance to monetize debts and therefore the Treasury will be less likely to borrow irresponsibly in the first place. As stated earlier, a main goal is to separate the ability to print money from the ability to spend money.^{47 48}

Chapter 3: Inflation, Fiat Money and the Gold Standard

MB vs M2 Money

In the real economy, money is not as simple as we lead on in Chapter 1. In that example, we treated all money as a single-layered, physical money without considering banks and their role in the money creation process. In the real economy, money is a multi-layered system, with different types of money at each layer. There are various layers of monetary base and money supply, but for ease of explanation we will focus on only two layers in this letter: 1) the monetary base (MB) and 2) the M2 money supply.⁴⁹

MB consists of all physical currency (bills and coins in circulation and in vaults) as well as Federal Reserve Deposits, which is a type of deposit only available to banks.⁵⁰ The Fed has control over the supply of MB and, under most circumstances, MB is the only type of money that the Fed can print directly. The other type of money, M2, includes a portion of MB (physical bills and coins), but also includes money that is not directly created by the Fed. This non-Fed controlled portion of M2 is created by private banks when they make loans to their customers. Specifically, M2 money consists of total physical currency in circulation plus all money in checking accounts, savings accounts, certificates of deposit (CD) of less than \$100,000 as well as money market accounts.⁵¹ A helpful though not perfect way to think of this is to think of M2 as the money in your checking account and MB as the physical money you have in your wallet. The average person is likely to have significantly more money in their checking account than to physical bills in one's wallet. In the same way, M2 outstanding is usually much larger than MB outstanding.

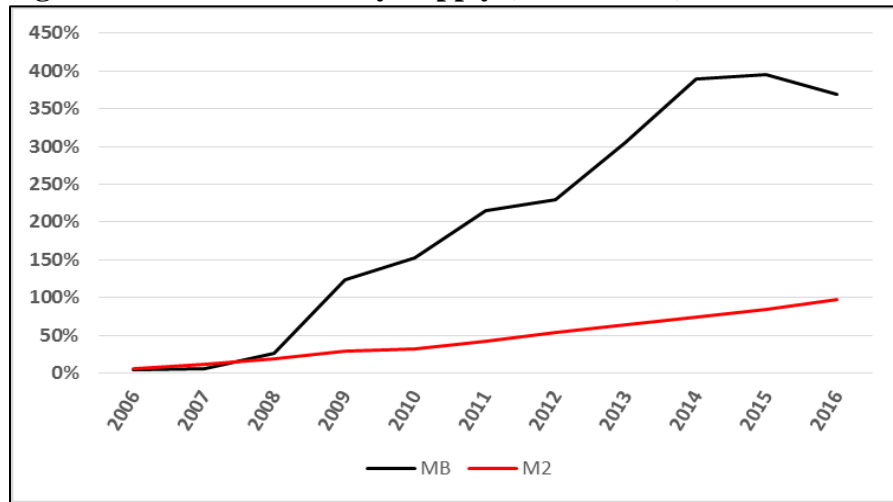
How exactly are MB and M2 related? Through a process known as fractional reserve banking, a bank starts with a base capital of say \$10. This \$10 can consist of say \$2 in physical dollar bills/reserves as well as 8\$ in other assets (subordinated term debt, etc.).⁵² The bank will make loans out to customers subject to keeping the capital ratio (total loans outstanding divided by bank capital) relatively constant.⁵³ The total value of these loans is usually much larger than the actual equity/capital base at the bank. The banking system relies on the fact that it is unlikely that all the customers will want their money at the same time. The ratio of equity to total assets (loans outstanding, etc.) is called the capital adequacy ratio or capital ratio for short.⁵⁴

The amount of money therefore is not directly related to the amount of MB.⁵⁵ Printing MB does not necessarily increase M2 (though extreme amounts of MB printing will certainly cause inflation and a rise in M2).⁵⁶ The amount of M2 money in the system is usually based on the demand from customers for loans that is counterbalanced by the banks need to maintain an adequate capital ratio^{57 58}. It is important to note that the capital ratio and reserve ratio are separate ratios. In the U.S. the capital adequacy ratio has hovered around 10% with the reserve ratio sometimes being much less.⁵⁹ In our overly simplistic example, this means that the bank is relying on less than 10% of customers needing their money at the same time. Absent a lender of last resort (usually a central bank), a bank with a capital adequacy ratio of 10% which experiences 20% customer withdrawals in the same day would go bankrupt.

On the other hand, there are forces which tend to put downward pressure on a bank's capital ratio. A bank with a capital ratio of 75% would have a tough time competing with a bank with a capital ratio of 10% because the bank with a capital ratio of 75% would be making much less loans relative to its equity and therefore be earning less interest, etc. The bank with the 75% capital ratio will certainly do better in a crisis but will struggle to be compete and remain profitable when economic conditions are tranquil. Maintaining the correct capital ratio is a balancing act between maintaining profitability but also maintaining a safe capital cushion if the economy deteriorates.⁶⁰

Moving back to the money supply, we note the divergence between MB and M2 since QE was implemented in the U.S. in 2008. The MB has increased over 350% since 2006, yet we've failed to see significant inflation. The reason for this is that the demands for loans has been depressed during that same time frame. Because of the lack of new loans, M2 has increased at a much lower rate than MB since 2006.⁶¹ Since M2 is what most consumers spend every day, it is the relatively slow growth in M2 that is causing the low inflation we've seen since the financial crisis. Unless demand for new loans picks up significantly, we are unlikely to see a sustained rise in the inflation rate. Furthermore, high debt levels tend to put downward pressure on new loan creation. Again, MB money printing does not necessarily cause inflation. Furthermore, it is possible to have deflation concurrent with the printing of large amounts of base money.⁶²

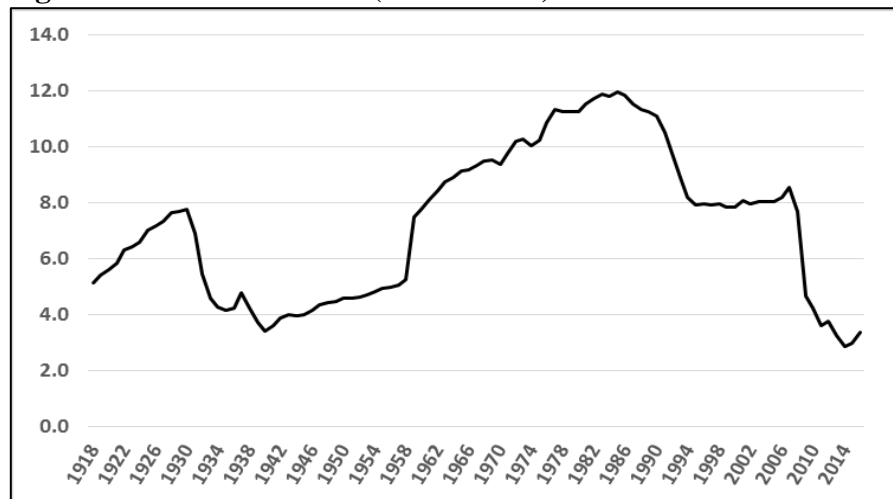
Figure 2: Increase in Money Supply (2006 – 2016)⁶³



To further complicate matters: while the printing of MB does not necessarily lead to inflation, the only scenario in which *sustainable* long-term inflation can exist is when there is a consistent increase in the MB money supply.^{64 65 66} It's a nuanced, yet important point: an increase in MB does not necessarily cause inflation, however, where there is a period of long-term sustained inflation, there must have been a corresponding increase in MB to cause this inflation.^{67 68 69} Temporary inflation can result if the M2 to MB ratio increases, but there is a limit to how much this ratio can increase.⁷⁰ Even a 5% annual increase in the M2 to MB ratio would result in a 38 to 1 M2 to MB ratio in 50 years and an over 445 to 1 M2 to MB in 100 years!

The figure below illustrates the band in which the M2 to MB ratio typically operates. There are fluctuations with this ratio, but there is no sustainable long-term trend in the ratio. Therefore, if we assume: 1) it ultimately increases in M2 that results in inflation, 2) the M2 to MB ratio is relatively constant over the long run and 3) Governments can't directly print M2 under most circumstances, then we must conclude that only printing of new MB can result in long-term inflation.⁷¹

Figure 3: M2 to MB Ratio (1918 – 2016)⁷²



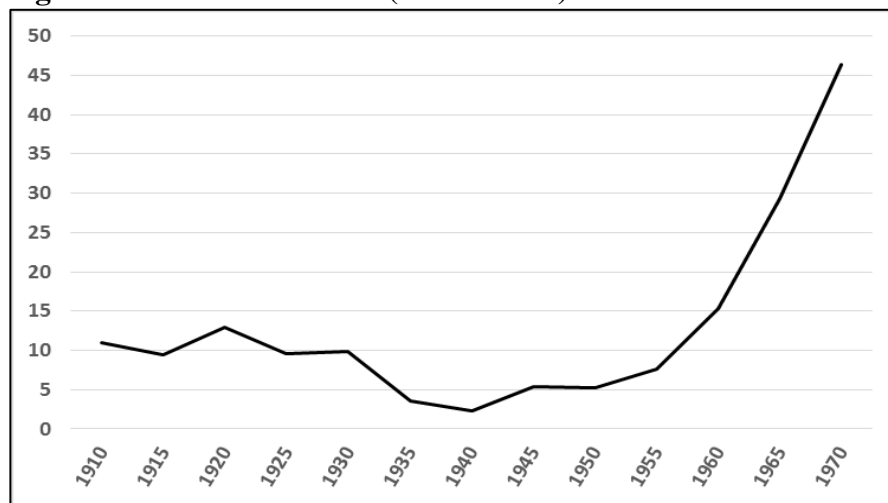
The Gold Standard

Prior to 1971, the U.S. was on the gold standard, in which the monetary base was not a fiat currency (in the form of Federal Reserve Notes) but instead the monetary base was physical gold (MB technically included other instruments besides actual physical gold, so for simplicities sake we will look at the ratio of M2 to physical gold held in reserves and not the M2 to MB ratio under the gold standard). At the base of the monetary pyramid was physical gold in reserves and in coinage. Layered on top of that was the M2 money supply. As with our earlier fiat example, while this M2 to gold ratio can change temporarily, one cannot increase the M2 to gold ratio indefinitely without causing a crisis. Therefore, under the gold standard, the only route to sustainable inflation was through new gold discoveries (approximately 1% to 3% per year) or gold inflows from other countries. The result of this strict monetary policy was approximate 0% average inflation from 1800 to 1900 when the gold standard was in place.

That said, even the gold standard was not a true long-term guard against inflation. Eventually, various episodes of money printing also broke the gold standard.⁷³ In 1934, in an attempt to cause inflation and end the Great Depression, the U.S. government ended dollar convertibility to gold for private citizens.⁷⁴ From 1934 onward, only foreign governments could redeem dollars for gold. In addition, the U.S. initiated a one-time devaluation of the dollar against gold, raising the per ounce price of gold from \$20.67 to \$35.⁷⁵

However, with these measures in place, a temporary reprieve was to be had, as the U.S. proceeded to *strengthen* its currency by decreasing the M2 to gold ratio to a cycle low of about 2.3 in the early 1940s. However, from this cycle low, successive episodes of money printing eventually brought about the destruction of the gold standard. By 1970, the M2 to gold ratio had increased to an unsustainable level of 46! This meant (somewhat over simplistically) that if even slightly more than $1 / 46 = 2.17\%$ of M2 outstanding was converted to gold at one time, then the U.S. would not be able to maintain dollar to gold convertibility. The United States had two choices: 1) devalue the dollar in relation to gold by raising the price of gold (in dollar terms) or 2) abandon the gold standard all together by ending dollar convertibility to gold.⁷⁶ The United States choose the latter option, closing the gold window and officially ending the gold standard. From then on, not even foreign governments could exchange their dollars for physical gold.

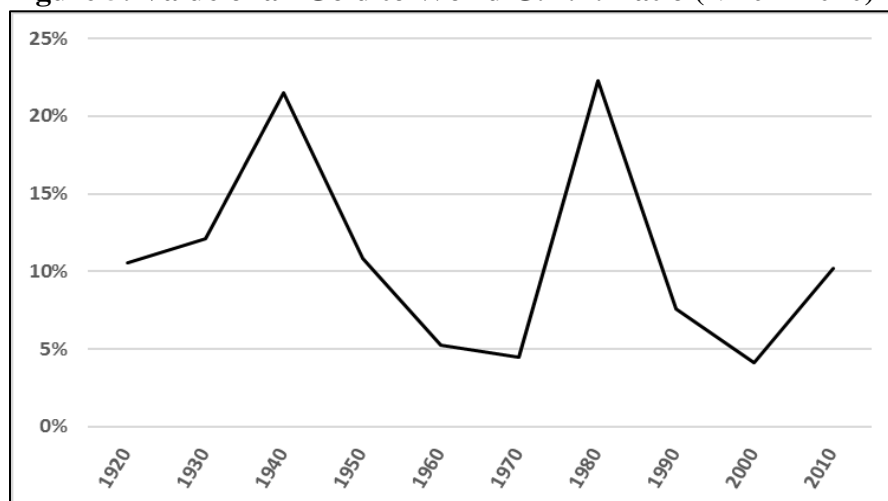
Figure 4: M2 to Gold Ratio (1910 – 1971)⁷⁷



Does the gold standard lead to lower inflation? The gold standard is commonly viewed as a preventative measure against inflation. We would disagree. It is minimization of budget deficits and restraint at the printing presses that curbs inflation. As we saw in the 1934 to 1971 period, simply proclaiming you are on a gold standard doesn't act as much of a check against money printing. Specifically, the pieces of paper that were redeemable for physical gold, turned out to be quite easy to print. When too many of these pieces of paper have been printed, the convertibility is ceased as we saw from 1934 to 1971. It's a bit of a conundrum; governments that are responsible enough to control their spending probably don't need a gold backing to maintain a stable currency. For governments that are *not* responsible enough to maintain their budget, a gold standard will provide little in the way of long term protection against currency devaluation.

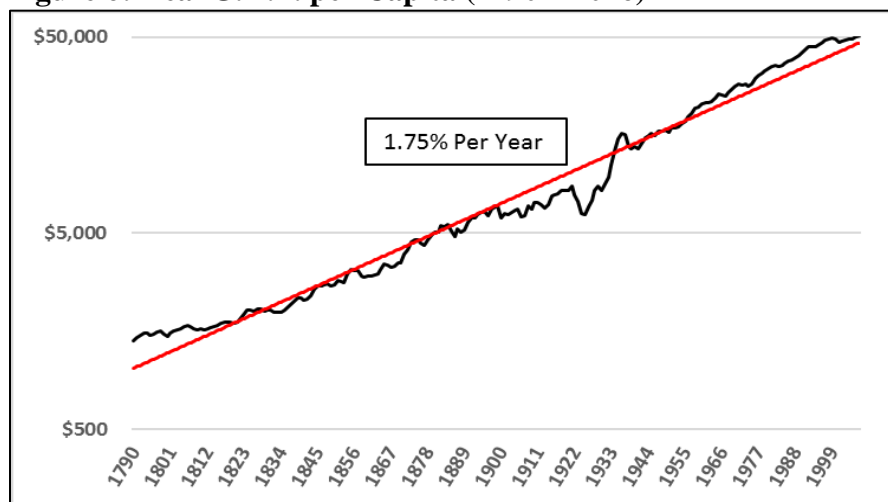
Moving on, we next examine the value of all gold in the world as a percentage of World G.D.P. We note, when looking at the 1920 to present period, that gold has held its value decently well in terms of World G.D.P. Gold or other gold like stores of value may play a role in the world economy going forward, though we have no special ability to price these assets so will usually avoid investing in precious metals.

Figure 5: Value of all Gold to World G.D.P. Ratio (1920 – 2010)⁷⁸



To wrap up our review of the gold standard, we briefly note that our preferred economic metric for wellbeing, the annual growth in real G.D.P. per capita, was nearly identical under the gold standard as it has been under the current fiat regime. Furthermore, inflation in the 1800s averaged about 0% and in the 1900's averaged over 3%, yet real G.D.P. per capita remained remarkably constant. Over the long-term there isn't much, if any, difference in fiat money vs the gold standard as it relates to average human wellbeing over time.

Figure 6: Real G.D.P. per Capita (1790 – 2016)⁷⁹



Chapter 4: Monetary Policy Tools

In Chapter 2 we discussed how the Fed can influence the supply of money in the economy. These monetary policies tend to affect the money supply by either increasing the amount of MB in the system and/or by influencing the M2 to MB ratio. In this chapter, we dig deeper into the stated goals and mandates of the Fed as well as the tools it uses to meet these objectives. For a discussion on possible changes to these Fed mandates, see Chapter 5 on nominal G.D.P. targeting.

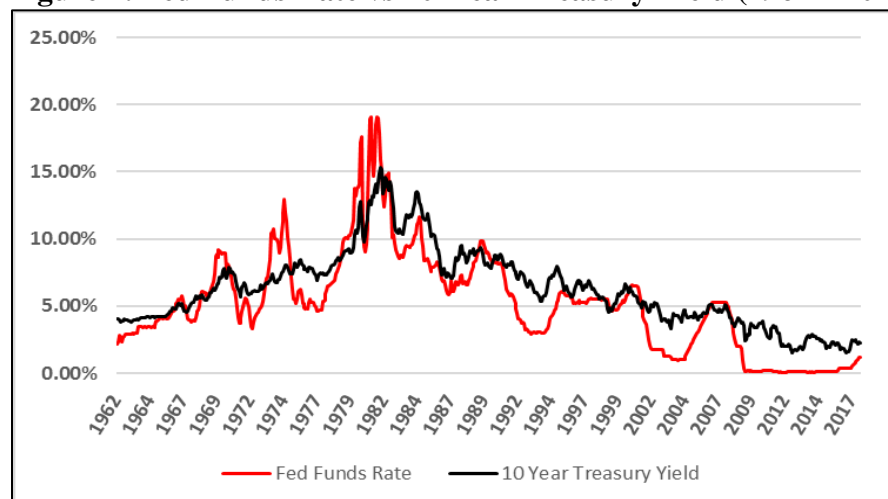
The Federal Reserve has two main goals: 1) reach maximum employment and 2) maintain stable prices.⁸⁰ In practice the Fed has stated that maximum unemployment corresponds to an unemployment rate of 4.7 to 5.8% and “stable prices” corresponds to an inflation rate of about 2%.⁸¹ Here we will discuss four primary tools the Fed uses to achieve these goals: 1) targeting of the federal funds rate 2) setting the discount rate 3) changing reserve requirements, and finally 4) forward guidance.⁸²

- 1) **Targeting of the Federal Funds Rate:** With this tool, the Fed is aiming to affect what is called the Federal Funds Rate. The federal funds rate is the overnight rate at which banks lend reserves to each other. To illustrate, if Bank A has more reserves than it requires, it may lend reserves (at the federal funds rate) to Bank B which has too few reserves. While this rate is technically negotiated between the two banks themselves, the Fed has direct influence on this rate via a mechanism known as open market operations.

Open market operations involve the Fed either buying or selling treasuries on the open market to influence interest rates and bring the *actual* fed funds rate closer to the Fed’s *target* fed funds rate. For example, if the actual fed funds rate is *above* the target rate, then the Fed will aim to increase the money supply. This is accomplished by the Fed buying treasuries off the open market in exchange for federal reserve notes. In this case, the Fed buys treasuries from the banks, and pays for these treasuries with reserves. The banks now have more reserves (the MB money supply has been increased). The extra supply of MB now in the economy tends to reduce interest rates because, as more money is available, lenders are more eager to lend out this extra money and will accept lower interest rates when lending. The opposite can also occur: if the fed funds rate is *below* the target rate, then the Fed will sell treasuries it has on its balance sheet in exchange for reserves from the banks. This will reduce the supply of money in the system and tend to increase short-term interest rates.

It should be noted that the target rate is largely going to be in a window established by the market rate for longer term treasuries which the Fed has little control over. As shown in the graph below, the fed funds rate tends to track with the 10-year treasury yield. Having a fed funds rate of 20% while the 10-year treasury yields 4% wouldn’t make much sense.⁸³ Under most circumstances the Fed can only influence the fed funds rate at the margin.⁸⁴

Figure 7: Fed Funds Rate vs 10-Year Treasury Yield (1962 – 2017)⁸⁵



Fed begins paying interest on Reserves (IOR) to establish a floor for Fed Funds Rate: Prior to 2008, the Fed paid no interest to banks for their reserves stored with the Fed. However, in 2008, to put a floor on the Fed Funds Rate, the Fed began paying interest on reserves.⁸⁶ Changing this rate allows the fed to change the amount that banks are willing to hold in reserves: if they raise the rate paid on reserves, banks will tend to hold more reserves and visa versa.⁸⁷ The interest rate on reserves has, in general, followed the fed funds rate: from 2009 through 2016 it was 0.25% and since then has risen with the fed funds rate to 1.25% as of 7/7/2017.⁸⁸ This payment on excess reserves has become a central tool for the Fed as of late and has become relatively more important than open market operations.

IOR was implemented to prevent interest rates from going negative and to keep the functionality of money market instruments intact. If IOR was nonexistent or negative, then many money market funds could go negative and the public would begin to hold cash.⁸⁹ That said, the negative aspect of IOR is that it has sterilized the banks willingness to lend and has led to an glut of reserves on banks' balance sheets.⁹⁰ Banks are less likely to lend out reserves if they get a guaranteed interest rate on their reserves from the government.⁹¹ In addition, another of the justifications given for paying interest on reserves was to allow the Fed to control what assets it bought (mortgage backed securities, etc.). As John Taylor puts it, the Fed was "more concerned with what they did with the money rather than the creation of the money".⁹² We would tend disagree with the Fed's justifications and instead side with Scott Sumner who argues that IOR rates should be negative to encourage banks to lend more and to get the Fed-created-reserves out into the real economy.⁹³ That said, in our view, if IOR were to be removed (or set at a negative rate), then it is also important that a credible N.G.D.P. target be implemented simultaneously to avoid negative rates (we explain N.G.D.P. targeting in a later chapter).⁹⁴

- 2) **Setting the Discount Rate:** The Fed has explicit control over the discount rate, which is the rate that banks are charged when they borrow from the Fed's discount window. Like the fed funds rate, the discount rate is an overnight rate. *Unlike* the fed funds rate, which is a rate for borrowing between banks, the discount rate is the rate at which banks borrow from the Federal Reserve itself. As of late, the discount window has been primarily used in moments of crisis when banks need extra money.⁹⁵ The discount window has not traditionally been used by banks on a consistent basis. By raising or lowering the discount rate, the Fed can influence the total level of borrowing at the discount window. This in turn influences the supply of money in the system.

It should be noted that, since 2003, the discount rate has been set *higher* than the fed funds rate.⁹⁶ This is largely a result of Fed policy and its desire to have the first source of lending for banks be other banks. The discount rate should be viewed as a last resort type of loan, and, in order to incentivize banks to first use the fed funds rate, the Fed has set the discount rate to be approximately 0.5% to 1% *higher* than the fed funds rate. This encourages banks to use the discount window only when absolutely needed and only after exhausting the option of lending from other banks.

Like the fed funds rate, the discount rate is set at the margin by the Fed and is normally within a range set by the market for longer term treasuries. Again, it would not be very useful for the discount rate to be 20% while the 10-year treasury is yielding 4%. In this case, there's very little (if any) chance that the banks would pay such a high price while other rates in the economy are substantially lower.

While the fed funds rate and the discount rate don't *directly* affect the M2 to MB ratio, they do influence this ratio. These two rates are an important factor in a banks' cost to borrow. A dramatic change in these costs will likely be passed onto the customer. Any change the customer experiences in his *rate* to borrow will likely affect the *amount* he is willing to borrow, which in turn affects the M2 to MB ratio. For example, if the Fed drastically raised both the fed funds rate and the discount rate, this would increase the banks cost to borrow. In turn, it is likely that the banks would have to pass on these higher borrowing costs on its customers in the form of higher interest rates on consumer loans.⁹⁷ This would tend to decrease the amount of loans that banks write and therefore could decrease the M2 to MB ratio and could lower the overall supply of money. However, we should mention that these rates are just *one* of the factors affecting the M2 to MB ratio. Other factors could certainly outweigh the impact from interest rates on the M2 to MB ratio.

- 3) **Changing Reserve Requirements:** This has been a relatively less important tool as of late. Reserve requirements are the amount of reserves a bank has vs. its total assets outstanding. In order to curb the tendency of banks to pursue profits at the expense of dangerously high leverage ratios, the Fed can establish minimum

reserve requirements at banks (though at present, capital requirements are a more prevalent and effective way of controlling a banks leverage and risk).

In a practical sense, both reserve requirements and the discount rate have become less important over time. Many developed countries have no reserve requirement at all, and yet banks still maintain reserves in order to facilitate day to day business. The discount rate is rarely used now, and used primarily in crises such as September 11th and during the 2008 financial crisis. It is rarely used when economic conditions are tranquil. Again, the main methods of monetary policy in the US of late are the fed funds rate and the interest rate the fed pays on reserves.

- 4) **Forward Guidance:** This is a relatively recent tool in which the Fed signals that it will keep interest rates low for an extended period. In 2008, interest rates were well on their way to negative territory, which can cause a dilemma known as the zero lower bound problem and lead to a [liquidity trap](#). In this scenario, as interest rates go negative, customers are actually charged for storing their money at the bank. As the rate at which they are charged gets more negative, customers will begin to store more of their money in cash since (because at least with cash, the rate they are charged is zero).⁹⁸ For this reason, central banks usually wish to avoid negative interest rates.⁹⁹ However, this still runs into the problem that interest rates at 0% may be too high if the economy is contracting at -2%. Under this scenario, despite rates at 0%, rates are still too tight given the economic conditions, and this tight monetary policy further exacerbates the recession and prevents a recovery. To mitigate this problem, the Fed will use forward guidance. Under this scenario, the Fed promises to keep interest rates at 0% for longer than would otherwise be prudent.

To illustrate, let's assume an economy is predicted to contract 2% in year 1, 0% in year 2 and then grow at a sustained rate of 3% annually for years 3-10. The Fed will promise to keep rates at 0% during the entire 10-year period. Under normal fed policy (Without forward guidance), the fed would set rates around 0% (or even negative) in years 1 and 2 and move up to around 3% in years 3-10 (again overly simplistic, and just to illustrate the point). However, with forward guidance, the Fed sets rates at 0% in year 1 and promises to keep them at 0% for the entire 10-year period. In this way, interest rates are never negative, but to compensate for being higher than normal in the early low growth years, they are held *lower* than normal in the latter high growth years (say years 3 - 5). This will tend to boost growth and can compensate for the Fed's lack of willingness to set interest rates below zero. Over the entire time, the interest rate policy tends to even out. Rates are *too high* in year 1 because, while the economy is contracting at 2%, interest rates are stuck at 0% because of the zero-lower bound. However, this deficiency is corrected when interest rates are kept *lower* than economic growth in years 3 to 5. This is made possible by the Fed effectively communicating its future policy goals. As Ben Bernanke has stated, "monetary policy is 98 percent talk and 2 percent action".¹⁰⁰

A Note Regarding the Interest Rate Focus of Central Bank Policy

Much of the above analysis of Central bank policy focuses on interest rates.¹⁰¹ While interest rates are a critical measure, it is our view that the monetary base and, more importantly, *expectations* on the growth rate of the monetary base are more critical.¹⁰² Scott Sumner notes one such misunderstanding regarding interest rates:

"The [Monetary] base may appear endogenous as well, as the Fed often uses a short-term interest rate target. But in practice the Fed is merely using Fed Funds Rate changes to signal an intention to change the MB path relative to changes in the expected future demand for base money. So the fundamental tool has been control of the base"¹⁰³

That said it is important to draw the distinction between Scott Sumner comment and the policy followed by the original monetarist school of thought, which placed undue emphasis on *only* the supply of base money.¹⁰⁴ One monetarist prescription advocated by Milton Friedman was to grow the money supply at a fixed percentage every year.¹⁰⁵ Under this plan, if the economy runs into a shock, the demand for money may outstrip the supply of money and since the MB growth rate is fixed, a recession or depression could result. Sumner, of the *Market* monetarist school, argues that it is the *expectations* of future growth/spending (or even wages) that should be targeted, specifically targeting the path of N.G.D.P. growth (more in the Chapter 5).^{106 107}

In addition, the interest rate focus with respects to QE can also lead to confusion. The ultimate goal of QE is to raise growth rates by injecting money into the economy. The Fed (usually) buys treasury bonds in an attempt to put downward pressure on bond yields, thereby easing monetary conditions and (hopefully) leading to higher economic growth. However, this higher economic growth should eventually lead to *higher* rates on bonds as the economy picks up steam. If a central bank focuses solely on keeping say 10-year bond yields at a low rate, then confusion could arise as rates rise in response to successful QE.¹⁰⁸ David Beckworth explains it better:

“This narrow emphasis on the interest rate channel ignores the fact that monetary policy can influence the economy through various transmission mechanisms. This New York Fed article, for example, notes that the transmission channels include the bank lending channel, the balance sheet channel, the wealth channel, the interest rate channel, the exchange rate channel, and the monetarist portfolio adjustment channel. I see the portfolio adjustment channel being much more important for QE than interest rate channel for several reasons.

....

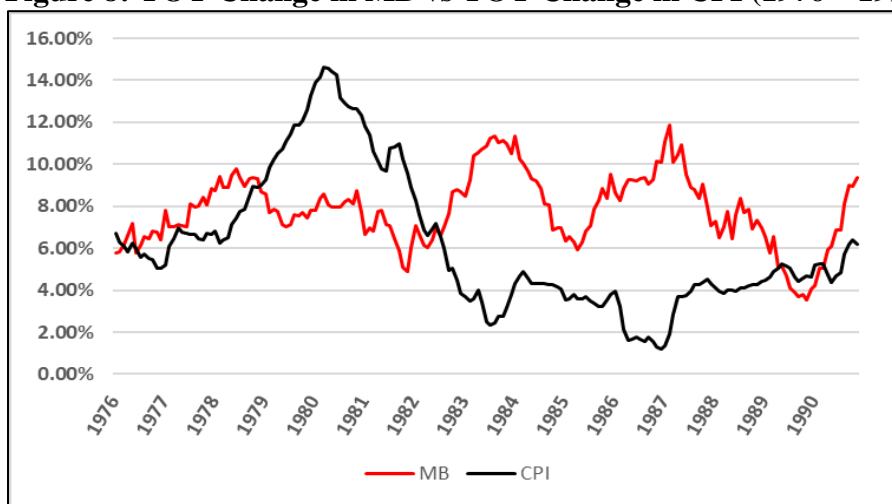
In other words, nominal interest rates--the sum of the real interest rate and expected inflation--will increase if QE is successful. This channel, then, will at best be fleeting.

That the interest rate channel will be fleeting if QE works is another reason why the narrow emphasis on this channel is wrongheaded: it creates the wrong expectation that QE will only work if long-term interest rates remain low. Thus, QE is bound to be plagued by second guessing and criticism from observers who only see monetary policy through the prism of the interest rate channel. For example, imagine there is a sustained rise in interest rates. I would view this as a sign that QE is working. Many observers, however, would probably view such a development as failure of QE.”¹⁰⁹

As we explain in the next chapter, targeting N.G.D.P. growth expectations instead of targeting interest rates/unemployment/inflation largely eliminates these issues.

Before the interest rate focus took over Fed policy thinking, the monetarist school of thought (incorrectly) focused almost exclusively on the supply of monetary base as an indication of whether Fed policy was too tight or too loose. One example of where monetary base growth would’ve led an observer astray of actual monetary policy occurred in the early 1980s under Fed Chairman Paul Volker. In order to quell the inflation of the 1970s, Volker raised short term interest rates from 11% to over 20% in from 1979 to 1981! This tightening of policy sent a clear signal to the market that Volker was serious about reducing inflation. This permanently reset inflation expectations and after a peak in inflation of over 14% in 1980, inflation dropped rapidly to less than 3% by 1983. This demonstrates how quickly inflation can change and how inflation is based on expectations. To further highlight the importance of expectations relative to actual monetary base growth: in 1983 MB was actually growing at over 10% YOY, however, since Volker had anchored in low inflation as his primary goal, expectations were anchored in and inflation continued to drop in 1983 *despite* MB growing quite rapidly (See figure below).¹¹⁰

Figure 8: YOY Change in MB vs YOY Change in CPI (1976 – 1990)¹¹¹

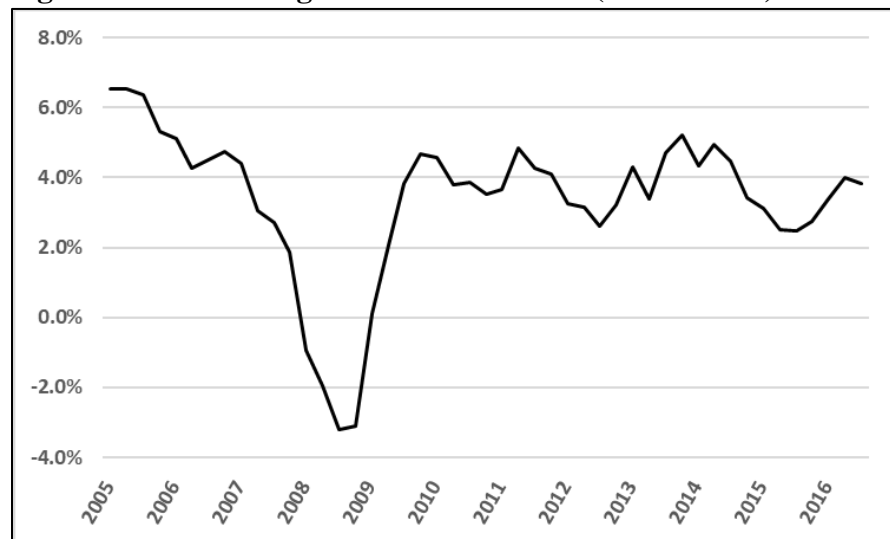


Chapter 5: Market Monetarism (Nominal G.D.P. Targeting)

We spent the early part of our [2016 letter](#) and parts of this letter explaining why we think growth rates and interest rates in the U.S. and around the world will remain low for the foreseeable future.¹¹² Having said that we would like to mention a caveat to our predictions: It is possible for the Fed to create massive (nominal) growth, however it would require a significant departure from current policy and we view this change as unlikely.¹¹³ However unlikely, we believe it is important to examine ways in which interest rates *could* rise as the result of a Fed induced growth spurt.¹¹⁴

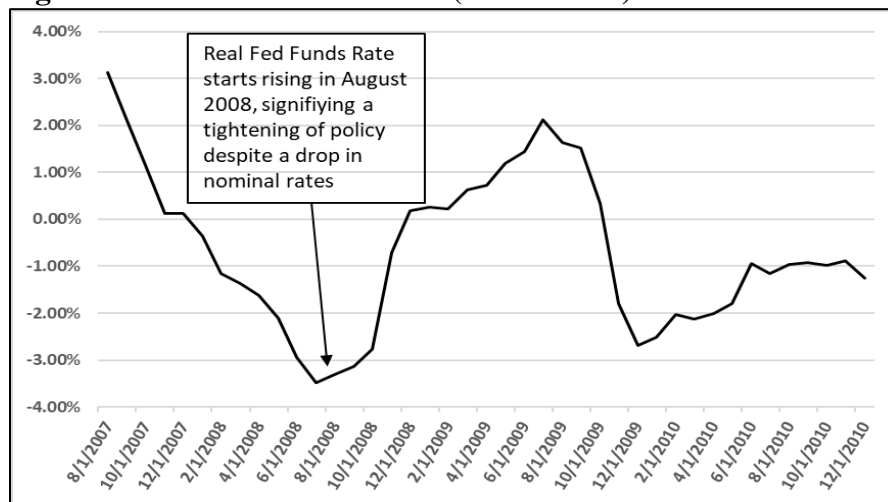
The idea behind market monetarism is that by targeting a fixed nominal G.D.P. growth rate, the Fed allows itself to be more flexible in its policy implementation. Lately we've seen one of the dual mandates (Unemployment) perform well, while the other has been stubbornly stuck (inflation). This presents a conundrum. Should the Fed tighten monetary policy if one metric is implying a rapidly growing economy, but the other is implying a slow growth economy? Since nominal G.D.P. accounts for both of these (N.G.D.P. = productivity growth + inflation + population growth), there is no conundrum.¹¹⁵ It is the sum of both that matters, i.e. total spending in an economy. Since the U.S. has been around 4% nominal G.D.P. growth, a N.G.D.P. target would likely call for an easing of monetary policy, instead of the tightening we've seen from the Fed as of late (i.e. the Fed raising rates and the unwinding of the Fed balance sheet). Furthermore, we are skeptical that the 2% inflation target is really what the Fed believes and acts upon. In practice it appears that the 2% inflation target is actually a 2% inflation *ceiling*. If it was truly a 2% average inflation target, we would expect to see the Fed allowing temporarily *higher* than 2% inflation in order to correct for the below 2% inflation we've seen over the past decade. If inflation is not allowed to run above average 9 years into a business cycle, then when will it be allowed to run above average?¹¹⁶ Again, the inflation target (or even better, the N.G.D.P. target) should be a *level* target, not a ceiling. If 5% is our target, but we've had 8 years of 4% N.G.D.P. growth, then we would need approximately 8 years of 6% N.G.D.P. growth to average it out.

Figure 9: YOY Change in Nominal G.D.P. (2005 – 2017)¹¹⁷



Many will say that the Fed did all it could in 2008 by cutting rates drastically. However, while nominal rates did indeed drop, *real* interest rates were actually *rising* throughout the crisis, and implied that, despite the Fed's rapid response, it should've acted even quicker and rates should've been reduced even further.¹¹⁸

Figure 10: Real Fed Funds Rate (2007 – 2010)¹¹⁹



Michael Belongia explains the problems that can result when the Fed puts undue importance on interest rates:

“That’s precisely how they (the Fed) gets in trouble. Because, at a market determined price, interest rates can change because of changes in *supply* of reserves or the *demand* for reserves (independently of the Fed’s open market operations). And the trouble with the Fed is they believe that every change in the federal funds rate is because of their actions and they don’t make allowances that the price of reserves (i.e. the federal funds rate) might change because of a change in the public’s demand for loans which will in turn affect the demand for bank reserves. Consider what happens if we go into an economic downturn. The demand for loans will fall and in turn the demand for bank reserves will fall because reserves are an input to bank lending. The Fed will see a decline in the federal funds rate. They will mistakenly assume that they have been overly expansionary in their provision of reserves to the banking system. So, what they’ll do it tighten up. They’ll give an instruction to the desk: “We’ve made a mistake, we’ve been too accommodative, so let’s drain reserves from the banking system”, precisely at the time when the economy is weakening. So, for example, if you look at the summer of 2008. Everybody, if you go back and look at things, is saying: “the Fed’s been really easy, look how easy the funds rate was”. Yet, I pointed out that the 5-year growth rate of bank reserves was slightly *negative* at that point. The Fed had been restrictive for a 5-year period. It was no wonder the economy was on the verge of entering a recession; they had been strangling monetary policy for a long period of time. But if you look at the funds rate, the signal was: “The Fed had been easy”. And of course, if you do this analysis in reverse, you get the same thing during an upturn: When the demand for loans rises, the demand for reserves rises, which pushes the funds rate up. The Fed looks at that and thinks that they have been overly restrictive, and they start to loosen (and pump money in) precisely as the economy is expanding and they add fuel to the fire on the upside.”¹²⁰

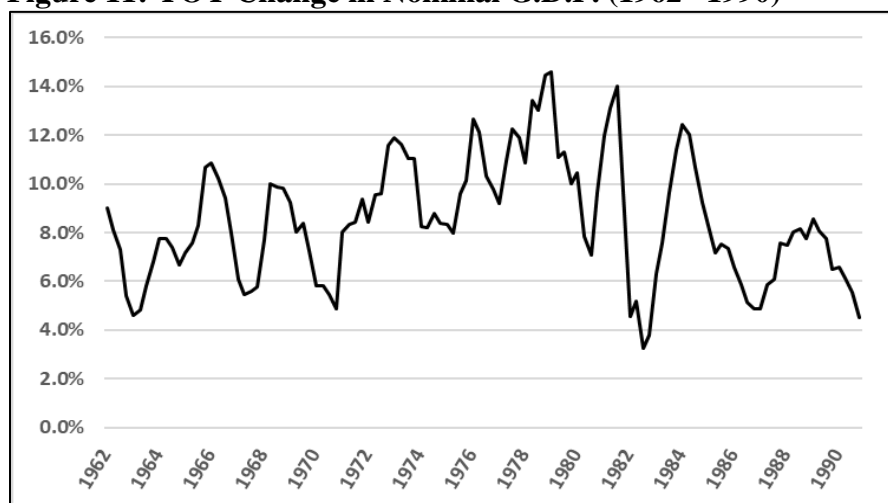
Moving on, we delve into the details of N.G.D.P. targeting and begin with pointing out that inflation expectations and any changes in these expectations are critical for actual inflation targets. If the public believes inflation will be 5%, they will spend money more freely which increases velocity and inflation (a self-reinforcing feedback loop). Conversely, if the market believes that, despite the Fed’s *stated* goals, that inflation will be less than 2%, then the public will spend their money less freely, thereby reducing velocity and making it more difficult for the Fed to raise actual inflation. The credibility of what the Fed says is critical and illustrates the fact that, if the Fed really wants inflation to be higher, then the public needs to actually believe that the Fed will act aggressively.

One remedy proposed by Scott Sumner is to setup a futures market for the predicted level of N.G.D.P. 1 or 2 years out. The Fed would be charged with buying or selling large amounts of treasuries (or other instruments like stocks, corporate bonds, etc.) whenever the futures market diverted from the 5% long term N.G.D.P. growth trendline.¹²¹ If the futures market shows that the market believes that N.G.D.P. will be less than 5% going forward, then the Fed would have a rule that requires them to engage in large amounts of open market operations (print money) until the futures market got back to 5% N.G.D.P. growth.¹²² Conversely, if the public thought the Fed was being too aggressive, the futures market would begin to imply N.G.D.P. growth above 5%. In this case, the Fed would again have an automatic rule to sell bonds and

remove money from the economy until the futures market dropped to 5% N.G.D.P. growth.¹²³ While a futures market would likely be the best option, it is not required.¹²⁴ After all, currently the Fed targets inflation and unemployment without using a futures markets for those metrics.¹²⁵ We'd tend to believe the markets' forecast for N.G.D.P. more than the Fed's own projections, but as a plan B, a simple change of the Fed's targets to a level target of N.G.D.P. (using the Fed's own estimates instead of futures) would also likely be effective and an improvement on the current Fed mandates.¹²⁶ As Sumner notes, under a N.G.D.P. targeting regime, "Start thinking of *expected* N.G.D.P. growth as the monetary policy, and nominal interest rates as the effect of that policy."¹²⁷ In addition, a N.G.D.P. *per capita* target may be an even better solution, as it ignores changes in the population.¹²⁸

Under a N.G.D.P. targeting scheme, the 1970s inflation would be unlikely as the Fed would've tightened much sooner in order to keep N.G.D.P. at 5%. Instead, the 1970s saw N.G.D.P. growth of 10%+ because the Fed remained too loose.¹²⁹

Figure 11: YOY Change in Nominal G.D.P. (1962– 1990)¹³⁰



Conversely, the Great Depression would've been much milder if the Fed had printed permanent money much earlier (i.e. devaluing the dollar in 1930 instead of 1934).

Figure 12: Drop in Nominal G.D.P. During the Great Depression (1929 – 1940)¹³¹



Some may complain that this sort of unlimited QE would lead to unsustainably large central bank balance sheets. While technically possible, this has been addressed by Scott Sumner, David Beckworth and others.¹³² Their main argument, which we tend to agree with, is that, if the public believes that a given episode of money printing is likely to be permanent, it will have a much greater dollar for dollar effect towards raising the inflation rate as opposed to temporary money printing which has very little effect on inflation. Similar to our example earlier, if the Fed handed \$10,000 to every citizen, but also promised to tax that money back out of the hands of the public in 2 years' time, then despite the public have \$10,000 for 2 years, inflation would be unlikely to rise because citizens would not spend the \$10,000. Instead, they would save it for when the one-time \$10,000 tax is established 2 years from now. Even helicopter money doesn't necessarily cause inflation if the public believes that the helicopter money will eventually be removed.¹³³ Both 1) the amount of money printed and 2) the markets belief in how permanent that money is likely to be, are both critically important. The more serious the Fed is about following through on its N.G.D.P. goal, the less amount of newly printed money will be needed. The increase in velocity does a lot of the work. Part of the reason QE1, QE2 and QE3 were so large was because the market wasn't entirely confident in the Fed's willingness to print permanent money.¹³⁴ The market has been vindicated of late, as the Fed has already begun to reduce the balance sheet.¹³⁵ Beckworth and Sumner predicted (before it was implemented) that even "unlimited" QE3 would not be enough to raise inflation since the Fed refused to fully commit to a permanent increase in the money supply.¹³⁶

If the Fed were serious about N.G.D.P. targeting, is there a risk that despite unlimited purchases of bonds, that inflation expectations would still remain low? This is unlikely in our view. Central banks have no problem creating inflation (are Zimbabwe central bankers more skilled at creating inflation than the Fed?).¹³⁷ Controlling inflation and making sure it doesn't get out of control is certainly an issue (which an N.G.D.P. futures market would control for), but central bankers being mystified by low inflation strikes us as odd. Inflation is low because not enough permanent money has been printed, and the market doesn't believe that the Fed will print much permanent money in the future. Furthermore, if people believe that unlimited purchases of bonds/stocks, etc. by the Fed would not raise inflation then, as Scott Sumner points out, why do we have taxes at all? If no amount of money printing led to inflation, then why not print money to pay for government services and set the tax rate at 0%.¹³⁸ Of course no one actually believes this, and of course there is a point where the Fed's buying of unlimited amounts of securities would cause inflation. We simply haven't reached it yet and are far from reaching that point where inflation is likely. There is a middle ground between the abnormally low inflation of late and the hyperinflation of Zimbabwe. An N.G.D.P. target is the easiest approach to arriving at this middle ground.¹³⁹

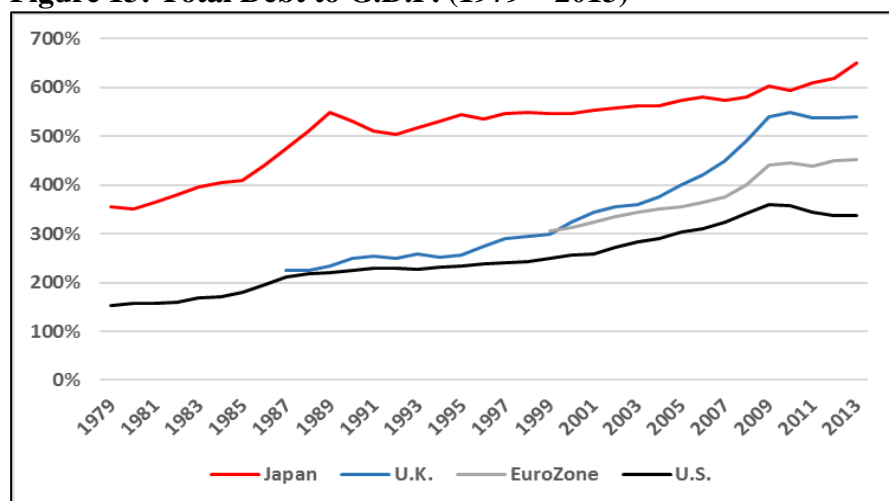
As to whether a 5% N.G.D.P. growth is the correct target, we aren't so much concerned with the actual target but more with the Fed's unwavering dedication to meet whatever target is set.¹⁴⁰ Some, such as Bill Woolsey, have argued for a 3% N.G.D.P. target which would keep prices relatively flat (assuming productivity growth of $\approx 2\%$ and population growth of $\approx 1\%$).¹⁴¹ In our opinion any N.G.D.P. target in the 3% to 6.5% range would ideal.¹⁴² Arguments for a lower target would include the benefit of lower inflation, but could also led to the economy running into the zero lower bound problem explained earlier. A higher N.G.D.P. target could potentially lead to inflation rates of 4 or 5% (not catastrophic in our opinion), however a higher target makes it less likely that rates will hit the zero lower bound. In addition, the debt burden would be reduced with higher inflation rates.¹⁴³ While zero interest rates are unlikely if the N.G.D.P. level target is credible and believable, market monetarist believe, unlike many economists, that the Fed can still aggressively ease even at 0% interest rates by buying other assets like long-term bonds, equities, etc.

In summary, the Fed always has control over interest rates if it prepared to act with enough gumption. It can create largely any level of N.G.D.P. growth it wants, and therefore can create any bond yield it wants. In practice, as we've seen in the decade since 2008, the Fed usually takes the middle ground course: acting aggressive enough to avoid a depression, but not aggressive enough to trigger healthy growth rates of 5% N.G.D.P. in a timely manner.¹⁴⁴ This middle ground course of action, in turn, results in other, less important, factors discussed earlier (debt levels, etc.) to have undue impact on the economy.¹⁴⁵ Debt levels would have much less impact on the economy if the Fed ran a strict N.G.D.P. targeting scheme.^{146 147} That said, we don't see an N.G.D.P. target as very likely in the near future, so we are forced to consider debt levels, etc.¹⁴⁸ We view low interest rates and growth rates as the most likely outcome going forward.¹⁴⁹ As we saw in the 1940s and 1950s, there is no guarantee that a higher N.G.D.P. growth would result in significantly higher yields in the short and medium term.¹⁵⁰ Finally, we think Fed Policy in 2017 was (at last) about right. N.G.D.P. is growing in the 4% to 5% range so a cautious rising of interest rates is not unwarranted. However, we wouldn't be surprised if N.G.D.P. growth rates dropped back below 4%, in which case the Fed should pause tightening.

Chapter 6: In Depth Look at Japan's Deleveraging

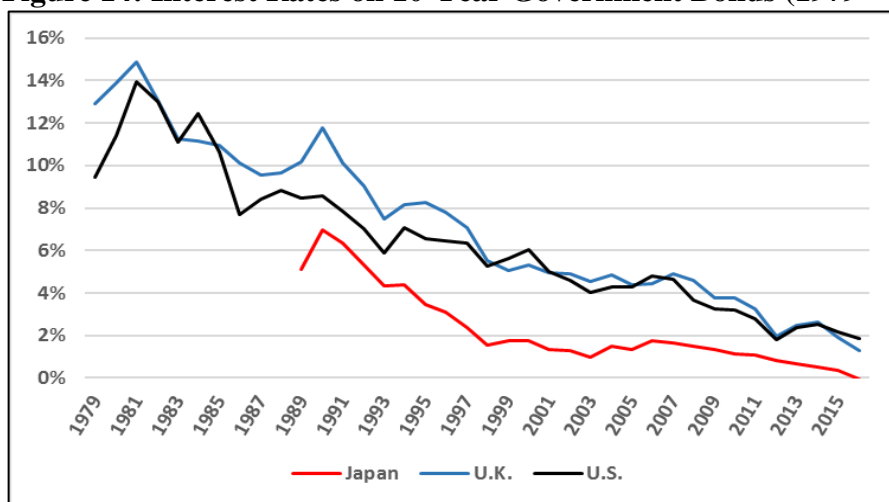
Debt around the world is high, however per the Figure below, we can see that Japan has, by far, the most debt in relation to its G.D.P. This high debt level, as well as other factors, has resulted in Japan having lower interest rates for longer compared to other developed countries. A combination of low population growth as well as high levels of debt lead us to believe that Japan is furthest along in the economic cycle.^{151 152}

Figure 13: Total Debt to G.D.P. (1979 – 2013)¹⁵³



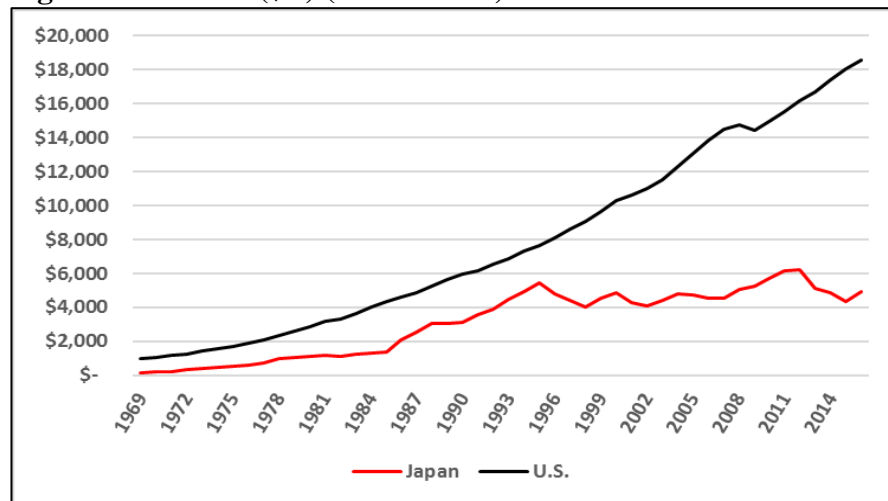
During this same timeframe as the figure above, we note that, while debt has risen, interest rates have dropped:

Figure 14: Interest Rates on 10-Year Government Bonds (1979 – 2016)¹⁵⁴



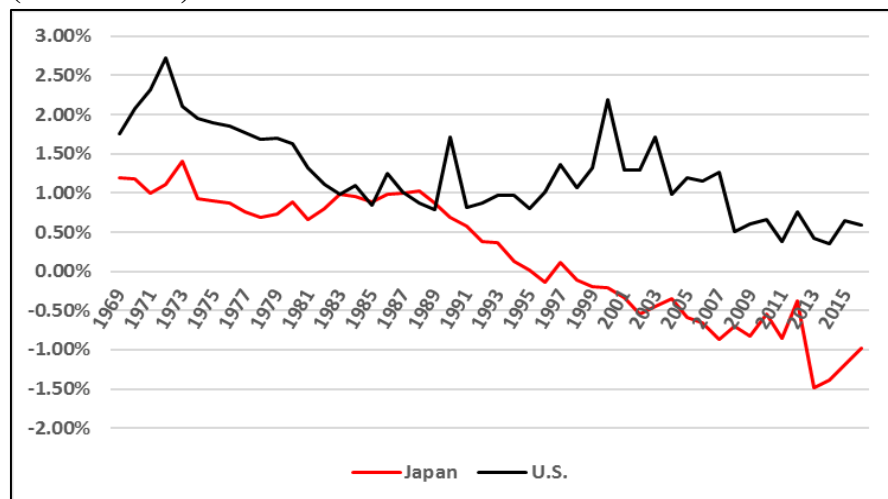
We also note the discrepancy between Japanese and U.S. G.D.P.:

Figure 15: G.D.P. (\$B) (1969 – 2016)¹⁵⁵



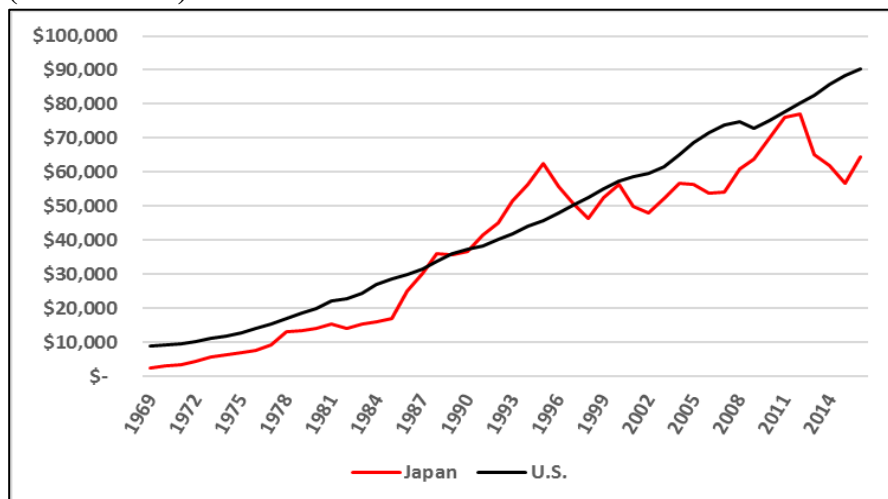
At first glance one notices the major divergence between the G.D.P. of the two countries starting in the early 1990s. To partially explain this divergence, we examine the change in working age population of the two countries.

Figure 16: YOY Change in Working Age Population, Age 15 – 64 (1969 – 2016)¹⁵⁶



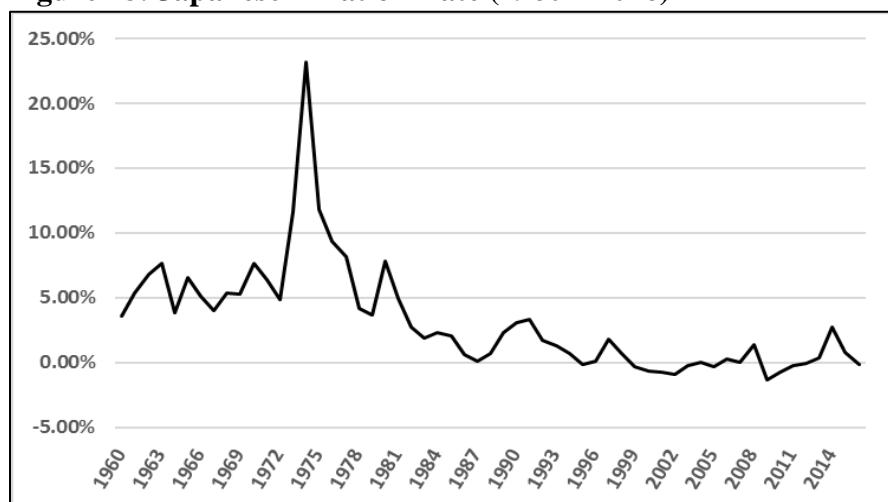
Next, by controlling for this divergence in the number of workers, we see that the G.D.P. *per working age adult* shows the gap between the two countries to be much narrower than expected.¹⁵⁷ That said, a substantial gap in the G.D.P. per working age adult has developed since 2011.

Figure 17: Nominal G.D.P. per Working Age Adult, Age 15 – 64 (\$)
(1969 – 2016)¹⁵⁸



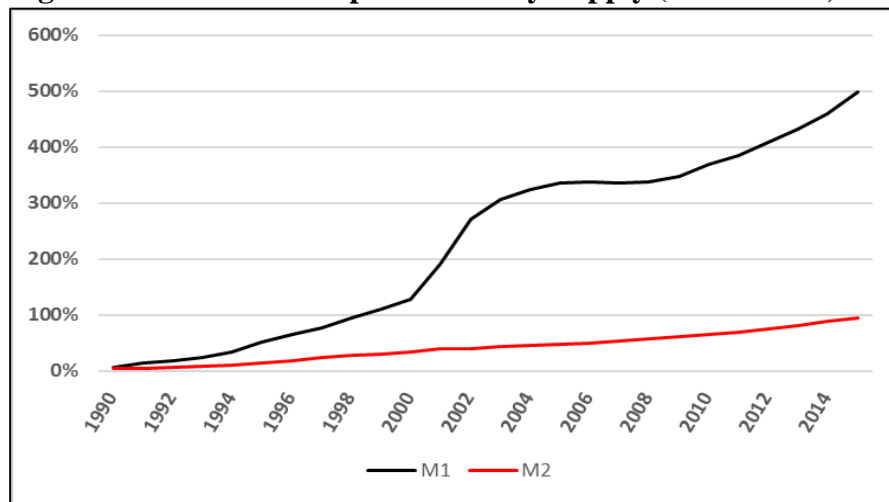
Next, we look at the inflation rate in Japan and note that it is substantially less than the 1% to 2% or so inflation we've seen in the U.S. over the last few years.

Figure 18: Japanese Inflation Rate (1960 – 2016)¹⁵⁹



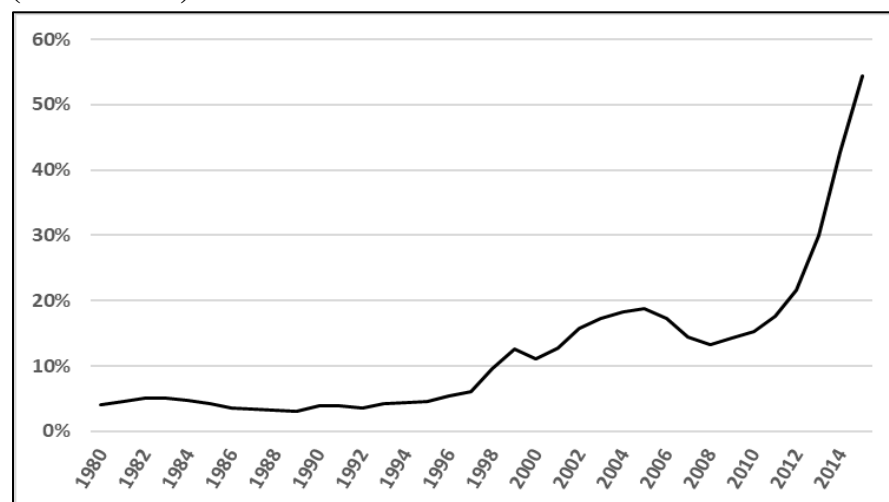
Combining the 1.5% per year difference in working age population growth with the 2% difference in inflation rates more than explains the 2% or so difference in long term bond yields between the two countries. Diving deeper into why inflation has been so low, we can see that it *appears* the Japanese government has been doing all it can to increase the monetary base, however, as with the US, M2 has failed to keep up.

Figure 19: Increase in Japanese Money Supply (1990 – 2016)¹⁶⁰



Many will argue that N.G.D.P. targeting is proven futile by pointing to Japan's massive increase in M1. However, when diving into the details we see that the messages from the BOJ have been a bit less clear, and their actions more haphazard than would appear by just looking at M1. While M1 has steadily risen, there have been a series of tightening signals that the BOJ has shown over the years. In 2000, the BOJ raised interest rates despite inflation and N.G.D.P. growth remaining low or negative!¹⁶¹ In 2006 the BOJ again raised rates under largely the same low growth conditions.¹⁶² Furthermore, the size of the BOJ balance sheet has *dropped* at times during the past 20 years despite inflation remaining low. These policies send mixed signals. In addition, the BOJ has not been 100% clear on its intention to reach inflation targets, which it only recently set at 2% in 2013.¹⁶³

Figure 20: Bank of Japan Balance Sheet as a Percentage of G.D.P. (1980 – 2015)¹⁶⁴



As a [report from the Reserve Bank of Australia](#) notes: in the 1990s and early 2000's the BOJ struggled with measuring inflation and adopted a policy of indifference toward deflation (and arguably set its inflation target at 0% without saying so explicitly):

“The first wave was from mid-1999 to the spring of 2000. At this stage, Mr Nobuyuki Nakahara, a Board member, consistently proposed adopting inflation targeting, but was always voted down by 1 to 8 votes. According to discussions at the MPMs and speeches of Board members, the majority

of the Board held the following view: deflation was not that undesirable as long as it reflected technological innovation and cheap imports. Moreover, when technological innovation puts downward pressure on prices, it is difficult to select an appropriate price index and to define price stability, let alone the numerical target of inflation. However, there was growing pressure from the academic community for the Bank to adopt inflation targeting. According to the minutes of various meetings, the majority of Board members remained skeptical about the merits of adopting inflation targeting. But the increasing interest in inflation targeting inside and outside the Bank led to the decision, on 9 March 2000, to conduct a comprehensive study on price stability. Until the study was done, discussions on inflation targeting were shelved.

....

The study, 'On price stability', was discussed on 11 October 2000. The study was not conclusive on any of the issues debated earlier. The report described price stability 'as a situation which is neither inflationary nor deflationary' (*0% inflation target?*). Defining price stability as a state that is neither inflation nor deflation is not a definition, but a tautology. The report acknowledged that a price index had biases, but concluded that it is not easy to obtain a reliable estimate of the magnitude of bias, and that the magnitude can vary.

In addition, there were also political concerns regarding the BOJ credibility and its newly found independence:

"Since the Bank of Japan became legally independent in April 1998, it has needed to be accountable for its actions. The mandate was clearly price stability, as mentioned in Article 2. But without a concrete definition of price stability, it is hard to assess whether the Bank has acted appropriately.

....

One possibility is that the Bank of Japan, using the term of Cargill et al (2000), fell into an 'independence trap'. According to these authors, the Bank of Japan was afraid to take bold actions after it had just gained independence. Theoretically, flexible adjustments and bold actions were supposed to have become possible under independence, since actions were at the sole discretion of the Bank Board. On the contrary, the Bank became much more conservative and rigid in taking actions, especially unprecedented ones. They feared that action might be judged a failure later and damage credibility. If this is the case, the Bank of Japan was given independence precisely at the wrong moment because the economy called for unprecedented monetary policy actions."¹⁶⁵

The Reserve Bank of Australia report goes on to mention the tightening of policy that the BOJ engaged in despite a lack of luster recovery:

"The (BOJ) Board indicated that it had done enough to ease monetary conditions, and it even cited the 'side-effects' of the ZIRP. The Board also challenged the market expectation that non-sterilized intervention would be pursued. This was indicative of their desire to end the ZIRP as soon as possible.

No additional easing was adopted between the fall of 1999 and the summer of 2000, except for liquidity injections to deal with Y2K concerns. In the spring of 2000, Governor Hayami started to suggest that the ZIRP may end soon, as the economy showed some signs of recovery... Immediately after the ZIRP was ended, the Japanese economy entered recession. The growth rate in 2000:Q3 turned negative, which was offset to some extent by a brief recovery in 2000:Q4. The peak of the business cycle was later dated as October 2000"

Finally, a fear of the uncontrollable nature of inflation also prevented the BOJ from acting (we've seen similar fears of too high inflation from Federal Reserve officials as of late as well):

“Hayami argued that ‘inflation is most likely uncontrollable once triggered’. Many argued at that time that it would be possible to pursue a policy aiming at a moderate inflation rate of 1 to 3 per cent. However, in response, Hayami commented: ‘if we tried to contain inflation after it had gained momentum, we would need very strong monetary tightening, which might result in a substantial deterioration of economic activity and a steep climb in unemployment’. He seems to be arguing that the optimal and stable inflation rate is zero, and any deviation from it, even a modest amount, would end up in an inflationary spiral that would need strong restraint to end. This might be a reflection of the literature of the early 1980s. Indeed, Hayami cited the experiences of the 1970s, where tolerating a small inflation rate triggered a further round of wage and price increases, which spiraled into a higher inflation rate. It was unfortunate that, in the early stage of deflation in Japan, the argument for moderate inflation targeting was dismissed on the grounds of a quite dated argument. The experience in the 1990s proved that inflation targeting could anchor expectations, so that it is possible to avoid a wage-price spiral.”

We largely agree with the conclusions of this report and highlight the report here to further demonstrate that it is not simply an increase in the monetary aggregates that matters for inflation. As we stated in the N.G.D.P. targeting chapter earlier, it is also the *believability* and credibility the central bank has in maintaining the permanence of any new money. If a central bank is not aggressive enough, as the BOJ has been for most of the last 20 years (and the Fed has been for most of the time since 2008), then even if large amounts of money are printed, the public will not believe the central banks’ dedication to meeting its stated goals and inflation will remain low. With all of this said, we also place blame for Japan’s slow growth on the United States and its insistence that Japan maintain a stable currency (i.e. instead of a much-needed devaluation of the yen) throughout much of its slow growth period.¹⁶⁶ In a broader sense, most countries *should* get into (at least minor) currency wars with each other and devalue their currencies simultaneously. While exchange rates might go relatively unchanged if all countries devalued simultaneously, the debt burdens (which are largely denominated in nominal currency units) would be greatly reduced as a result of these devaluations. Unfortunately, for most of these countries, internal politics (such as the U.S. appeasing U.S. based exporters who decry “unfair” competition from China and Japan) prevents such devaluations.¹⁶⁷ This in turn prevents the easing of debt burdens that would result from said devaluations. As a result, interest rates and growth rates remain low around the world.

Looking at the value of the yen, we see there is no consistent effort on the part of Japan to devalue their currency.¹⁶⁸

Figure 21: Japan / U.S. Foreign Exchange Rate (1992 – 2018)¹⁶⁹



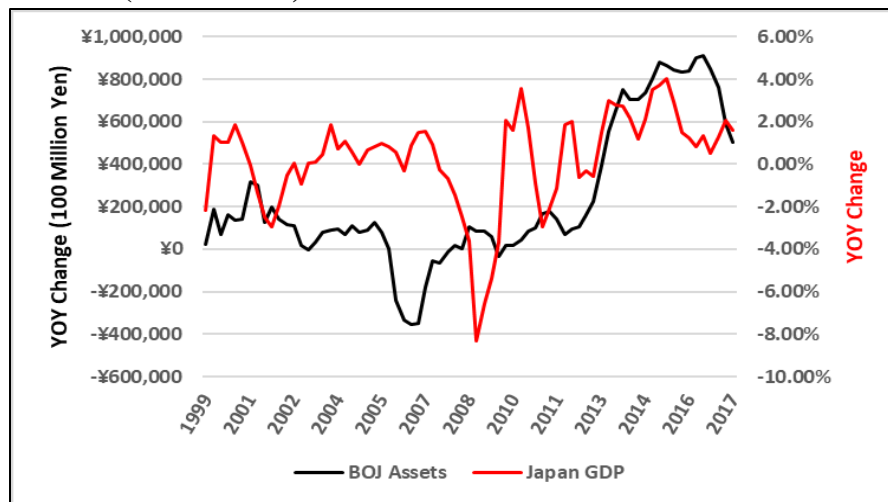
Abenomics, which began in 2012, has been a decent first step to the BOJ regaining some credibility, yet has also come along with conflicting messages (a sales tax increase in 2014, etc.). Despite Abenomics not being ideal, Scott Sumner notes that N.G.D.P. in Japan has reversed its downward trend since Abenomics was implemented and has been increasing recently despite low population growth.¹⁷⁰ It may take time for the public to truly trust the BOJ again. Past sins can have a lasting effect. That said, it is far from certain that Abenomics will succeed. All the way back in 2013,

Sumner expressed his doubt: “I doubt the BOJ will reach an inflation rate of 2%, because the BOJ doesn’t seem committed to that goal” citing internal disputes at the BOJ regarding specific inflation targets.¹⁷¹

Very little actual money printing is needed if a public truly believes the central bank will do whatever it takes. Conversely, even large amounts of money printing (M1 at over 100% of G.D.P. in Japan’s case) will have a muted effect on inflation if the public doubts the central banks dedication to meeting its goals at all costs.¹⁷²

In the chart below, we notice that, since a peak in 2016, the BOJ has recently begun *reducing* the size of QE despite sluggish NGPP growth in the 1-4% range. Again, if the BOJ clearly stated its intentions to permanently increase the money supply, then the lack of QE wouldn’t be so concerning.¹⁷³ However without a clear statement, and with N.G.D.P. growth low, the reduction in QE is showing once again that the market is correct in being skeptical of the BOJ and its dedication to raising growth rates. The BOJ has recently begun targeting interest rates (10-year bond target is 0%). The problem with this is the BOJ is setting too low of a target and has entrenched in now growth expectations. Why not set the 10 year yield target at 4% and commit to buying an ever increasing amount of assets until this target is met (N.G.D.P. target would be even better than a bond yield target)? This, once again, illustrates the confusion between QE and interest rates. Most pundits (and central bankers) think that QE should lower rates. While this is potentially true (at least temporarily) it is exactly wrong in the longer term. QE should instead *raise* interest rates in the long term as QE stokes growth. Once again, we invoke Zimbabwe and ask: “in 2008, while it was undergoing hyperinflation, would anyone want to buy Zimbabwe (nominal) bonds yielding 2%?”. Of course not. Any rational investor would demand a very high rate of interest because Zimbabwe has done a huge amount of monetary easing. If affective, QE should raise rates and by setting a rate target of 0%, the BOJ is creating a self-fulfilling feedback loop of low growth and low interest rates.

Figure 22: YOY Change in Bank of Japan Assets vs Japanese G.D.P. Growth (1999 – 2017)¹⁷⁴



We wrap up this section with a few comparisons of monetary aggregates for Japan vs. the US to illustrate the extreme lengths Japan has gone in printing money, as well as the futility of these efforts if they are not accompanied by strong, believable messages from the central bank that the targets will be meet at any cost.

Figure 23: M1 to G.D.P, Japan vs U.S. (1960 – 2015)¹⁷⁵

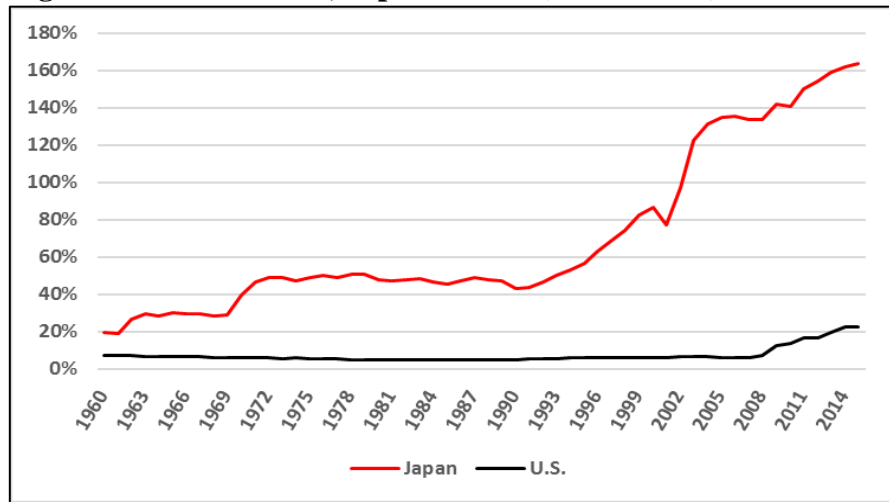


Figure 24: M2 to G.D.P, Japan vs U.S. (1960 – 2015)¹⁷⁶

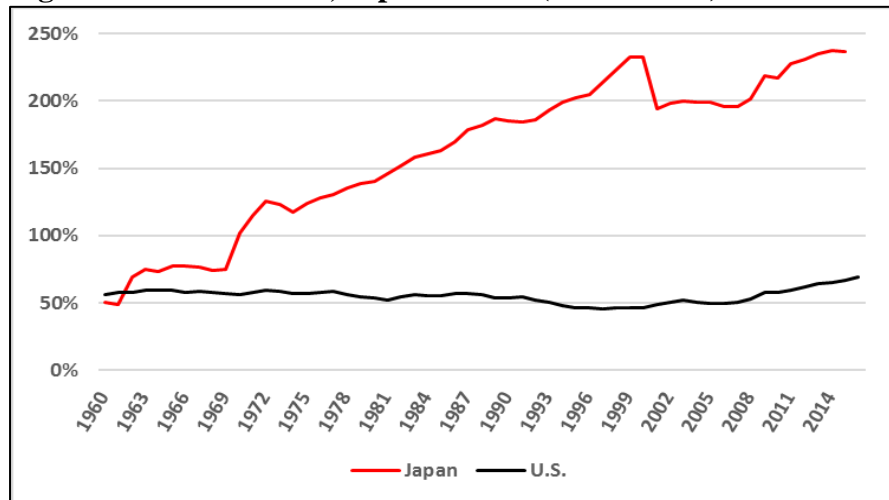
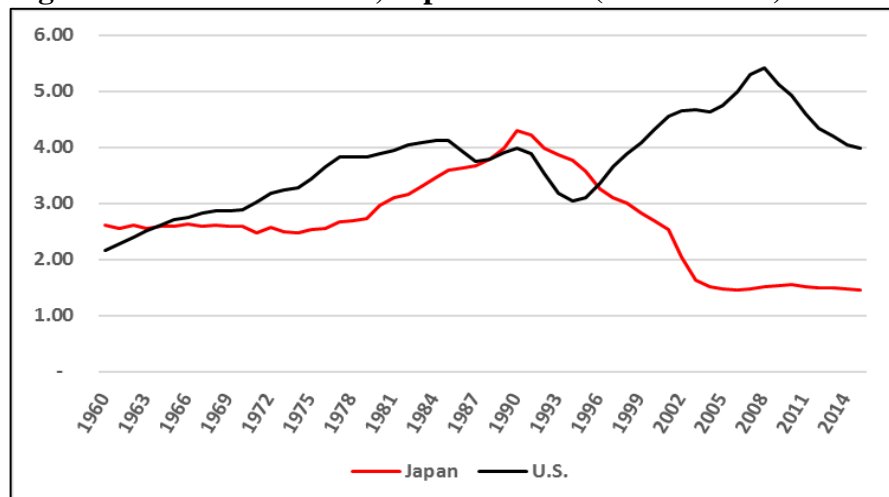


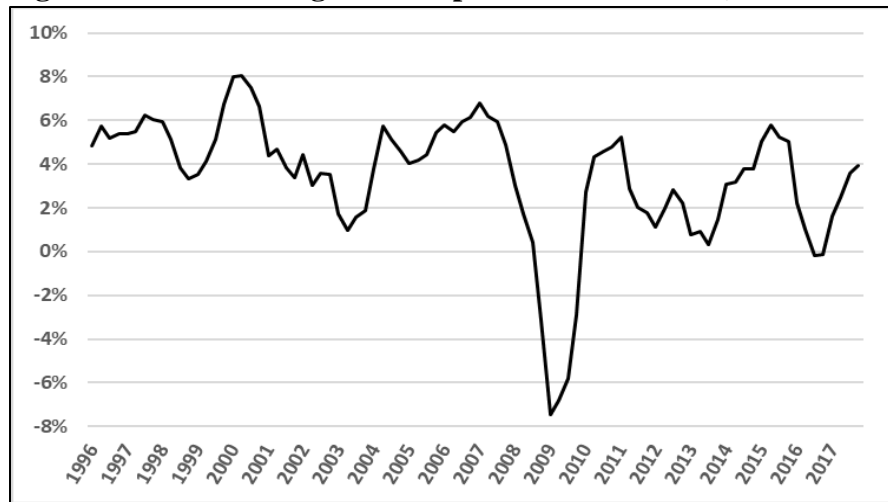
Figure 25: M2 to M1 Ratio, Japan vs. U.S. (1960 to 2015)¹⁷⁷



Chapter 7: A Look at the Monetary Policy of the European Central Bank

The EU is, in many ways, in between the United States and Japan on its growth path. EU growth is not as robust as the U.S. but the demographics in Europe are (slightly) better than Japan. That said, in our view the ECB has not been aggressive enough and the recent talk of ECB tightening is misplaced. Looking at N.G.D.P. growth for the euro area, we see the EU is nowhere near our 5% target (like Japan, one could argue that because of the slower demographic growth, that the N.G.D.P. trendline in Japan and Europe should be 4% instead of 5%).

Figure 26: YOY Change in European Union G.D.P. (1996 – 2017)¹⁷⁸

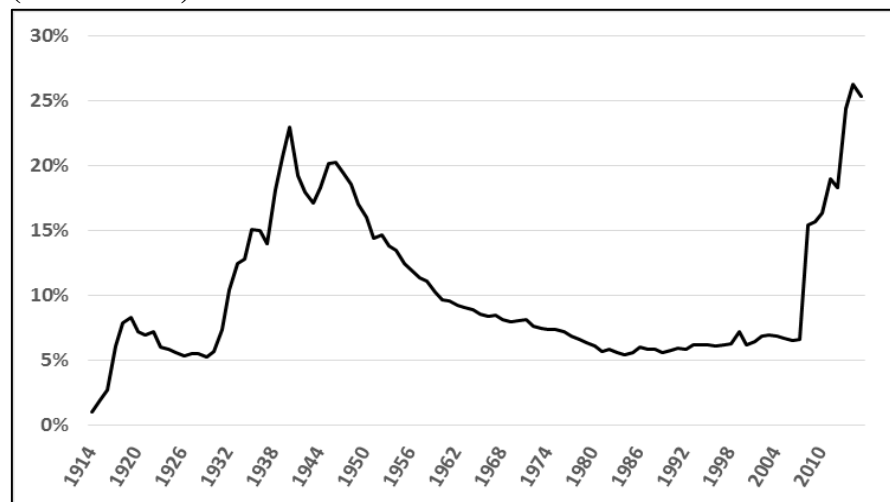


The EU certainly has a tougher problem than the US as the ECB must manage differing economic conditions in the various European countries.¹⁷⁹ Less than perfect movement of labor between EU countries leads to differing economic conditions in say Germany (relatively stronger growth economy) vs Greece (lower growth economy). That said, the ECB is serious about keeping inflation low and talk of reducing QE monthly purchases signals that they will not let inflation rise.¹⁸⁰ With all this said, EU equities appear relatively cheap and have likely discounted the lower growth prospects going forward.

Chapter 8: A Historical Look at the Federal Reserve's Balance Sheet

In recent years the Fed's balance sheet has increased dramatically. This is a rare occurrence and it is therefore beneficial to look at past instances of such a dramatic increases. During the Great Depression, the US went through a similar period of increasing central bank assets in relation to G.D.P. During both periods, the Federal Reserve increased the size of its balance sheet and began buying assets to counteract a severe private sector deleveraging. In both cases, Federal Reserve assets as a percentage of G.D.P. reached approximately 25% of G.D.P.

Figure 27: Federal Reserve Balance Sheet as a Percentage of G.D.P. (1914 – 2015)¹⁸¹

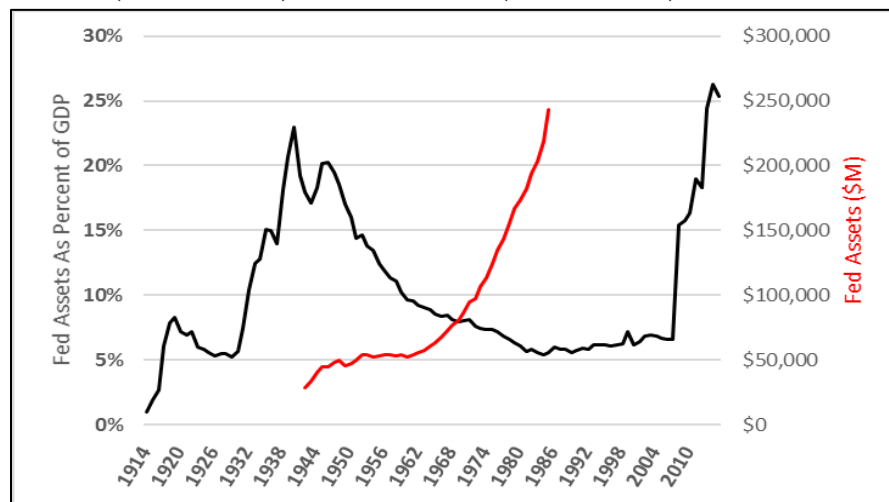


In the first instance, beginning in the 1930s, the Fed initially increased its balance sheet to counteract the severe deflationary forces occurring during the Great Depression. The Fed maintained this enlarged balance sheet through World War 2 and only started reducing the balance sheet after World War 2 ended. It should be noted that the entire deleveraging process took over 35 years, with the size of the balance sheet reaching a low in 1984. During this deleveraging period, the Fed gradually reduced its balance sheet to around 5% G.D.P.

While it remains possible that the post 2008 scenario will also see a gradual deleveraging of the Fed's balance sheet, we should note that there are significant differences between the current crisis and the post World War 2 era. In the post World War 2 era, the total debt-to-G.D.P. was reduced from 300% in 1932 to 146% in 1946. In the current crisis the U.S. has seen only a minor reduction in total debt-to-G.D.P. In 2009, total debt-to-G.D.P. was 366% and in 2017 total debt-to-G.D.P. has fallen only slightly to 329%. In the post World War 2 era, the Fed did not have to deleverage at the same time as the private sector was deleveraging.

In addition, there wasn't much actual shrinkage of the Fed's Balance Sheet in nominal terms. From 1940 to 1985 there were only 6 years where the Fed's Balance sheet shrunk in nominal terms. As shown in the figure below, the Fed's balance sheet actually *increased* in nominal terms quite significantly, rising from \$23 billion in 1940 to over \$63 billion in 1965! The main cause of the Fed's balance sheet shrinking in relation to G.D.P. was the rapid G.D.P. growth of the United States, not a reduction of the Fed's balance sheet in nominal terms. The rapid G.D.P. growth the US experienced after World War 2 in a sense "bailed out" the central bank and allowed it to reduce its balance sheet to a more manageable size. There certainly wasn't much "austerity" in nominal terms on the Fed's part. The Fed could increase N.G.D.P. growth rapidly by targeting a higher level of growth, however this appears unlikely. With the current low growth environment, any significant reduction in the balance sheet will be challenging. Counterintuitively, a believable N.G.D.P. growth target, while potentially increasing the size of the Fed's balance sheet in the short term, would anchor in higher growth expectations and make it easier to achieve the longer-term goal of shrinking the Fed's balance sheet over the next few decades.

Figure 28: Federal Reserve Balance Sheet as a Percentage of G.D.P. (1914 – 2015) vs. Fed Assets (1942 – 1985)¹⁸²



Other factors will also add to the difficulties of deleveraging this time around. Unlike today, the post World War 2 era saw significant one-time increases in the workforce population as woman entered the work place in large numbers.¹⁸³ In addition, birth rates and population growth were higher then than they are now. This tended to keep G.D.P. growth higher than we’ve experienced in the post 2008 crisis. Higher growth rates allow for a smoother deleveraging process, as much of the balance sheet normalization can simply be “grown into” with high nominal G.D.P. growth rates masking the deleveraging taking place on the Fed’s balance sheet. As an analogy, it is easier to pay off existing debts if one’s income is growing at 10% a year vs 2% a year.

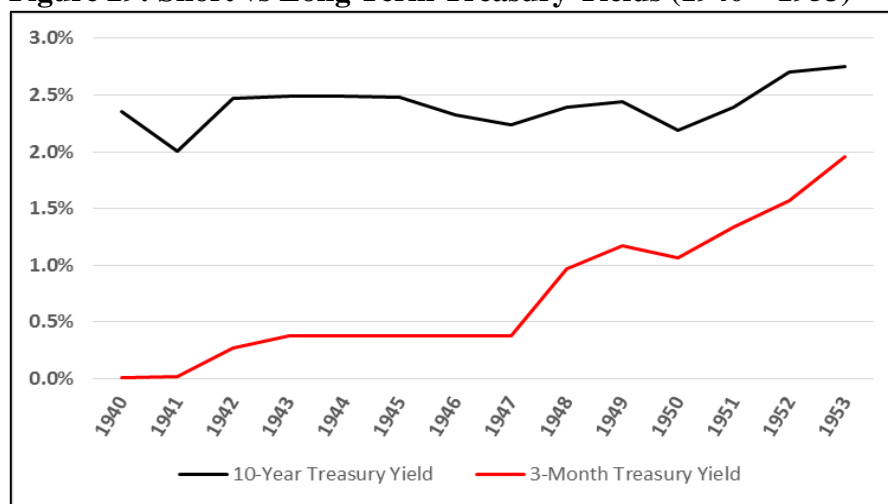
The Fed of late has stated they could begin unwinding at an initial rate of \$10B per month with a maximum unwind rate of \$50B per month (so called “Quantitative Tightening” or “QT”). The Fed has stated that it eventually would like to get rid of the mortgage related assets on its balance sheet and eventually have a treasury only balance sheet. While the low end of \$10B per month (or \$120B per year) is possible (though not certain) we struggle to see how a sustained reduction of \$50B a month (\$600B per year) is likely anytime in the near future. A few months at the \$50B per month rate may be possible, but again, it took over 40 years after World War 2 to reduce the balance sheet to 5% of G.D.P. and this reduction was largely made possible because of a rapid rise in nominal G.D.P. The Fed has recently projected about \$3 trillion in assets by 2024. Assuming nominal G.D.P. growth of 3.75% per year, that would imply the Fed’s balance sheet will drop from the current 24% of G.D.P. to 12% of G.D.P. in 2024. This is a significant reduction. We would wager that the Fed’s balance sheet will be *above* 12% of G.D.P. in 2024. However, even if they do accomplish this task, we wouldn’t be surprised if interest rates remained low (in the 3% or so range) for a significant time thereafter.

Chapter 9: The Federal Reserve (Usually) Does Not Have Much Control over Long-Term Interest Rates (Part 2)

In [Appendix D](#) of our 2016 Annual Letter, we noted that it is not the central bank that controls long-term interest rates, but instead the market that controls these rates.¹⁸⁴ We should add the caveat that, while the Fed normally does not have much control over long term interest rates, they can retain almost absolute control over interest rates *if* they act aggressively. While this power remains in the Fed's hands, in practice they have been almost completely reluctant to use this power in a decisive manner. In so doing, they have let other factors (like debt levels, etc.) dictate interest rates.¹⁸⁵ When the Fed takes only half measures, we witness some puzzling phenomena (such as rising short rates coinciding with *falling* long rates) that we explore further in this chapter.

During the Great Depression, the Fed lowered the federal funds rate to 0% and kept it there for an extended period. Starting in the early 1940s the Fed began to raise rates, yet the yield on 10-year Treasury Bonds remained stubbornly flat.

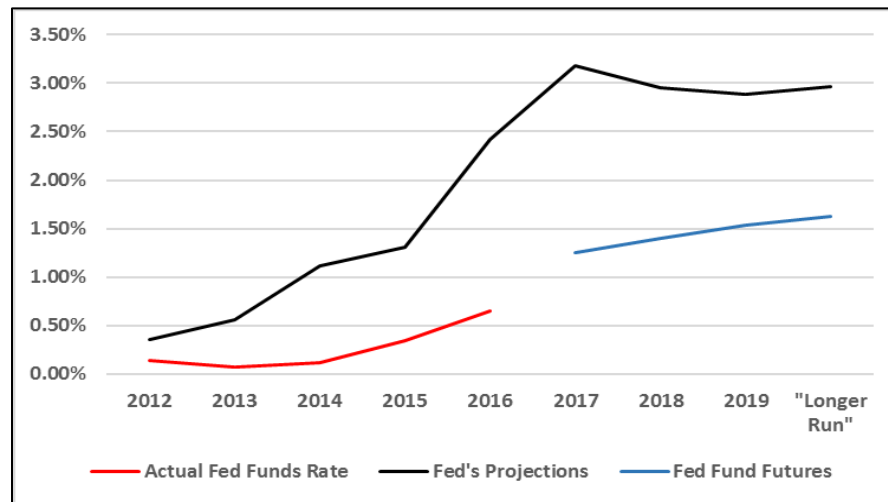
Figure 29: Short vs Long Term Treasury Yields (1940 – 1953)



By raising the fed funds rate, the Fed had significant effect on the 3-month Treasury yield, which rose from 0% in 1940 to 2% in 1953. Yet over that same time frame, the 10-year Treasury remained essentially flat, moving from 2.4% in 1940 to 2.8% in 1953.

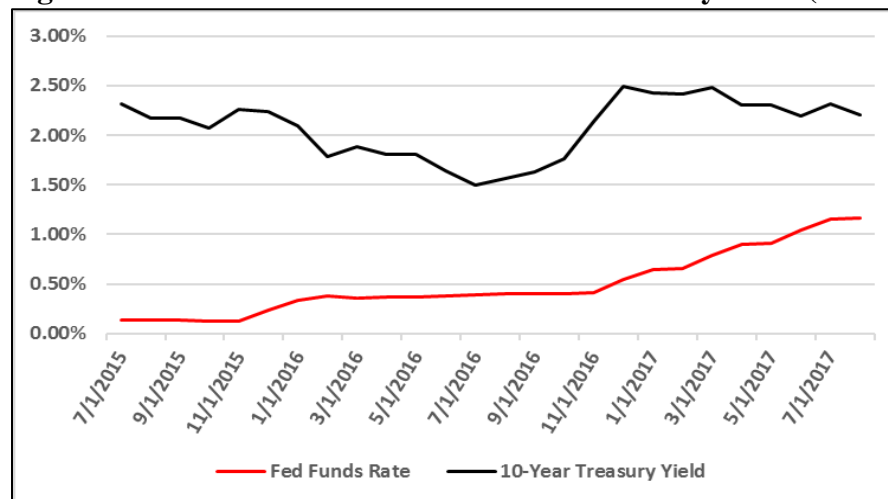
Moving to more recent events, we examine the Fed's recent track record of predicting the future fed funds rate. Comparing the data series below, we see that the Fed has consistently *overshot* its projections for the fed funds rate. Again, this confirms the general notion that the Fed, as well as many other financial pundits, are not appreciating both 1) the deflationary impact that the current high levels of debt are having on the economy and 2) the tightness of Fed policy for much of the last decade. The economy is growing much slower than their models would initially have suggested. The market, which we would tend to trust *more* than Fed predictions, has also overshot projections over the last few years.¹⁸⁶

Figure 30: Fed's Projections of Federal Funds Rate vs Actual Year End Fed Funds Rate¹⁸⁷



Finally, during the rise in rates from 2015 to 2017, we again notice the lack of correlation between a rising fed funds rate and the 10-Year Treasury. Despite the fed funds rate rising from close to 0% in 2015 to over 1% in mid-2017, the 10-year treasury yield was *below* its 2015 yield well into 2017.¹⁸⁸ The 10-year yield has started rising from mid-2017 to early 2018, though we'd argue this is not caused by a rise in the short term interest rate, but instead because of a general increase in growth expectations as well as the fiscal deficit and the possibility that the fiscal deficit will lead to looser monetary policy down the road. That said, long rates still remain significantly depressed and below N.G.D.P. growth. We would not be surprised to see long rates remain depressed and below N.G.D.P. growth for quite some time to come.

Figure 31: Federal Funds Rate vs 10-Year Treasury Yield (2015 – 2017)¹⁸⁹



As a final note, we find the recent outcries of the Fed “manipulating” interest rates as oddly timed to say the least.¹⁹⁰ In a certain sense, the Fed is always “manipulating rates” when it prints money at a rate of 3% above real G.D.P. growth (as they did for most of the 20th century). Couldn't *any* money printing above 0% be regarded as “manipulation”? Why is 3% inflation (i.e. 6%/year increase in MB) over the last 100 years regarded as “manipulation” whereas the 0% inflation (but still 1-3% increase in MB via new gold discoveries) of the 19th century not regarded as manipulation? Of course it's manipulation in a strict sense, but it's what the Fed/Treasury has always done. Did the pre-2007 era of 6% average annual increase in MB involve less manipulation? Inflation

was 2% before 2007 and has been less than 2% since. There is not much of a lag between money printing and inflation, it is expectations of future money printing that drives current inflation; the markets react almost immediately to any changes in expectations.¹⁹¹ The fact is that the market thinks the Fed will not print much money in the future and the market therefore sees very little inflation going forward. The market has been right so far. If anything, the Fed should have “manipulated” more since 2008, in order to reach its 2% inflation target (not to mention N.G.D.P. growth since 2008 has been well below the 5% trendline we saw pre-2007).¹⁹²

Chapter 10: Capital Ratios, Banking Crisis's and the Great Depression

Earlier in this letter we discussed the capital ratio, which measures a bank's capital in relation to its assets. As Neel Kashkari says, capital can be thought of as the down payment necessary on a house. Banks require 20% down for a house as an insurance policy. The higher the down payment, the less risk the bank is exposed to. In a similar vein, the higher the capital ratio, the more shock a bank can weather (all else being equal). With this simple explanation behind us, we begin this chapter by showing the capital ratio for US banks since 1834.

Figure 32: U.S. Bank Capital to Asset Ratio, “Capital Ratio” (1834 – 2016)¹⁹³



We can see that, in the mid-1800s, capital ratios were much higher than today. By the early 20th century the capital ratio had dropped to a point where the banks were stretched to their limits. JP Morgan, acting as a lender of last resort, was barely able to rescue the system in 1907. Because of this close call, as well as other factors, the Federal Reserve was created in 1913 to reduce the reliance on private bankers to rescue the economy.¹⁹⁴

We list these historical figures to point out that, as the capital ratio is reduced, the likelihood for a crisis increases. As a result, the importance of a lender of last resort increases as capital ratios are reduced. An economy whose banks have a 75% capital ratio is less likely to need a lender of last resort compared to an economy whose banks have a 10% capital ratio. We deem it unlikely that, with capital ratios of 10%, banks can survive over the long-term without a central bank or lender of last resort.^{195 196}

However, we should note that simply raising capital requirements does not solve all banking problems.¹⁹⁷ In today's complicated banking system, capital is measured on a risk adjusted basis, with a central authority (or even banks themselves) determining which assets get certain risk weightings. If it turns out that this authority incorrectly ranks assets, listing them as safer than they actually are (as occurred with mortgage backed securities during the financial crisis), then capital ratios can quickly drop to dangerously low levels as these “safe assets” rapidly lose value.^{198 199} Even with 100% reserved banks, it's possible that other non-bank institutions could over extend themselves.^{200 201} Some, like John Cochrane, have proposed equity financed banks as a potential run proof version of the current banking system.^{202 203}

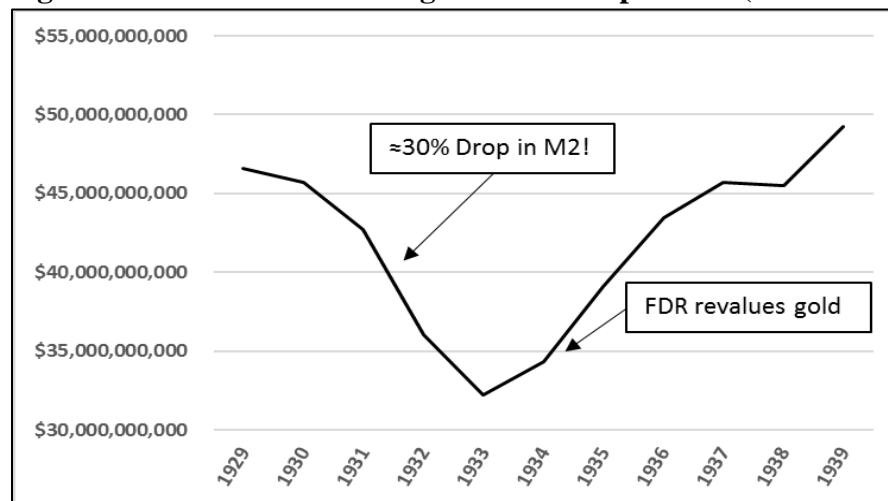
Diving further into capital ratios, let's first imagine an economy with bank capital of \$1 trillion, and bank assets of approximately \$10 trillion. As a result of a financial crisis, let's assume that \$500 billion in bad mortgages have to be written down because of improper risk weighting and deteriorating economic conditions.²⁰⁴ In this example, the banking system immediately becomes much more leveraged ($[1.0 - 0.5]/10 = 5\%$ capital ratio after write-down vs $1/10 = 10.0\%$ capital ratio before write-down).²⁰⁵ Furthermore, this overly simplistic analysis covers only the first order affects. In practice, any sudden move of capital ratios from 10% to 5% would tend to increase the withdraw rates at banks, further increasing leverage in a vicious cycle (classic bank run). It is all but certain that a lender of last resort would be required in this case.²⁰⁶

Other issues, such as the size of a bank (larger banks are usually better able to pool risk), also contribute to the likelihood of a banking crisis.^{207 208} While there are many valuable proposals aimed at decreasing the likelihood of a banking crisis, we tend to believe that a gradual increase in capital ratios from 10% to around 20% over a few decades would be a good first step in reducing risk.^{209 210 211} In addition, a move toward more equity financed banks could improve the stability of the system.

What happens in an economy with 10% capital ratios and no central bank? In a way, the Great Depression is an example of just such an economy. While there was technically a central bank in the United States during the 1929 to 1932 time period, the Fed's action during this time were largely counterproductive.²¹² Rates were *raised* (in an effort to curb gold outflows) even as the economy stalled in early 1930s!²¹³ The Fed did not make enough of an effort to print money or fulfil its duty as a lender of last resort. Money supply dropped by one third! The Fed failed in its central duty by not printing enough money as the panic progressed from 1929 to 1933.²¹⁴ If the Fed has printed significant amounts of permanent money and taken a more authoritative role as the lender of last resort, it is likely that the Great Depression could have been avoided.²¹⁵ As stated in our earlier chapter on Market Monetarism, it is critically important that the market believe that an increase in the money supply is *permanent*. Any money that the Fed tried to print in the early parts of the Great Depression was viewed as temporary money since the exchange rate of \$20.67 per ounce of gold remained unchanged during these bouts of attempted easing. Only after FDR changed the dollar to gold exchange rate to \$35 per ounce, did the market truly believe that the increase in money supply was permanent.²¹⁶

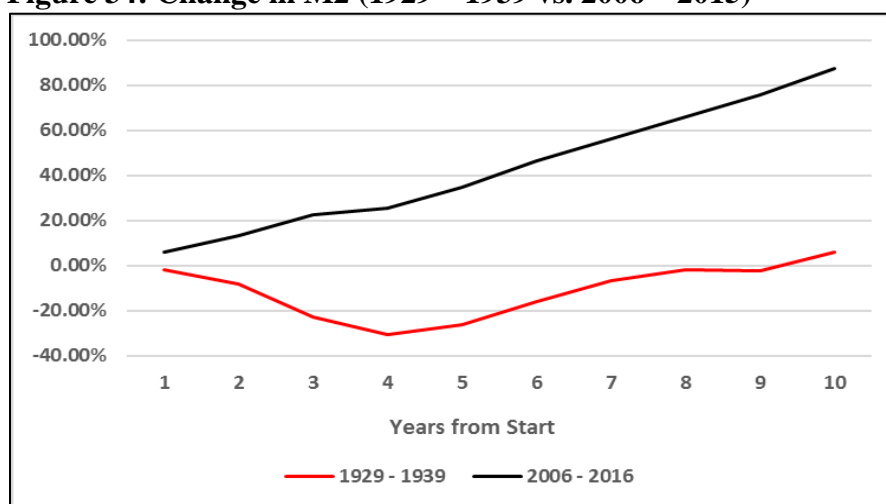
It should be noted that without FDR's actions, the system would have deleveraged much more than it already had. Capital ratios peaked at only 15% during the bottom of the Great Depression. This implies that (at least in our overly simplistic example) prices could've dropped $1/0.15 = 6x$ more than it did! Under the most extreme case (though unlikely), the Great Depression could have continued until most or all leverage was removed from the banking system (ie bank capital ratios reach 100%). There would likely have been other factors that would've prevented this much deleveraging, but we mention this extreme example here in order to better understand the big picture in regards to capital ratios and its potential effects on the economy.²¹⁷

Figure 33: Nominal M2 During the Great Depression (1929 – 1939)²¹⁸



Next, we turn to a more successful, though far from perfect, example of Fed policy. In the figure below we compare the change in M2 during the Great Depression to the change in M2 during the financial crisis of 2008.

Figure 34: Change in M2 (1929 – 1939 vs. 2006 – 2015)²¹⁹



The divergence of these two lines is the primary reason we did not have a severe depression in 2008. The Federal Reserve and U.S. Treasury acted in a decisive and timely manner and in so doing, prevented a severe deleveraging/depression. A significant deleveraging of the private sector must be accompanied by a leveraging up of the public sector to prevent a deflationary spiral.²²⁰ Ray Dalio separates the two into “ugly deleveragings” (1929 to 1939) and “beautiful deleveragings” (2006 – 2016).²²¹

Fractional Reserve Banking and Negative Interest Rates

If a fractional reserve banking system deleverages over a 3 or 4 year timeframe, it is possible that interest rates will turn negative, especially on shorter term bonds. For example, if our current banking system went from 10-to-1 leverage to 1-to-2 leverage over a 5 year period, it is likely that short term bonds (say 5 years and less) would have negative yields. In this scenario, actual inflation could approach -7% per year. Under this scenario there are many investors who would find a 1-year treasury yielding -1% to be very attractive. Under these circumstances it is possible that default risk would not be much of a concern, and therefore low/negative growth would be the central driver of negative interest rates. Again, it is largely the leverage in the system that leads to the potential of negative interest rates. Leverage tends to increase growth on the upswing and to decrease growth rates on the downswing.²²²

Under our example, it is possible for small amounts of money to be stored in cash (which yields 0%) to avoid the adverse effects of negative yielding bonds. This works in small dollar amounts, but under such an extreme deleveraging, cash may be in short supply. After all, by the nature of the 10 to 1 levered banking system, only a maximum of 10% of citizens can go to cash (in reality banks would close before anywhere close to 10% of the population is able to withdraw their cash from the bank).²²³ The rest of the population is forced to keep their money in the bank and, in this case, the negative yielding bond may be the highest yielding asset around. Attempts to store cash in stocks, real estate etc., may provide marginally better returns than bonds, but these assets are likely to drop in absolute price terms as well. They may themselves have negative returns during the period of deleveraging (for example, stocks dropped about 90% during the Great Depression). The above two paragraphs assume very little action by the central bank and illustrate the negative economic consequences that can result from a highly leveraged banking system with no lender of last resort.

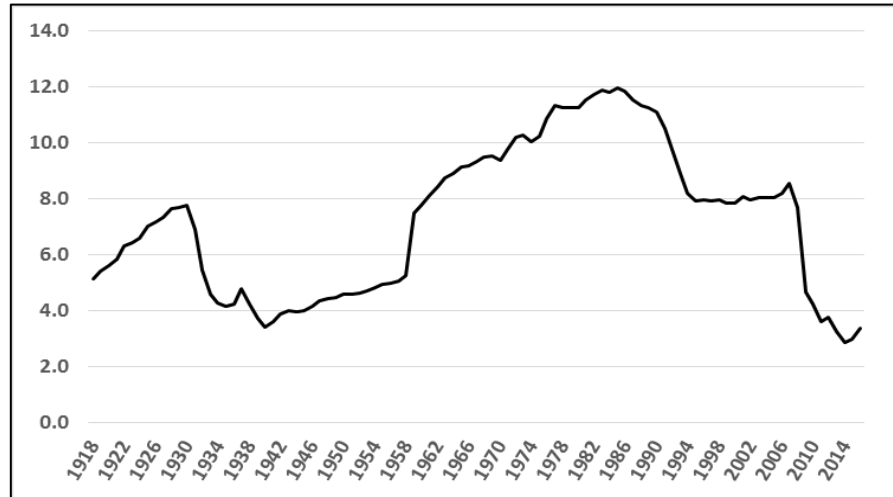
Again, the gradual levering up of the banking system from 40% capital ratio to 10% capital ratio, as well as the increase in the total Debt-to-G.D.P. ratio from 125% to 360%, created the potential for instability.²²⁴ Unwinding this leverage in a sudden matter will be detrimental for the economy. We witnessed the beginning of such an unwinding during the early years of the Great Depression and to a lesser extent during the 2008 financial crisis.²²⁵

Finally, many pundits are confused by the low or negative yielding bonds present in the world economy. They incorrectly focus on default risk. However, in a country that issues its own currency, as is the case in many of these low yield countries, default risk is much less of a concern. Instead it is the growth of said economy (or lack of growth) that primarily dictates bond yields.²²⁶ For example, we aren't worried much about the ECB defaulting on its debt, so we don't demand a premium bond yield.²²⁷ We are however worried that the ECB will *under* stimulate the economy, in which case low yielding EU area bonds become more attractive.²²⁸

Chapter 11: 1970s Inflation vs 2020s Inflation(?)

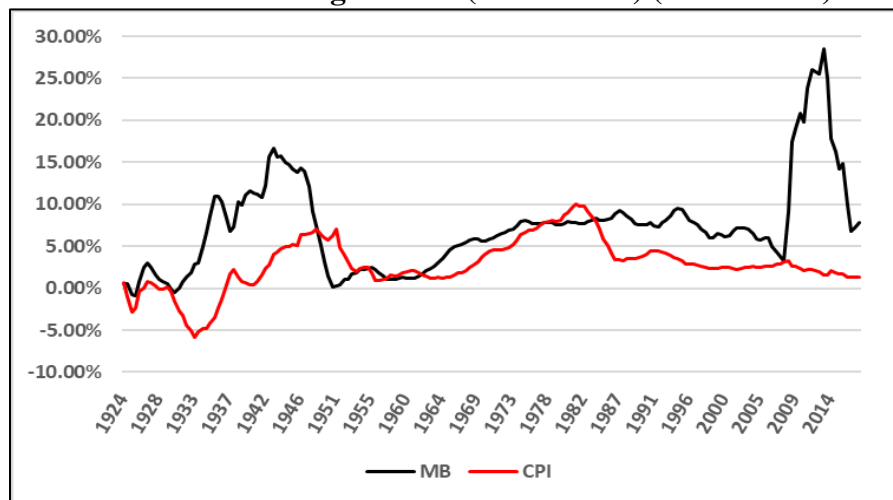
We begin this chapter by looking at both the M2 to MB ratio as well as the M2 to G.D.P. ratio in the 1970s as well as today.²²⁹

Figure 35: M2 to MB Ratio (1918 – 2016)²³⁰



The low M2 to MB ratio would imply the inflation in the future is possible. That said, when we look deeper, we notice that much of the increase in velocity was partially the result of a steady increase in MB over many years. More specifically, the Fed signaled that it was going to print much more MB going forward so the market adjusted and increased velocity. The result was a “double whammy” of inflationary pressures: a rising monetary base coupled with a rise in velocity which caused the inflation of the 1970s.

Figure 36: MB Growth for Trailing 5 years (Annualized) vs. CPI Growth for Trailing 5 Years (Annualized) (1924 – 2017)²³¹



Are we in for a similar fate today? After all, doesn't the 7.5% or so YOY increase in MB over the last 5 years signal that inflation will soon rise as well? Again, we'd argue against this idea and would point to the lower inflation expectations that the Fed has established. While MB has increased significantly over the past few years, unlike the 1970s, this new MB is likely to be temporary. The Fed has talked for a while about unwinding its balance sheet and has already begun to remove MB. From August 2014 to January 2018, the MB *dropped* from \$4.1 trillion to \$3.8 trillion.²³² We do not have

the steady rise in MB that we saw in the lead up to the 1970s inflation. It's possible that, with the recent aggressive fiscal deficits, inflation expectations will rise, however our view is that the Fed will remain tied to its 2% inflation target going forward.

As we stated earlier, despite MB rising at about the same rate after 1980 as before, the *trend* in the rate of change was flat or downward after 1980. More importantly, it was really Volker's hard stance against inflation that showed that the Fed would no longer let inflation grow out of control. Money velocity peaked in the early 1980s and started to drop thereafter. This drop in velocity did much of Volker's work for him in keeping inflation muted (despite increases in MB). Inflation expectations are paramount.²³³

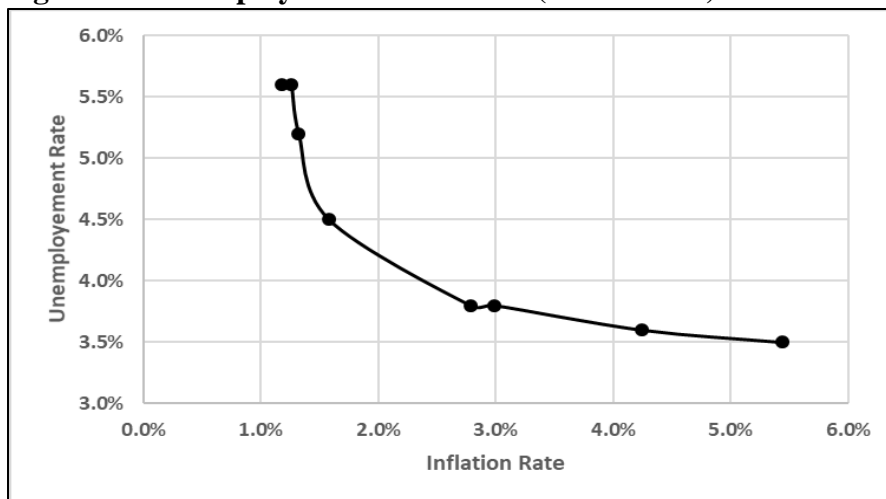
Demographics, Money Supply and Inflation

We next turn our attention to effect of demographics on growth rates. In the 1970s there was a rapid increase in the work force as woman entered the employment ranks in large numbers. This trend has largely ended. In addition, we are seeing *slower* growth in the work force of late which has largely been caused by the retirement of baby boomers. As these older workers retire, it tends to *decrease* the average wage of workers, as these older workers are usually replaced by younger workers who earn less. This will tend to keep inflation at bay, at least over shorter time-frames. In addition, as more elderly workers retire (and are not replaced by enough younger workers), they tend invest more in safe assets such as bonds, which would tend to put downward pressure on interest rates.²³⁴ In a purely theoretical sense, monetary factors are the main factors affecting inflation. In reality, the political concerns regarding wage growth, unemployment etc. often end up leading to expansionary monetary policies which in turn cause inflation (second-order effects). For example, the inflation of the 1970s could likely have been quelled by reducing the growth of the MB money supply (especially when combined with an N.G.D.P. target that replaces the dual mandate). However, this would have temporarily caused higher unemployment, and therefor was politically difficult. As a result, MB money supply continued to expand rapidly in order to avoid these negative political consequences. The first-order cause of the 1970s inflation was certainly the increase in MB, however this in turn was caused by the second-order negative political ramifications of high unemployment.

Does the trend of lower unemployment rate signal upcoming inflation? The Phillips Curve is an equation that shows the inverse relationship between unemployment and inflation.²³⁵ It states that, as unemployment falls, inflation tends to rise. As the competition for jobs increases, so too do wages which in turn adds to inflationary pressures. This may be true over the short run, but over the long run it is our view that wage growth is *not* the primary cause of sustained inflation. Instead, it is inflation itself, caused by printing money in excess of real G.D.P. growth, that causes outsized wage gains.

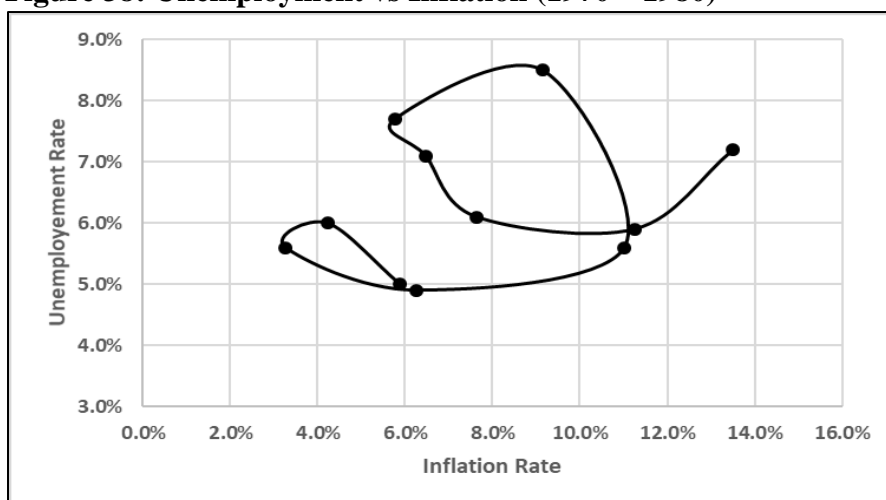
In the fantastic book, [Market Monetarism](#), Marcus Nunes discusses the breakdown of the Philips curve in the 1970s. The Philips curve posits that the relationship between inflation and unemployment should look like the 1961 to 1969 period (Figure 37 below), but at times this relationship breaks down as we saw in the 1971 to 1979 period (Figure 38 below). Scott Sumner says “The things that you think cause inflation (unemployment rates, etc.) are merely the symptoms of price stickiness...This makes excess demand/Phillips curve/interest rate theories of inflation doubly wrong. Not only do these factors not cause inflation, to the extent they are important they actually *slow* the inflation process resulting from monetary shocks (shocks to the money supply or money demand).” (translation: unemployment/interest rate policy isn’t nearly as important as MB growth and MB growth expectations are what matter.)²³⁶

Figure 37: Unemployment vs Inflation (1962 – 1969)²³⁷



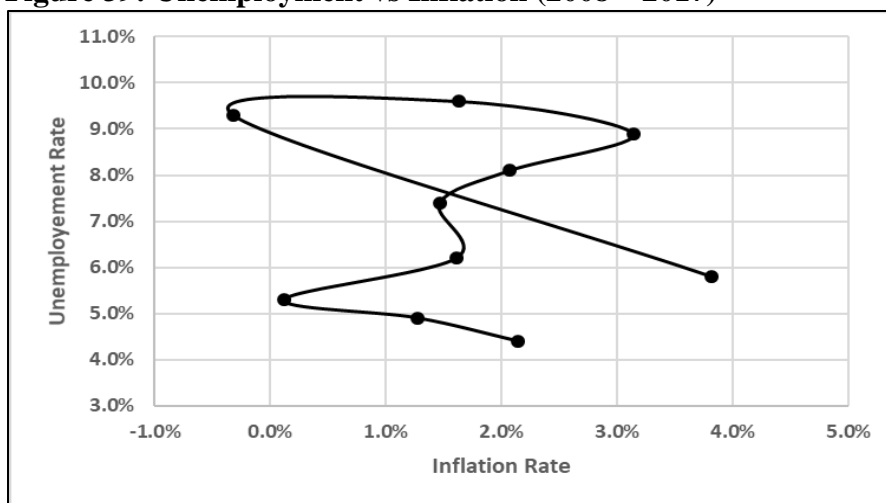
We notice a decent curve forming in the 1962 to 1969 period (Figure above). That said, it becomes clear that there is no relationship when looking at the 1970 to 1980 time frame (Figure below).

Figure 38: Unemployment vs Inflation (1970 – 1980)²³⁸



Finally, when looking at the 2008 to 2017 period, we again see no relationship between inflation and unemployment. It is our hope that pundits will eventually realize that low unemployment is not the cause of inflation. ²³⁹

Figure 39: Unemployment vs Inflation (2008 – 2017)²⁴⁰



Chapter 12: Lower Growth Implies *Higher* Multiples, Higher Volatility and Bonds with Longer Maturities

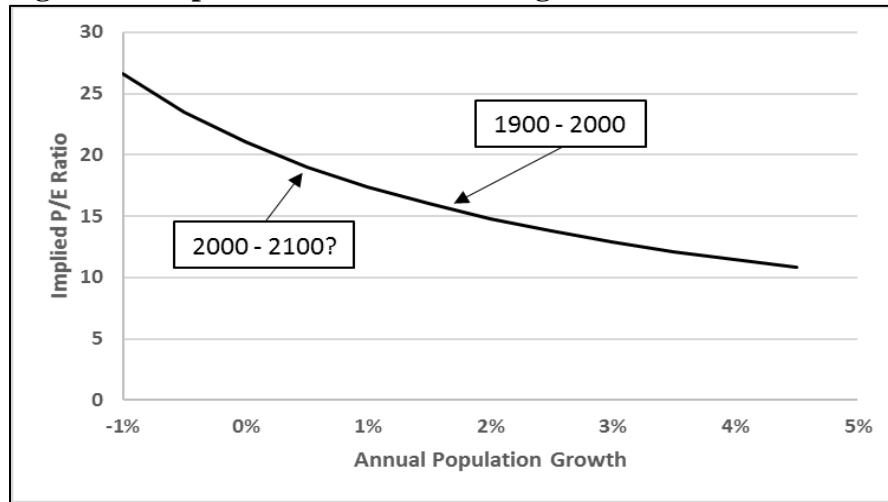
The idea that lower sustainable growth means an investor should pay *less* for a given amount of earnings is mistaken in our view. In fact, we believe the exact opposite: if growth and interest rates are going to be lower for the foreseeable future, then we are willing to pay *more* for a given amount of earnings, compared to a higher growth environment. This is a counterintuitive point, but as Warren Buffett says: “If you had zero interest rates and you knew you were going to have them forever, stocks should sell at 100 times earnings or 200 times earnings.”²⁴¹ The idea that there is a relatively constant equity risk premium (that is, as interest rates go down, equity multiples go up) is discussed extensively in our [2016 Annual Letter](#).

However, while this would appear bullish for stocks, there are of course negative consequences to a low growth world. One such negative consequence is the potential for increased volatility. To illustrate, let’s imagine an economy where nominal G.D.P. growth is about 3% a year. P/E ratios of around 33 are the normal (to maintain a relatively constant equity risk premium). Next let’s imagine a second economy where nominal growth is 20% a year. P/E ratios of 4 or 5 are normal (again, the equity risk premium is relatively equal between our two economies). Assuming an equity risk premium of zero, which economy will have more volatility if growth forecasts rise 1%? If, in our 3% growth economy, we move to 4% growth, then average P/E ratios should fall to around $1/.04 = 25$, or a price drop of around $1 - 25/33 = 24\%$. In the 20% growth economy, if growth rates move to 21%, then P/E ratios should drop a very small amount ($1 - [1/.21] / [1/.2] \approx 4.8\%$). In both case, growth changed by 1%, but in the low growth world, prices dropped much more. This illustrates that prices are much more sensitive to changes in growth expectations in a low growth world than in a high growth world.

We should also examine how interest rates and the length of bond maturities. Recently we’ve seen the introduction of 100-year bonds in some countries. The question is, why now? To answer this, let’s do the math on a \$1,000 100-year zero coupon bond with a 10% interest rate vs a \$1,000 100-year zero coupon bond with a 3% interest rate. The price of the 100-year bond at 10% interest rates is $\$1000 / [(1+10\%)^{100}] = \0.07 . The price of the 30-year bond at 10% interest rates is \$57. Therefore, with high interest rates, only a small fraction of the face value of the bond is in 31 to 100-year time frame. Conversely, at 3% interest rates, the 100-year bond’s price is $\$1000 / [(1+3\%)^{100}] = \52 and the 30-year bond is priced at \$411, demonstrating that a significant portion of a 100-year bond’s value is in years 31 to 100.²⁴² The differences in price between a 30-year bond at 3% and a 100-year bond at 3% are significant.

Finally, we acknowledge that recent bond prices are *below* YOY changes in nominal G.D.P. In the long-term we expect this divergence to shrink, however, it could take decades for the gap to disappear. During a multi-decade deleveraging, rates tend to stay below nominal G.D.P. growth as they did in the period after the Great Depression. Long-term, we believe nominal G.D.P. growth will be slightly less than historical figures, largely because of the lower population growth rates going forward. As a result, we expect P/E ratios to be sustainably higher than in the past. The average P/E ratio of 16 that existed for the last 100 years, was partially a result of the high population growth in the 20th century. Going forward, the population numbers will grow at a slower rate, and therefore we expect the average P/E ratio for the 21st century to be higher. This assumes inflation rates and productivity rates will remain largely the same as in the past.²⁴³ If anything, inflation may be *lower* going forward, which again would point to *higher* equity multiples.

Figure 40: Population Growth Vs. Long-term P/E Ratio²⁴⁴

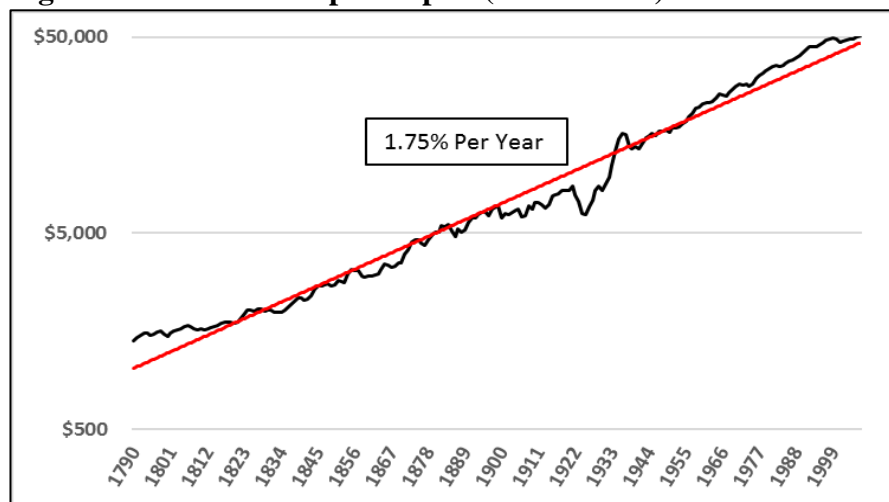


Besides productivity growth and population growth, it is ultimately the Fed that determines the inflation rate. Despite markets pundits believing that the Fed has been juicing the stock market, we believe it's the opposite. At least through 2015 or so, the Fed has not eased enough. This has pushed growth rates lower, which pushes interest rates lower, which in turn increases stock multiples. If the Fed wanted to reduce asset bubbles they should have eased more aggressively, which would have increased interest rates sooner and *reduced* stock multiples. That said monetary policy in 2017 was approximately right in our opinion, as N.G.D.P. growth is approaching the 5% range.²⁴⁵ Furthermore, we think the world would eventually adjust to a 0% inflation world. Finally, there is clearly some limit to multiple expansion when rates are at 0% (i.e. in a zero-rate world, despite Warren Buffet's earlier quote, we don't think P/E ratios would be 200 or above. More like 30-70.). That said, we list out these scenarios to show the other side of the "Fed is juicing the markets" narrative.²⁴⁶

Chapter 13: Sustained Real G.D.P. Growth Much Above 3% is Unlikely

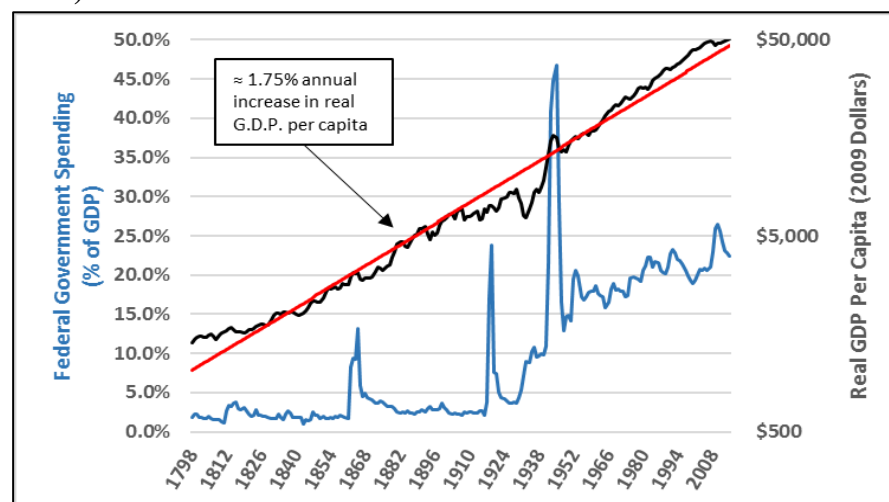
Real G.D.P. is made up of two components: 1) productivity growth and 2) population growth. We will start by looking at the historical growth rate of productivity as measured by G.D.P. As shown in the below chart, productivity growth has remained steady at about 1.75% a year since 1790. We don't think the fundamental institutions, laws, culture, etc. that led to this steady growth in productivity have been affected by recent events. Our best guess for productivity growth in the future is about the same 1.75% per year it has been for over 200 years.

Figure 41: Real G.D.P. per Capita (1790 – 2016)²⁴⁷



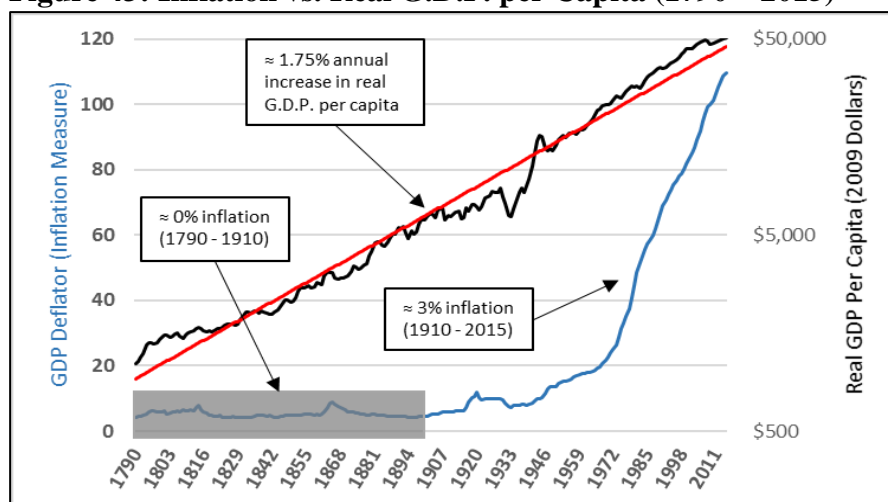
The take this chart further, it appears that it is difficult to buck the trend in real G.D.P. per capita growth. The pundits are constantly arguing about whether inflation is good or bad, whether a certain amount of government spending is good or bad, whether government debts are good or bad, etc. It is our view that, over the long term, none of this really matters. Up until the beginning of the 20th century, federal government spending was about 10% of G.D.P.²⁴⁸ Since then, it has increased to 25% of G.D.P., and about 40% of G.D.P. if state and local government spending is included.²⁴⁹ Yet during both time frames, real G.D.P. per capita growth went largely unchanged.

Figure 42: Federal Government Spending vs. Real G.D.P. per Capita (1798–2015)²⁵⁰



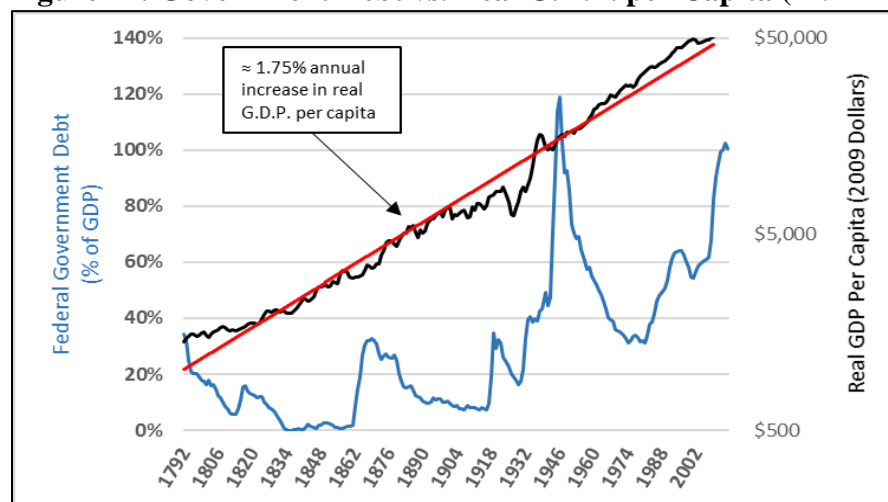
The dollar lost $\approx 0\%$ of its value from 1800 to 1900, yet the dollar lost 97% of its value from 1900 to 2016. Despite these two drastically different periods, the growth rate in real income per person was essentially the exact same for both periods!

Figure 43: Inflation vs. Real G.D.P. per Capita (1790 – 2015)²⁵¹



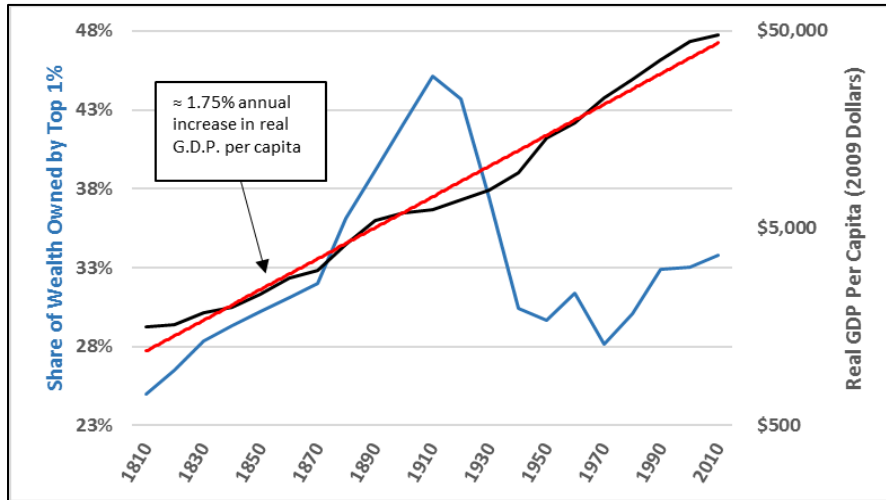
Furthermore, The Great Depression had little, if any, effect on long term income per person. It caused a dip below the trendline in the 1930s, but by the 1940s it had regained all lost ground. Government debt climbed to over 100% of G.D.P. in the 1940s, but by 1974 it had dropped back to 22%.²⁵² During this time frame real G.D.P. per capita continued its slow and steady climb along the trendline.

Figure 44: Government Debt vs. Real G.D.P. per Capita (1792 – 2015)²⁵³



Wealth distribution is an important topic of late. From the figure below, we note that the distribution of wealth has varied considerably over time in the past two centuries. Looking at the distribution of income paints a similar picture. While policy discussions regarding wealth and income distribution are important, they are unlikely to significantly affect real income per person going forward.²⁵⁴

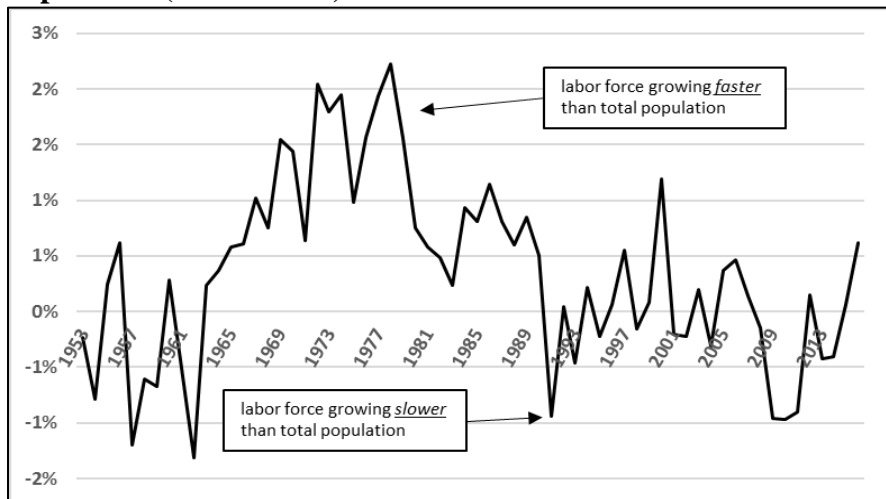
Figure 45: Share of Wealth owned by Top 1% vs Real G.D.P. per Capita (1810 – 2010)²⁵⁵



The 1970s inflation, the 2000 dot com bubble, the 2008 financial crisis were all monumental events, yet none of them moved us off the trendline of income per person. We argue that the general work ethic of the American people, as well as the institutions and laws, provide the opportunity for smart individuals to continue innovating. It is certainly possible to erode these factors, but in our opinion, we are nowhere close to eroding those advantages. The health care debate, government debt, which party controls congress, etc. are all important issues that should be discussed. But they will have little effect on the long-term per person income trends in the US. In addition, many other countries around the world are now getting on board the 2% or so real G.D.P. per capita trendline (and in fact growing at even faster rates while they catch up with the US, at which time they'll slow down to 2% or 1.75% per year).

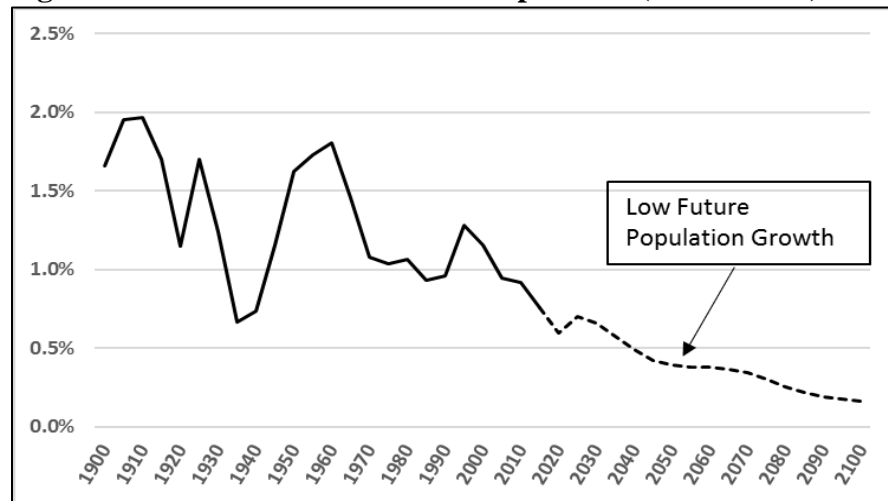
Productivity growth of late is doing fine.²⁵⁶ Furthermore, from 1960s through the 1980s, the working age population was growing faster than the population as a whole which gave a temporary boost to the real G.D.P. per capita numbers. When this differential (See in figure below) is positive, real G.D.P. per capita will tend to be *higher* than normal. When the differential is negative or zero (as it has been for a good portion of the 2009 to present era), then real G.D.P. per capita will be *lower* than it otherwise would have been.

Figure 46: YOY change in Civilian Labor Force *minus* YOY Change in Total Population (1953 – 2016)²⁵⁷



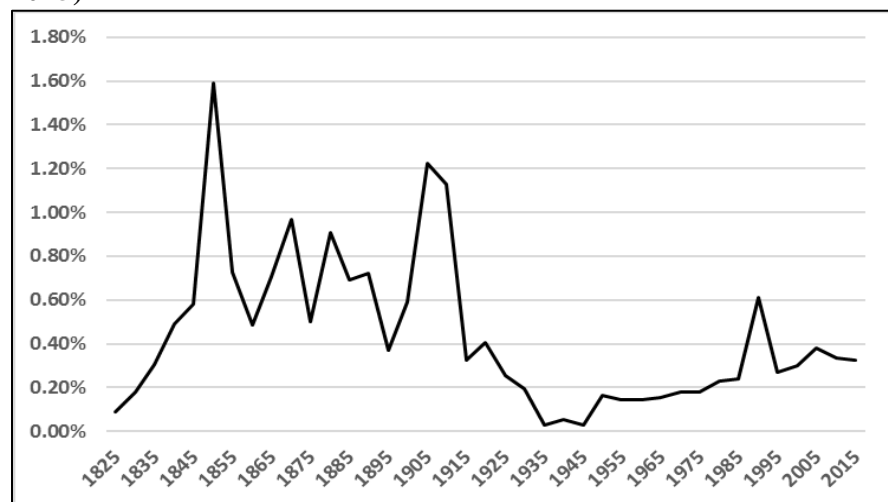
Looking at population growth rates, we notice that current and future population growth rates are lower than historical averages.

Figure 47: Annual Growth in U.S. Population (1900 – 2100)²⁵⁸



While population growth can be increased by allowing more immigration, we notice that, based on recent history, immigration is unlikely to materially change the future population growth rates.

Figure 48: Annual New Immigrants as a Percent of Total U.S. Population (1820 – 2015)²⁵⁹



Unless the United States increases working age population growth rates (unlikely) or increases the productivity growth rate to something materially above 1.75% per year (even more unlikely), then real G.D.P. growth significantly above 3% per year becomes highly unlikely. As discussed above, U.S. productivity growth has remained constant through both high and low tax rates, high and low debt levels, etc. Yet the pundits say, “if only we could lower/raise taxes (insert political agenda here), that 3.5% or 4% real G.D.P. growth is possible”. In our view, this is the equivalent of saying “1 + 1 = 3”. Again, politics at the margin doesn’t affect real G.D.P. per capita. Most of the recent political debates fall within this “politics at the margin” classification. The formula for success that the United States has used for the past 200 years has not been altered. While per person growth rates are unlikely to be much lower than history would suggest, we also shouldn’t expect growth rates going forward to be higher than the per person income growth rates we’ve seen over the past two centuries.

Footnotes and Sources (most links archived on <http://archive.is/>):

¹ Assumes a 1% annual management fee. Not included in these calculations is an approximately \$200 charge per account per year for fixed costs (minimum account fees, trading commissions, etc.).

² Includes dividends.

³ Assumes a 1% annual management fee. Not included in these calculations is an approximately \$200 charge per account per year for fixed costs (account fees, trading commissions, etc.).

⁴ Partial year only; from inception date of 12/15/2015 to 12/31/2015.

⁵ Source: <http://www.themoneyillusion.com/why-did-monetary-policy-fail/>

⁶ Daniel Alpert, in his book “The Age of Oversupply: Overcoming the Greatest Challenge to the Global Economy” makes the argument that the glut of savings has been supplied, at least partially, by the high savings rate in developing countries. Because of the lack of social safety net in these countries, citizens are forced to save a much higher percentage of their income. This savings glut, as well as the constant influx of workers moving from farming to other occupations, tends to keep prices low.

⁷ Scott Sumner illustrates the importance of expectations and the permanence of money supply in talking about the Great Depression. In 1933, the money supply and interest rates remained relatively unchanged, yet the market rallied greatly simply on the (ultimately) correct assumption that FDR would implement massive monetary easing. See more at kindle book location 3580 in “The Midas Paradox: Financial Markets, Government Policy Shocks, and the Great Depression” by Scott Sumner.

⁸ That said, lately policy has been about right. Sumner notes: “Easy money is the last thing the economy needs now—the bigger danger is that money will be too easy”. Source: <http://www.themoneyillusion.com/unsustainable/>

⁹ We are left with two outcomes: 1) the Fed never adopts a N.G.D.P. target and we get the boom bust pattern we’ve had for a while. Interest rates will stay low (because of N.G.D.P. and/or inflation ceilings – i.e. the Fed snuffs out the recover at the first sign of growth) or 2) Fed does aggressively adopt a 5%+ N.G.D.P. target which the market believes. In this case, earnings grow and the current P/E ratio, while high, can quickly be “grown into” (i.e. multiples contract over a few years, but higher earnings growth offset this drop in the P/E ratio). Furthermore, if the Fed truly adopted an N.G.D.P. target, the argument could be made that growth will be much more stable going forward; we will have less extreme swings in business cycles, N.G.D.P., etc. In this case, we want to be 100% stocks. Many of the past stock market declines have been caused by volatile N.G.D.P. growth, which an N.G.D.P. target seeks to eliminate. The Fed has shown they will do enough to avoid a depression (ie 30% drop in N.G.D.P.) but not enough to get back to sustainable 5% N.G.D.P. growth over the long term, and we therefore remain fully invested in stocks. If they do happen to get 5% N.G.D.P. growth, under the current policy, it is possible that they overshoot and get, for example, 10% N.G.D.P. growth for a short time, and then crash back down again (i.e. big swings in N.G.D.P.)

¹⁰ Source: <http://finance.townhall.com/columnists/mikeshedlock/2013/10/11/how-does-us-debt-stack-up-globally-n1720978>

¹¹ “I expect very low nominal (and real) interest rates for a long time. This means the cost of financing the debt will be much lower than if real rates were back at 1980s levels. This is because I expect the mother of all credit bubbles to soon emerge out of East Asia. If East Asia (especially China) continues to grow rapidly (which I expect) and continues to save at relatively high rates (which I also expect), then world real interest rates are likely to remain depressed for decades. Don’t forget that China alone has nearly as many people as North and South America, Europe, and Australia. And they save 40% of their incomes. And they are growing extremely fast.” Source: <http://www.themoneyillusion.com/10-reasons-not-to-fear-high-inflation/>

Another source of Sumner saying rates will stay low for very long: “The Real Problem was Nominal: N.G.D.P. targeting and the Great Recession | Scott Sumner”

https://www.youtube.com/watch?v=XIYxb6c87aw&list=PLOdXrdpuU5ignn-gAHO9FqXcwqZm6SP_1&index=2&t=52m30s

¹² A possible example of this would be the Fed implementing QE under the assumption that it would eventually unwind its balance sheet. However, 10 years later, after finding it difficult to unwind, the Fed simply writes off the debt (or agrees to carry it on its balance sheet indefinitely). In this case QE was initially a mix of austerity and money printing. After the Fed acknowledges that the balance sheet would never be truly wound down, then the initial QE retroactively turns into pure money printing/debt write-off/helicopter money.

¹³ Source: <https://fred.stlouisfed.org/series/GDP>

¹⁴ In the Great Depression, while debt in dollar terms dropped approximately 33% from 1929 to the end of 1932, total G.D.P. dropped 43% leading to an *increase* of debt/G.D.P. from 250% in 1929 to 300% in 1932. Source: https://static.seekingalpha.com/uploads/2009/12/3/saupload_total_debt_to_gdp.png

¹⁵ Source: https://fred.stlouisfed.org/graph/?graph_id=316528

¹⁶ In the 1930s austerity was applied too quickly when the U.S. government took on negligible amounts of debt despite a massive deleveraging in the private sector. The result was a much too rapid and severe deleveraging of the private sector, economic contraction and extreme unemployment levels.

¹⁷ In practice, not all the newly printed money would go to paying off debts. Some of the newly printed money would be spent directly by consumers, so the debt reduction in this case would likely be less than the amount of money printed.

¹⁸ Ray Dalio says there is either money or credit. If credit goes down, then you better print money to offset the drop in credit spending. Total spending, whether it is credit or money, is what matters (especially in regards to inflation)

¹⁹ Technically, a small amount of these liabilities *are* able to be carried on the balance sheet indefinitely, but this amount is usually small and constant in relation to G.D.P. Typically, the Fed's balance sheet grows at about 6% over the long run, in line with nominal G.D.P. This money in general will never have to be paid back. Any long-term sustained growth in the Fed's balance sheet above this G.D.P. growth rate of about 6% per year, will eventually (likely) need to be paid back.

²⁰ "At the zero-rate boundary, fiscal and monetary policies become one. The central bank's sole right to make monetary policy is gone. But the reverse is also true: the central bank can send money to every citizen. This is the helicopter drop proposed by the late Milton Friedman." Source:

<http://macromarketmusings.blogspot.com/2008/12/pulling-out-big-monetary-guns.html>

²¹ Related: <http://macromarketmusings.blogspot.com/2013/06/a-foolproof-approach-to-monetary-policy.html>

²² "Again, monetary policy may be temporary (as you say) but fiscal policy has to be [temporary], unless they plan to default" Source: <http://www.themoneyillusion.com/i-shouldnt-do-this-but/>

²³ "Sumner has argued that one cannot account for the impact of fiscal policy without first considering how monetary policy may affect the outcome; fiscal stimulus may not succeed if monetary policy is tightened in response. Economic journalists have referred to this as the Sumner Critique, akin to the Lucas critique.[13] Summarizing this thinking, The Economist suggested:

‘...the economy will almost certainly not grow at a 5.3% rate no matter what Congress does. Arguments to the contrary are subject to what econ bloggers have come to call the Sumner Critique, after economist and blogger Scott Sumner. It is reasonable to assume, by this critique, that the Federal Reserve has a general path for unemployment and inflation in mind and it will react to correct any meaningful deviation from that path. A 5.3% growth rate is well outside the range of current Fed projections. Growth that rapid would almost certainly bring down unemployment quite quickly, triggering Fed nervousness over future inflation and prompting steps to tighten monetary policy.’“

Source: https://en.wikipedia.org/wiki/Scott_Sumner#Nominal_GDP_targeting

²⁴ Scott Sumner on Monetary vs Fiscal stimulus in Japan: "Japan has run big fiscal deficits for 20 years, and had falling N.G.D.P.---one of the worst growth rates of aggregate demand in all of modern world history. How can that be? Very simple, expectations of deflationary BOJ monetary policies prevented the fiscal stimulus from boosting current AD. Just because the Japanese government gives out a tax rebate, the public isn't going to run out and buy new houses if the BOJ's deflationary monetary policy is expected to drive house prices relentlessly lower. To work, fiscal policy must be accompanied by an expansionary expected future monetary policy. But if you have that, why bother with fiscal?" Source: http://econlog.econlib.org/archives/2015/01/the_implication.html

²⁵ Source: https://en.wikipedia.org/wiki/Helicopter_money#Differences_to_Quantitative_Easing

²⁶ "Interest on reserves represents a permanent policy shift that had been planned since 2006. It was not an ad hoc crisis response that can be expected to disappear. If interest is paid on reserves at the overnight rate and short-term bond markets are liquid, then short-term bonds and base money are perfect substitutes and a helicopter drop performed by the Tim Geithner dropping bonds from an F-16 would be as effective (or ineffective) as Ben Bernanke dropping dollar bills from his flying lawnmower." Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/09/can-monetary-policy-work.html>

“In the real world, the closest thing to a helicopter drop of money is a tax cut financed by money creation. The government cuts taxes and instead borrows money by selling bonds. The central bank buys the bonds with new money created out of thin air. Again, those people who used to buy houses and were holding more money because they could think of nothing else to do with it, presumably just hold on to the additional money they receive. However, other people, who are holding money despite valuing the additional goods they might buy, spend the additional money on whatever goods they want the most. Perhaps some of them spend more on houses. Given sufficiently large tax cuts funded by money creation, total spending will rise enough to match the productive capacity of the economy. The most likely scenario will be that fewer houses are demanded and more other goods are demanded. There remains a need to redeploy resources, including labor, from the production of houses to other goods.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2010/12/scarcity-and-unemployment.html>

²⁷ “I agree that a helicopter drop would probably work. But the same monetary injection could work just as well without the bad side effects (either ballooning the deficit or creating hyperinflation) if they simply bought bonds. It’s not like the Fed and ECB don’t know how to debase their currencies, they just don’t want to do it.” Source: <http://www.themoneyillusion.com/more-reverse-causation/>

“The root of this problem is credibility; the Fed doesn’t know how credible its inflation promises will be, and hence errs on the side of mild deflation, rather than hyperinflation. Of course the markets understood this fear, and quickly figured out that disinflation, not hyperinflation, was the real risk. Markets aren’t dumb. They sniff out Fed indecision like a schoolyard bully sensing the timidity of his next victim.” Source:

<http://www.themoneyillusion.com/spot-the-flaw-in-nominal-index-futures-targeting/>

²⁸ “You might object that the effect is small because I assumed such a small fiscal stimulus. But if that same measly \$20/capita represented a permanent increase in the money supply, we know it would raise expected future nominal spending by 20%, thus triggering all sorts of dramatic changes in asset prices and output in year one. The difference between an OMO and a helicopter drop is trivial, the difference between temporary and permanent monetary injections is huge. There’s reason it’s called ‘high powered money.’” Source:

<http://www.themoneyillusion.com/robert-hall-and-the-monetary-transmission-mechanism/>

²⁹ “When the Fed injects more base money than the public wants to hold, they try to get rid of excess cash balances, and AD rises. Although monetary economics is actually about the supply and demand for base money, from a commonsense perspective it seems to be about banking. Yes, banks demand a significant share of base money (usually about 10%) but then so do drug dealers. And monetary economics courses generally spend little time on drug dealers. And most importantly, there is absolutely nothing in monetary theory that suggests we should worry about whether banks are “lending” or not. I put “lending” in quotation marks, because of course banks are almost always lending, even if they invest in T-bills. We only need worry when they change their demand for base money (i.e. reserves.) My hypothesis is that even very smart monetary economists often slip into the commonsense view and think monetary policy is about banks and credit markets, rather than the supply and demand for base money. Would a central bank focusing on the supply and demand for base money start paying interest on excess reserves during the very week the economy was clearly sliding into deflation?” Source:

<http://www.themoneyillusion.com/being-there/>

³⁰ “In my view, it’s too soon to jump to helicopter money, just because the techniques mentioned by Bernanke have been exhausted. I recall Bernanke once arguing that the inflation target might have to be raised if there was a danger of hitting the zero bound, but he doesn’t mention that here. In my view there are many alternatives that we’d need to run through before considering helicopter drops, such as a higher inflation target, or price level targeting, or better yet N.G.D.P.L.T. I’d also want to go beyond T-bond purchases, to the purchase of other assets. Thus creation of a sovereign wealth fund would be far superior to helicopter drops.” Source:

<http://www.themoneyillusion.com/bernanke-on-helicopter-money/>

³¹ In this case, money velocity is fixed.

³² “Because its quantity is pre-programmed, the stock of BTC is free from supply shocks, unlike that of monetary gold. Supply shocks from gold discoveries under the gold standard were historically small, however. The largest on record was the joint impact of the California and Australian gold rushes, which (according to Hugh Rockoff) together created only 6.39 percent annual growth in the world stock of gold during the decade 1849-59, resulting in less than 1.5 percent annual inflation in gold-standard countries over that decade. For reference, the average of decade-averaged annual growth rates over 1839-1919 was about 2.9 percent.” Source: <https://www.alt-m.org/2018/01/11/how-a-bitcoin-system-is-like-and-unlike-a-gold-standard/>

³³ It is also possible to have higher sustained inflation rates. If we wanted 7% inflation, then money supply would grow at 10% a year. If the market believed this and thought it was sustainable, it’s likely that the Fed’s Balance

sheet in G.D.P. terms would remain constant. While MB would be increasing at 10% a year, so would N.G.D.P., thereby keeping the ratio constant. If MB to G.D.P. ratio is increasing over time, there is a distinct possibility that the market doesn't believe that the money printing will be permanent and the pushing on a string phenomenon ensues. Over the medium and long term, if the market believes that any money printed will increase at a steady rate and it will remain permanent, then the MB to G.D.P. ratio would tend to remain relatively stable (all else being equal).

³⁴ There is also an interesting difference between the total wealth vs flow of money in an economy. For example, if a hurricane destroys a home, then wealth has clearly been reduced. Yet all else being equal, no corresponding drop in the flow of money (G.D.P.) has resulted. On the contrary in most cases, the home owner will likely have to *increase* spending in the near term to replace his damaged property. This illustrated the counterintuitive relationship between the destruction of assets and G.D.P.

³⁵ Interest rates are in a sense measuring projections for *future* growth, while G.D.P. measures *current* economic growth

³⁶ For simplicities sake, we are ignoring depreciation.

³⁷ Sources: <https://fred.stlouisfed.org/series/GDP> ; <https://fred.stlouisfed.org/series/TNWBSHNO>

³⁸ Consistent nominal deficits of 2.5% of G.D.P., with 6% nominal GDP growth will lead to a long-term steady state debt to G.D.P. ratio of about 44%.

³⁹ Government deficits/debts that are consistently large in magnitude are usually, but not always, monetized (which usually leads to inflation). While it is uncommon, it is possible for a government to take on quite a bit of debt, yet have inflation remain muted, especially if the market is certain that the Fed will not monetize the debt (and will eventually pay back all the debts).

⁴⁰ This point is made on page 205, "Money Mischief: Episodes in Monetary History" by Milton Friedman

⁴¹ There are also other motivations for creating a central bank: "The letter took pains to characterize the Reserve Association not as a "central bank," but as an institution more suited to American needs. The goal was to bring about three seminal changes: 1) a more unified banking system; 2) a more logical basis for the currency; and 3) the development of a market in bank paper, so that liquid funds would be loaned to businesses rather than to stock market traders." Source: p. 122 of "America's Bank: The Epic Struggle to Create the Federal Reserve" by Roger Lowenstein

In general, the central bank would eventually be a financing of arm for the government (this was main reason for bank of England, which actually created the central bank to monetize the government debt and get the government best interest rates etc. (and achieve the king's ends). For the Fed in particular, the U.S. was fragmented, i.e. a dollar in Cleveland wasn't worth the same as dollar in NYC so the Fed was implemented to be a national clearing bank which would bring value of dollar consistent across the country. The Fed was NOT viewed as financing arm of government (unlike bank of England). When Fed was started, it couldn't even buy government debt, it could only buy private bank debt (after all it is private bank). However, in World War I, Fed rules changed to allow it to buy government debt.

⁴² "In short, incumbent politicians often have an "inflation bias." If they were allowed to pull the levers of monetary policy, the likely result would be undesirable levels of inflation. Empirical studies generally support this conclusion: monetary policy independence is associated with greater price stability.¹⁷ It is therefore perhaps not surprising that, within the vast US administrative state, the Federal Reserve enjoys an unparalleled degree of formal independence." Source: p. 155 of "The Money Problem: Rethinking Financial Regulation" by Morgan Ricks

⁴³ https://en.wikipedia.org/wiki/United_States_Note

⁴⁴ As of March 2018, there is a bit less than \$21 trillion in outstanding treasury debt, of which the Fed has about \$2.4 trillion on its balance sheet. If the Fed were to fully monetize the debt, the Fed would own all outstanding treasuries and the Fed's balance sheet would be \$21 trillion instead of 2.4 trillion (Fed has other securities as well which brings its current balance sheet to over \$4 trillion. Sources: <https://fred.stlouisfed.org/series/TREAST> ; <https://treasurydirect.gov/NP/debt/current>

In order to get money into the economy, the Fed still needs to buy something. If no treasuries are available for it to buy, then it could buy other safe private company bonds, etc.: "Of course, the alternative of taking on private obligations raises other issues, including those involved with potential effects on private credit allocation and the management of risk and liquidity in the System's portfolio. . . . A key tradeoff would be between minimizing the

effects of System portfolio choices on relative asset prices on the one hand, and minimizing risk and maximizing liquidity on the other. A broadly diversified portfolio, which included credit to financial intermediaries holding nonmarketable assets, would have the greatest chance of exerting as little influence as possible on private credit decisions. With such a portfolio, the System would have a low profile in each market and it would not be favoring one type of asset over another. But the System would be acquiring riskier and less liquid assets. . . . At the other end of the spectrum, if the Committee chose to concentrate operations in a small subset of markets that promised the least credit risk and the greatest liquidity . . . it would increase the odds on eventually affecting relative asset prices.” || “When doing monetary system design, we can’t assume there will always be enough public debt to accommodate the entire money supply—or even just the base money supply if such a concept exists in one’s institutional setup. Presumably we would want the monetary system to work even if the government consistently balanced its budget. So let’s assume that, even if the government does borrow, its outstanding debt isn’t large enough to accommodate the desired money supply. The monetary authority must therefore buy private credit assets. We are then left with the problem Kohn was describing—the problem of credit allocation” Source: p, 157 of “The Money Problem: Rethinking Financial Regulation” by Morgan Ricks

Finally, while congress in theory approve an unlimited amount of treasury bonds, it is likely that in such a scenario, the Fed would raise interest rates to slow this down and counteract the rise in treasury debt.

⁴⁵ There is an opposite scenario where instead it is the Fed itself that has run into trouble. One possible scenario is if the Fed buys bonds but as a result of a rapid rise in interest rates, these bonds fall enough so that the Fed’s liabilities are greater than its assets and the Fed is technically insolvent. Bill Woolsey explains further: “For example, suppose the Fed undertakes quantitative easing and base money rises to \$2.6 trillion. Money expenditures begin to rise, resulting in higher prices (and, hopefully, higher production.) The rising prices lead people to expect higher inflation. Long term interest rates rise. Some of the assets the Fed currently holds, which includes mortgage backed securities and longer term bonds, fall in current market value because of the increase in interest rates. If the Fed wants to get base money all the way back to \$800 billion, then it will need to sell approximately \$1.8 trillion worth of assets. If the market value of its asset portfolio falls more than 31 percent, then the Fed will be out of assets to sell, and base money will still be greater than \$800 billion. As we imagine the Fed following this policy and reducing base money, the expected inflation should decrease, raising the market value of the bonds. While, normally, selling off these assets would tend to lower their prices because of the liquidity effect, remember, that the reason base money needs to drop is that banks are strongly expanding lending, perhaps by making commercial loans, but also by purchasing bonds. Presumably, the sensible strategy for the Fed would be to sell off all of the bonds it holds with short terms to maturity, and hold off on selling the long term bonds. But it is possible that it would need to sell off long term bonds and mortgage backed securities at a loss. And if the losses are great enough, the Fed might become insolvent, and further, the insolvency could become so great that it would not have enough assets to reduce the quantity of base money enough to keep money expenditures from rising too much, resulting in above target inflation.” || “The possibility that the Fed might become insolvent, and even so insolvent that it cannot undertake the needed contraction in base money should not be a deterrent to quantitative easing. If necessary, the government should bail out the Federal Reserve. The simplest approach would be for the Treasury to swap the Fed’s long term bonds for short term bonds at par. The Fed can then sell the short term bonds to contract the quantity of base money. The Treasury, of course, will have to sell new short term bonds to pay off the ones the Fed sold when they come due. The interest rates the treasury will have to pay will be higher, and so this will increase the government’s interest expense. And the government should pay that expense and reduce other sorts of expenditures. Of course, the point of quantitative easing is to expand money expenditures on output, and raise production and employment. This will tend to reduce government social expenditures and raise tax revenue, helping with the deficit.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2010/11/quantitative-easing-and-fed-insolvency.html>

⁴⁶ Even if Fed goes along and finances irresponsible government spending, public would still likely demand higher rates as they see more and more dollars are being printed and the value of their future coupon payments is being reduced by inflation.

⁴⁷ In order to further solidify the central banks independence, the leaders of this new Federal Reserve are appointed for long terms by congress. Similar to judges who are also appointed by congress, the long terms and formalized independence should reduce the ability of the Treasury to influence the Federal Reserve members into printing more money than is prudent.

⁴⁸ See Larry Summers comment Fed being independent so that congress can't create large inflation in video titled "Event webcast: Peterson Institute for International Economics"

https://www.youtube.com/watch?v=tNwefYMhA_8&t=3705s ; In the same video, Ben Bernanke also discusses central bank independence: https://www.youtube.com/watch?v=tNwefYMhA_8&t=5917s

⁴⁹ Technically MB is monetary base, and is separate from money supply (M1, M2). It is explained further in the table here:

https://en.wikipedia.org/wiki/Money_supply#Empirical_measures_in_the_United_States_Federal_Reserve_System ; https://en.wikipedia.org/wiki/Fractional-reserve_banking#Money_supplies_around_the_world

"During the Fed's inception, the Fed needed only to back gold deposits by 35%. This created a very dangerous situation because if more than 35% of banks demanded their Federal Reserve Deposits as gold, then the Fed would be insolvent. Such a crisis did happen in 1933 and Federal Reserve Deposits (as well as Federal Reserve Notes) lost their gold backing. Foreign governments were still allowed to be on the gold standard and their Federal Reserve Deposits were still redeemable in gold. But these too were only fractionally backed. This inevitably led to another gold run in 1971, led by heavy withdrawals by Switzerland (51 million) and France (191 million). Nixon chose instead of heavily devaluing the dollar against gold, to simply remove the US from the international gold standard." Source: https://en.wikipedia.org/wiki/Federal_Reserve_Deposits#History

⁵⁰ Most of the physical dollars are, in value terms, \$100 bills. There is approximately \$1.5 trillion in physical dollar bills outstanding (about 8% of GDP, 11% of M2, 38% of MB). However, \$1.1 trillion of that is in \$100 bills. If you take only \$50 and less, there is approximately \$308 billion (1.6% of GDP, 2% of M2, 8% of MB). Source: https://www.federalreserve.gov/paymentsystems/coin_currircvalue.htm

⁵¹ M2 does not include all components of MB. In particular, M2 does not include Notes and Coins in bank vaults, nor does it include Federal Reserve Bank Credit. That said, for ease of understanding it is approximately correct to think of M2 still being built on top of these Notes and Coins in Bank vaults, as well as Federal Reserve Bank Credit.

⁵² "Banks can still invest in equities on a very small level, but it is usually frowned upon by regulators". Source: p.141 "The Bank Investor's Handbook" by Nathan Tobik and Kenneth J. Yellen

⁵³ Of late, many non-bank institutions have made loans and created money like instruments (mainly very short-term IOUs that act like money or close to money such as money market funds, various loans in the shadow banking sector, etc.) It should be noted that in general these non-banking institutions are less regulated on the ability to create these near money instruments. This illustrates how it is difficult to draw clear distinctions between what is and what isn't money. We particularly like the 1946 quote from John Hicks that illustrates this problem: "Pure money is nothing else but the most perfect type of security. Bills of short maturity form the next grade, being not quite perfect money, but still very close substitutes for it. The rate of interest on those securities is a measure of their imperfection – of their imperfect 'moneyness'".

⁵⁴ We should also note that modern day banks have many non-money instruments on their balance sheets so the capital ratio for banks as a whole will not simply equal the MB to M2 ratio for the economy as a whole.

⁵⁵ "Also, I often point out to my students that the simple story of banks making loans based upon their existing level of excess reserves is very unrealistic. Do banks put out a sign saying, "excess reserves available today, come get your loans?" In reality, banks set interest rates on both loans and deposits intending to use their deposits to fund their loans. In a growing economy, this generally involves setting interest rates on loans and deposits so that demand for loans from banks is matched by the supply of deposits to banks. The banks then use money market instruments to adjust for any temporary imbalances between the demand for loans and the supply of deposits. Higher loan demand would immediately result in banks selling off government bonds, reducing overnight lending to other banks, or borrowing more overnight from other banks. An increase in the supply of deposits would result in banks buying government bonds, reducing overnight borrowing from other banks, or lending more overnight to other banks." Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2012/04/money-multiplier.html>

⁵⁶ That said, if the Fed printed unlimited amounts of MB, certainly inflation would result. Bill Woolsey explains: "If a central bank wants to expand the quantity of money, it undertakes open market purchases. This creates an excess supply of reserves. Banks use the reserves to purchase money market instruments. The impact on overnight interbank loans just reduces the interest rates on those loans. Further, purchases of government bonds by banks from other banks has no impact on the quantity of money, and only results in lower interest rates on the bonds. However, purchases of government bonds from firms other than banks and households increases the funds in their checkable deposits, as well as lowering the interest rates. The increase in the checkable deposits of those households and firms

other than banks is an increase in quantity of money.” || “Suppose that the banks respond to lower interest rates on government bonds by selling them and instead just hold reserve balances. This is a decrease in the money multiplier, and tends to reduce the quantity of money. How then can a central bank expand the quantity of money? It buys all of the government bonds the banks want to sell, and also buys bonds from households and firms. And the result is an increase in the quantity of money. Base money expands enough to offset the decrease in the money multiplier and increase the quantity of money. Nothing in the process requires that banks make any loans.” Source:

<http://monetaryfreedom-billwoolsey.blogspot.com/2012/04/money-multiplier.html>

⁵⁷ Does the Fed raising Discount rate (different from fed funds rate), affect M2 to MB ratio? It clearly only affects it partially, and the market has a large impact on M2 to MB ratio. If interest rates were 15% vs 3% the ratio wouldn't be directly affected so technically interest rates have little direct effect on M2/MB ratio. However, it could have indirect impact if the Fed is rising during rising economy then it may correlate, but it's not causation. Furthermore, if we are at 15% but were at 30% a year ago, then the Fed is likely stimulating (so M2/MB ratio might be rising in such a case). The direction of interest rates is much more likely to increase M2/MB ratio (the absolute level of interest rates likely don't matter as much in regards to M2/MB ratio).

⁵⁸ Bill Woolsey on the money multiplier: “Also, I often point out to my students that the simple story of banks making loans based upon their existing level of excess reserves is very unrealistic. Do banks put out a sign saying, “excess reserves available today, come get your loans?” In reality, banks set interest rates on both loans and deposits intending to use their deposits to fund their loans. In a growing economy, this generally involves setting interest rates on loans and deposits so that demand for loans from banks is matched by the supply of deposits to banks. The banks then use money market instruments to adjust for any temporary imbalances between the demand for loans and the supply of deposits. Higher loan demand would immediately result in banks selling off government bonds, reducing overnight lending to other banks, or borrowing more overnight from other banks. An increase in the supply of deposits would result in banks buying government bonds, reducing overnight borrowing from other banks, or lending more overnight to other banks.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2012/04/money-multiplier.html>

⁵⁹ “Monetary policy can be implemented effectively without reserve requirements as long as cost incentives ensure a predictable demand for settlement balances. A central bank can then achieve the level of short-term interest rates that it desires, using market-oriented instruments only. In Canada, the framework provided by rules on interbank payments settlement and by the costs of deficits and surpluses on settlement accounts provides a strong incentive for the banks and other clearing institutions to target zero balances. Reforms of this framework, to follow the introduction of the Large-Value Transfer System, will ensure its continued effectiveness and make it more transparent. An appendix outlines the process by which reserve requirements were phased out in Canada.” Sources:

<https://www.bankofcanada.ca/1997/04/working-paper-1997-8/> ;

https://en.wikipedia.org/wiki/Reserve_requirement#United_States ; https://en.wikipedia.org/wiki/Liquidity_ratio

⁶⁰ If you had 100% capital ratio banks, you could still have lending, but all lending would be by non-bank entities. The question arises, whether these non-bank entities would also overextend themselves. Since these non-bank creditors would be financed by bonds, the bonds would take the brunt of any “run” on these lenders. If a loan went bad, the value of the bonds would drop. With normal banks they have deposits which can lead to runs, but with our private creditors who only have bonds, it's the private creditors bond holders who pay in the event of a loan going bust. If these bonds aren't insured, then investors will be more careful so, in theory, these private lenders will be more constrained. Some have argued that it's the deposit insurance that provides bad incentives and leads to banks overextending themselves, since under this system, depositors are in theory the ones who pay when a loan goes bad (but because of deposit insurance, there is not much incentive for depositors to ensure that loan quality is high)

⁶¹ We should note that M2 may not encompass all forms of money. It is a complicated subject, but in most circumstances, short term safe bonds can also be treated as money (“moneyness” is a spectrum). If we added up these short-term bonds as well, we get a figure over \$25 trillion for amount of money in the system vs something like \$13 trillion as the official M2 number. For more info on how money is broken down, see chart 1.1 from “The Money Problem: Rethinking Financial Regulation” by Morgan Ricks.

⁶² “A change in monetary growth affects interest rates in one direction at first but in the opposite direction later on. More rapid monetary growth at first tends to lower interest rates. But later on, the resulting acceleration in spending and still later in inflation produces a rise in the demand for loans, which tends to raise interest rates. In addition, higher inflation widens the difference between real and nominal interest rates. As both lenders and borrowers come to anticipate inflation, lenders demand, and borrowers are willing to offer, higher nominal rates to offset the

anticipated inflation. That is why interest rates are highest in countries that have had the most rapid growth in the quantity of money and also in prices—countries like Brazil, Argentina, Chile, Israel, South Korea. In the opposite direction, a slower rate of monetary growth at first raises interest rates but later on, as it decelerates spending and inflation, lowers interest rates. That is why interest rates are lowest in countries that have had the slowest rate of growth in the quantity of money—countries like Switzerland, Germany, and Japan.” Source: p. 49 from “Money Mischief: Episodes in Monetary History” by Milton Friedman

⁶³ Sources: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; M2 from <https://fred.stlouisfed.org/series/M2NS>

⁶⁴ “Changes in the demand for money (M2 to MB ratio) can have the same effect as changes in the quantity of (MB) money”, “...substantial changes (“long-term sustained” in our words) in prices or nominal income are almost always the result of changes in the nominal supply of (MB) money, rarely the result of changes in demand for money” from p. 45 of “Money Mischief: Episodes in Monetary History” by Milton Friedman

⁶⁵ Scott Sumner, a Market Monetarist, doesn’t think Keynesians are right (they believe that interest rates that are what matter for monetary policy), but instead agrees more with the Monetarist view (the quantity of money is what matters). Scott’s slight digression is he believes that the ideal target is Nominal GDP growth (Market Monetarist) instead of targeting just the money supply (Monetarist) or interest rates. Source: “The Real Problem was Nominal: N.G.D.P. targeting and the Great Recession | Scott Sumner” -

https://www.youtube.com/watch?v=XlYxb6c87aw&list=PLOdXrdpuU5ignn-gAHO9FqXcwqZm6SP_1&index=2&t=55m20s

⁶⁶ Specifically, the quantity theory of money equation states: $\text{Prices} = (\text{Money Supply} * \text{Velocity}) / \text{Real GDP}$. Velocity and Real GDP can’t rise indefinitely and are usually within a band. Source: “Causes of Inflation”

<https://www.youtube.com/watch?v=gi7jx5IJtik>

⁶⁷ Technically, helicopter money in the form of handing electronic money directly to the consumer’s bank accounts would increase the M2 money supply. In theory the difference between M2 growth and real G.D.P. growth should approximate inflation over long time frames. In practice, over short time frames, the correlation is not as perfect as the theory would predict. For the 10 years ending 1983, M2 grew at 9.6% per year and Real G.D.P. grew at 2.3% per year. This delta of $9.6\% - 2.3\% = 7.3\%$ should correlate with inflation. While there was significant inflation during this time frame, the correlation breaks down over even a decade period when we compare these numbers to the 10 year period ending in 2016. In this time period, M2 grew at 6.5% per year and Real G.D.P. grew at 1.32% per year for a delta of $6.5\% - 1.32\% = 5.17\%$

⁶⁸ We should note that by “long term inflation” we are usually referring to a multi-decade inflation rate. In practice, monetary policies are rarely consistent for such a long period of time. The conundrum then is that over any timeframe of less than a decade, there are many other factors that can influence the inflation rate.

⁶⁹ Page 13, The Phenomenon of Worldwide Inflation by David I. Meiselman (1975)

⁷⁰ At least in the 1970s, and under most other circumstances, the Fed has an easier time controlling the levels of MB, and has a harder time controlling the M2 to MB ratio. Short term interest rates do affect the M2 to MB ratio, but the Fed’s level of control in his case is much less than the Fed’s ability to control the actual MB supply.

⁷¹ As shown in the M2 to MB graph, the inflation of the 1970s could not be sustained by a rise in velocity alone. It was a result of the increasing M2 to MB ratio, but eventually this increase had to stop. It did in the early 1980s, and as no surprise, inflation also ended around that time.

⁷² Sources: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; Pre 1959 M2 Data from

http://www.econdatas.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS>

⁷³ As an example, in the pre-Fed era, national banks had to keep reserves of 25% of deposits outstanding in gold! After 1913, this requirement was dropped to 13% and the currency was further weakened because of that 13% only a fraction had to be held in *physical* gold. Specifically, the 13% could be held in federal reserve notes. And the fed had to maintain only a 35% ratio of physical gold to fed reserve notes outstanding. That said, while the rule change that planted the seeds for inflation was initially created in 1914, it wasn’t until 25 years later that the effects were felt. The gold ratio actually increased up until the 1940s! Only after the Great Depression, at the start of World War II, did the ratio of gold to M2 begin to fall (and eventually broke in 1971). Source: kindle location 2773 from “Money: Free and Unfree” by George Selgin

⁷⁴ “A key problem with the gold standard is that it has a hard time handling money demand shocks”, ie it’s not elastic. Source: <http://macromarketmusings.blogspot.com/2012/06/i-ruined-dollar.html>

⁷⁵ “Unfortunately, a gold standard is not a guarantee of price stability. It is simply a promise made “out of thin air” to keep the supply of money anchored to the supply of gold. To consider how tenuous such a promise can be, consider the following example. On April 5, 1933, President Franklin D. Roosevelt ordered all gold coins and certificates of denominations in excess of \$100 turned in for other money by May 1 at a set price of \$20.67 per

ounce. Two months later, a joint resolution of Congress abrogated the gold clauses in many public and private obligations that required the debtor to repay the creditor in gold dollars of the same weight and fineness as those borrowed. In 1934, the government price of gold was increased to \$35 per ounce, effectively increasing the dollar value of gold on the Federal Reserve's balance sheet by almost 70 percent. This action allowed the Federal Reserve to increase the money supply by a corresponding amount and, subsequently, led to significant price inflation. This historical example demonstrates that the gold standard is no guarantee of price stability. Moreover, the fact that price inflation in the U.S. has remained low and stable over the past 30 years demonstrates that the gold standard is not necessary for price stability. Price stability evidently depends less on whether money is "created out of thin air" and more on the credibility of the monetary authority to manage the economy's money supply in a responsible manner."

Source: <https://www.stlouisfed.org/on-the-economy/2014/august/the-gold-standard-and-price-inflation>

⁷⁶ Private dollar convertibility to gold had been outlawed in 1934, so from 1934 to 1971, only foreign governments could redeem dollars for gold.

⁷⁷ The U.S. officially left the gold standard in 1971, and in theory made irrelevant all the gold held in reserves. That said, gold still plays some difficult to measure role in boosting confidence a country's currency, even if that country has explicitly abandoned the gold standard. For that reason, we include data through 1995 for reference. Sources: Pre-1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from

<https://fred.stlouisfed.org/series/M2NS> ; gold reserve data from

http://www.gold.org/download/file/2957/annual_time_series_on_world_official_gold_reserves.pdf ; While not used in this letter, here are some other good sources for gold reserve data:

<https://fred.stlouisfed.org/series/M14062USM027NNBR> (gold stock in reserves 1914-1949) ;

https://www.bullionvault.com/gold-news/US_gold_reserves_01120092 ; <http://goldsilverworlds.com/money-supply-and-monetary-base-to-gold-price-ratio-long-term-charts-till-2012/>

⁷⁸ Sources: <http://www.numbersleuth.org/worlds-gold/> ; The Production of Gold Since 1850, Edward Sherwood Meade, Journal of Political Economy, Vol. 6, No. 1 (Dec., 1897), pp. 1-26 ; <https://infogram.com/share-of-world-gdp-throughout-history-1gik92e6yjqm16> ; <https://www.measuringworth.com/usG.D.P./> ; St. Louis FRED Data Series: GOLDAMGBD228NLBM ; some years are Split Rock estimates/extrapolations

⁷⁹ Source: <https://www.measuringworth.com/usG.D.P./>

⁸⁰ While we don't have strong opinions on the matter, recent events show the potential downfalls of focusing only on inflation and unemployment. If forced to choose a Fed policy, we would tend to choose the Fed targeting nominal G.D.P. (which combines the inflation and employment targets and allows for more flexible fed policy)

⁸¹ <http://www.investopedia.com/articles/investing/100715/breaking-down-federal-reserves-dual-mandate.asp>

⁸² A complete list of Fed policy tools is listed here: <https://www.federalreserve.gov/monetarypolicy/policytools.htm>

⁸³ There's a debate on which is the leading indicator: The 10-year treasury or the fed funds rate? Will a drop in the fed funds rate cause a drop in the 10-year treasury yield? We believe it is the 10-year treasury which dictates the fed funds rate (to a large degree). <https://www.socionomics.net/wp-content/uploads/2013/10/Fed-Follows2.gif>

⁸⁴ There is also the interesting scenario where the Fed would have to buy other types of assets if the government every fully reduced its debt and had no treasuries outstanding. For further information see p. 214 of "The Age of Turbulence" by Alan Greenspan.

⁸⁵ Source: <https://fred.stlouisfed.org/graph/?g=f28v>

⁸⁶ Before 2008, the Fed was able to put a floor on interest rates using only open market operations and keeping reserves scarce if they wished to increase the interest rate. This was convenient for the Fed, as there was very little cost to this course of action. However, with QE, reserves have been flooded into the system and the Fed could not rely only on open market operations to keep the interest rates above a floor. In order to prevent negative interest rates, the Fed began paying interest on the banks reserves, which does establish a floor. However, this also costs the Fed more since they are now paying interest on all their reserves (and weren't paying this interest before the financial crisis). This policy change is one of the ramifications of QE. In addition, paying IOR tends to make banks less likely to lend out these reserves, therefore partially sterilizing the stimulating effects of QE.

⁸⁷ "But the interest on reserve lever is different from all the other policy levers discussed above. It is a policy lever that works by changing the demand for base money, not the supply. In addition, it only applies to the portion of the base that is held by banks. Thus once the IOR goes a couple points below zero, further decreases have essentially no impact on excess reserves. This is because at even a negative 2% IOR, banks will cut excess reserve holdings to the bare minimum, and further rate cuts will not have any additional impact on ER demand, or market interest rates. So isn't that a sort of zero bound?" Source: <http://www.themoneyillusion.com/guess-who-discussed-negative-interest-rates-on-money-in-1998/>

⁸⁸ <https://fred.stlouisfed.org/series/IOER>

⁸⁹ Bill Woolsey on IOR: “So, the reason for interest on reserves is to allow brokers on the Federal Funds market to make money and stay in business. The Fed's excuse for keeping these folks in business is to make sure that they are there to help to Fed use its preferred operating procedure after economic conditions return to the way they were in the past. The Fed wants to do things in familiar ways, and so it is making sure that there is plenty of business for certain money market brokers on Wall Street. In my view, if banks don't want to do as much interbank lending and borrowing, then brokers in that market should shift to doing other sorts of money market transactions. And then, if interbank lending markets pick back up, then they should shift back. The Fed shouldn't try to keep interest rates up to protect their friends. If the Fed believes that federal funds are not liquid enough for the federal funds rate to mean much, then the Fed should quit using the federal funds rate as a target. Or, of course, it could give up on interest rate targeting.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/08/bernankes-reason-for-paying-banks-not.html>

⁹⁰ Bill Woolsey: “I think that the element of truth in Williamson's argument is that if the Fed purchases government bonds with yields lower than the interest rate it is paying on reserves, it unlikely to have much of an effect. (The situation is ambiguous because not everyone is allowed to hold reserve balances at the Fed.) I disagree with his view that having the Fed purchase long term to maturity government bonds would have no expansionary effect. My view is that as long as the Fed purchases assets with yields higher than the yield it is paying on reserves, it can correct an excess demand for money.” || “if the Fed were to increase the interest rate it pays on reserves so that the amount banks want to hold increases with the additional quantity, then no excess supply of money would develop. (Something like that appeared to be the goal of QE1. Pay interest on reserves to raise the demand for reserves, so that the Fed could expand the quantity of reserves and lend them to a variety of Wall Street firms whose financial health was considered essential to the operation of credit markets. Or, as I prefer to say, rebuild the house of cards that was the shadow banking system.)” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/08/williamson-on-quantitative-easing.html>

⁹¹ IOR tends to create a floor system (with the floor being the IOR rate) whereas (a corridor system) “would still give the 'interest rate control' feature the Fed desires but with a much smaller balance sheet. In a corridor system, the IOER would become the floor for the federal funds rate and the discount rate (or the TAF) would set the ceiling. The figure below shows the difference between a corridor system and floor system.” Source: <http://macromarketmusings.blogspot.ca/2017/10/from-floor-system-to-corridor-system.html>

An argument for the floor system is made here: <http://jpkoning.blogspot.com/2018/01/floors-v-corridors.html>

⁹² Source: 41min50sec at http://www.econtalk.org/archives/2012/04/taylor_on_rules.html

⁹³ Bill Woolsey: “A decrease in the IOR rate would also likely affect the federal funds market, where banks and certain other institutions lend funds to each other overnight. A lower IOR rate would give banks less incentive to borrow in this market, which would likely decrease the amount of activity. When less activity takes place, the market interest rate will be influenced more by idiosyncratic factors, making it a less reliable indicator of current conditions. This decoupling of the federal funds rate from financial conditions could complicate communications for the FOMC, which operates monetary policy in part by setting a target for this rate. So, if market interest rates become negative, then banks would not be motivated to borrow overnight” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/11/negative-interest-rates.html>

George Selgin also argues against IOR at 35:50 mark of Episode 95 of the Macro Musings Podcast by David Beckworth: <https://soundcloud.com/macro-musings/georgeselgin3>

⁹⁴ “Because IOR endows the Fed with the ability to expand the size of its asset portfolio without the associated reverse creation depressing the funds rate below target, it can expand the size of its asset portfolio to allow it to intervene more aggressively to allocate credit”. IOR provides a floor. Without IOR, there would be no floor and the flooding of the system with reserves would cause negative interest rates and the fed would give up control on interest rates. With IOR it can buy assets but also control interest rates. Source: Kindle location 6578 of “The Great Recession” by Robert Hetzel

⁹⁵ “The Fed also used the discount window to make dozens of loans, often exceeding several billion dollars at a time, to the United States Central Federal Credit Union, helping to prevent a collapse that would have harmed hundreds of smaller credit unions. And the Fed helped to save some of the largest banks in Europe by pumping desperately needed dollars into their American subsidiaries. In fact, the biggest borrower from the Fed program was

Dexia, a French-Belgian bank that frequently held more than \$30 billion in outstanding loans from the program from late 2008 to early 2009.” Source: <http://www.nytimes.com/2011/04/01/business/economy/01fed.html>

⁹⁶ Source: <http://www.frbsf.org/education/publications/doctor-econ/2004/september/federal-funds-discount-rate/>

⁹⁷ If the rate on interest on reserves is greater than the discount rate, then banks could borrow from the discount window and store reserves at the Fed and make money on that spread. This obviously won’t happen, and would be hugely costly for the Fed, so under almost all circumstances, the rate paid on interest on reserves will be greater than the discount window rate.

⁹⁸ Plus some annual cost for the storage of this cash

⁹⁹ Up to about negative 1% we’ve seen no major cash withdraws, but its experimental and no one is sure at what rate consumers begin to withdraw to cash in mass.

¹⁰⁰ Source: <https://www.brookings.edu/blog/ben-bernanke/2015/03/30/inaugurating-a-new-blog/>

¹⁰¹ Source: <http://macromarketmusings.blogspot.com/2012/06/money-still-matters.html>

¹⁰² “Assume money is neutral in the long run. Interest rates are hard to model, but I’ve never seen any evidence that they play an important role in business cycles. (Yes, they affect velocity somewhat, but I see interest rates as mostly reflecting expected changes in N.G.D.P. growth, which are primarily driven by monetary policy.)” Source: <http://www.themoneyillusion.com/anything-is-lm-can-do-fisher-did-better/>

¹⁰³ “Is this endogenous M2 theory the same argument that the Post-Keynesians are making? I don’t think so, as the Fed still controls the expected path of N.G.D.P. by controlling the monetary base (relative to the demand for base money.) The base may appear endogenous as well, as the Fed often uses a short-term interest rate target. But in practice the Fed is merely using fed funds rate changes to signal an intention to change the MB path relative to changes in the expected future demand for base money. So the fundamental tool has been control of the base.” Source: <http://www.themoneyillusion.com/good-monetarism-bad-monetarism/>

¹⁰⁴ Source: “During the moderate inflation in the United States from 1969 to 1979, the quantity of money increased at the average rate of 9 percent a year and prices at the average rate of 7 percent a year. The difference of 2 percentage points reflects the 2.8 percent average rate of growth of output over the same decade. As these examples show, what happens to the quantity of money tends to dwarf what happens to output; hence our reference to inflation as a monetary phenomenon, without adding any qualification about out.” from p.193 in “Money Mischief: Episodes in Monetary History” by Milton Friedman

¹⁰⁵ https://en.wikipedia.org/wiki/Friedman%27s_k-percent_rule

¹⁰⁶ Bill Woolsey argues the same thing: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/05/fed-critics-are-blaming-fed-for-high.html>

¹⁰⁷ On targeting the monetary base: “Of course, Market Monetarists have never proposed fixing the quantity of base money and having the price level adjust so that the real quantity adjusts to the real demand. Instead, they favor a target for the growth path of nominal GDP. In this scenario, the nominal quantity of base money would be reduced in step with its falling demand so that nominal GDP would remain on the targeted growth path.” || On targeting interest rates: “However, as Sumner explains, it is never sensible to have an interest rate goal. This leaves the price level indeterminate.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/09/summer-of-pure-credit-economy.html>

¹⁰⁸ “Fortunately, it is possible that an increase in the quantity of money will be associated with higher rather than lower market interest rates, even if the increase in the quantity of money is implemented in the usual way--purchases of bonds by the central bank. All that is necessary is that when the Fed and the banking system purchase bonds (or make commercial loans,) households and firms sell off some of their current bond holdings or borrow by issuing new bonds. This decrease in the supply and increase in the demand for credit can result in higher market interest rates. Do these higher interest rates imply that there is no decrease in spending on capital or consumer goods or both? Not at all. It simply requires that households selling bonds use the funds raised to purchase consumer goods and firms selling bonds use the funds to purchase capital goods. Why would they increase spending? Again, it because output, income, and employment is expected to be higher in the future. The natural interest rate has increased.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/01/money-disequilibrium-and-interest-rates.html>

¹⁰⁹ <http://macromarketmusings.blogspot.com/2010/11/too-much-focus-on-interest-rates.html>

¹¹⁰ MB YOY growth has been volatile, standing at 0% as of March 2018, but as high as 9% at the end of 2017. Meanwhile M1 (which includes demand deposits which are not included in MB) has been more consistent standing at 8% YOY in March of 2018. M2 has also been in the 5% to 7% range since 2015, though has been dropping of

late and stands at 4.2% in February 2018. The recent drops in MB and M2 may signal that the Fed is tightening too quickly

¹¹¹ Source: <https://fred.stlouisfed.org/graph/?g=jdEe>

¹¹² David Beckworth on monetary policy being more important than debt levels:

<http://macromarketmusings.blogspot.com/2011/01/do-we-really-have-balance-sheet.html>

¹¹³ For more information on this, David Beckworth has written on this at the following blog post:

<http://macromarketmusings.blogspot.com/2013/02/the-train-has-already-left-station-paul.html>

¹¹⁴ Here is a bit more on how its likely that Bernanke (and other Fed officials) know what they need to do, but can't implement the N.G.D.P. policies, etc. because of political concerns: <http://www.themoneyillusion.com/?p=13330>

¹¹⁵ N.G.D.P. *per capita* might be an even better metric to target, as it would ignore changes in population.

¹¹⁶ Source: <http://macromarketmusings.blogspot.com/2013/09/at-least-fed-has-inflation-target-right.html>

¹¹⁷ Source: <https://fred.stlouisfed.org/series/GDP>

¹¹⁸ “The root of this problem is credibility; the Fed doesn't know how credible its inflation promises will be, and hence errs on the side of mild deflation, rather than hyperinflation. Of course the markets understood this fear, and quickly figured out that disinflation, not hyperinflation, was the real risk. Markets aren't dumb. They sniff out Fed indecision like a schoolyard bully sensing the timidity of his next victim.” Source:

<http://www.themoneyillusion.com/spot-the-flaw-in-nominal-index-futures-targeting/>

¹¹⁹Source: <https://fred.stlouisfed.org/graph/?g=hVGr>

¹²⁰ Source: 25:00 http://www.econtalk.org/archives/2010/01/belongia_on_the.html

¹²¹ George Selgin expanded on this idea of opening up more private institutions to the Fed's Open market operations: “By opening access to the Fed's ordinary credit auctions to numerous counterparties, including all those institutions, whether banks or non-banks, that play a prominent role in the payments system, flexible OMOs should make it possible for any of these counterparties that are for any reason unable to secure needed liquidity from private sources to apply directly to the Fed for it, and, by outbidding rival applicants, to get it.” || “Third, by eliminating distinct last-resort lending operations, flexible OMOs make it unnecessary for authorities responsible for such operations to coordinate their efforts with those of separate central-bank authorities charged with conducting ordinary monetary policy operations. The elimination of multiple authorities also reduces the risk of shirking, by placing responsibility for adequate aggregate liquidity provision firmly on the shoulders of a single decision-making authority—here, the FOMC. Fourth, flexible OMOs should rule out any future resort to ad hoc emergency lending facilities, establishing instead a stable and predictable arrangement for central-bank liquidity provision, meant to meet both ordinary and extraordinary liquidity needs. The existence of fixed arrangements for liquidity assistance, combined with the competitive pricing of such assistance, allows prospective borrowers to prepare themselves for potential liquidity shocks, while ruling out moral hazard” || “What distinguishes the flexible-OMO plan from these precedents is that it envisions a single facility only, supplying both routine and emergency credit, and doing so in a way that relies to the fullest extent possible on market forces, rather than on decisions by bureaucrats, to achieve an efficient allocation of liquidity among competing applicants. By allowing a broad set of potential applicants, using a wide range of eligible collateral, to compete for available funds, not only in private markets, but, when necessary, at a single Federal Reserve facility, flexible OMOs minimize the Federal Reserve's credit footprint, and thereby prevent it from taking part in either deliberate or inadvertent credit-allocation exercises for which fiscal rather than monetary authorities ought to be responsible.” Source: page. 207 to page. 210 <http://thf-reports.s3.amazonaws.com/2017/ProsperityUnleashed.pdf>

¹²² “Krugman implied in the 4th paragraph that he understood that if pushed to the extreme (say \$10s of trillions in purchases of unconventional assets) that we would generate inflation. But also that (in Krugman's view) the problem with this policy is that if we pick the wrong assets the taxpayers might lose a lot of money. If that's not what he meant by paragraph 4, if he thinks that no amount of unconventional asset purchases would boost AD, then say so. But I doubt he will say that is what he meant by “we don't know how well these unconventional measures will work.” Krugman knows that we could buy up common stocks, real estate, all kinds of stuff-and no serious economist believes that if the Fed bought up the entire world's stock of wealth we'd have no inflation.” Source: <http://www.themoneyillusion.com/reply-to-krugman/>

¹²³ Source: <http://www.themoneyillusion.com/spot-the-flaw-in-nominal-index-futures-targeting/>

¹²⁴ If the Fed doesn't use futures and just guesses at the N.G.D.P. target, then the market may not believe them as much. “If they had used my proposed futures targeting approach, so that N.G.D.P. growth expectations always stayed at 5%, I doubt whether short term rates would have fallen much below 2%. The reason short term rates fell to

zero was because N.G.D.P. growth expectations went negative. But I freely concede that this is just a guess on my part, and you might be right. I also think it is much more likely that you would be right if the Fed used discretion to target N.G.D.P. growth. In that case there would have been less credibility, and I think rates would have had to have been cut more aggressively.” Source: <http://www.themoneyillusion.com/a-few-links/>

¹²⁵ “Sumner contends that inflation is “measured inaccurately and does not discriminate between demand versus supply shocks” and that “Inflation often changes with a lag...but nominal GDP growth falls very, very quickly, so it’ll give you a more timely signal stimulus is needed”. Source:

https://en.wikipedia.org/wiki/Scott_Sumner#Nominal_GDP_targeting

¹²⁶ “The main problem today isn’t that the Fed cannot forecast as well as markets, they do OK, the problem is that they don’t target their forecast. But I might add that under futures targeting it is much easier to target the forecast, because there is no need to rely on discretion.” Source: <http://www.themoneyillusion.com/hes-baaack-to-his-1990s-views/>

¹²⁷ Source: http://econlog.econlib.org/archives/2015/01/the_implication.html

¹²⁸ Sumner states “I agree” to Inklet’s (user name) comment: “Maybe a better target than N.G.D.P. is N.G.D.P. per capita, so changes in population doesn’t affect it.” Source: <http://www.themoneyillusion.com/the-government-is-beginning-to-see-the-light/>

¹²⁹ “In the 1970s real GDP grew at a decent pace, the problem is that N.G.D.P. was growing at over 10%. That’s why inflation was so high. (Not because of anything OPEC did.)” Source: <http://www.themoneyillusion.com/whats-the-point-of-fiscal-stimulus-and-qe/>

¹³⁰ Source: <https://fred.stlouisfed.org/series/GDP>

¹³¹ Source: <https://www.measuringworth.com/usgdp/>

¹³² “People at the Bank of Japan and the Swiss National Bank think they can have a smaller balance sheet if they adopt a tighter monetary policy, but in the long run just the opposite is true. On the other hand, it’s hard to blame them, because in this case the truth is far stranger than the fiction. Here’s the truth: If the BOJ wants to avoid a socialist outcome, where it owns much of the Japanese economy, then it should announce the following policy on Wednesday: ‘We plan to start buying massive quantities of a wide variety of assets, and will continue doing so at a rapidly accelerating rate, until N.G.D.P. growth expectations rise to 4%’. That’s what the Bank of Japan should do Wednesday if it wants a smaller balance sheet. No wonder only a few lonely market monetarists see the world this way, it’s about as counterintuitive as you can get.” Source: http://econlog.econlib.org/archives/2016/09/balance_sheet_a.html

“In my view if they had not paid interest on reserves, and if they’d adopted an explicit N.G.D.P. or even price level target, the Fed could have hit its objective in September and October with less than \$100 billion injected, not the \$800 billion actually injected.” Source: <http://www.themoneyillusion.com/the-wizards-of-oz/>

¹³³ “, I agree with Svensson that even a helicopter drop of cash is only expansionary if expected to be permanent. And I also agree that very few people recognize this fact. In fairness, a helicopter drop is clearly much more likely to be perceived as permanent than an OMO.” Source: <http://www.themoneyillusion.com/hes-baaack-to-his-1990s-views/>

¹³⁴ “Yes, I’m say monetary policy should have been more expansionary, but no, I’m not saying he should have pumped even more money into the economy. In my view if they had not paid interest on reserves, and if they’d adopted an explicit N.G.D.P. or even price level target, the Fed could have hit its objective in September and October with less than \$100 billion injected, not the \$800 billion actually injected.” Source: <http://www.themoneyillusion.com/the-wizards-of-oz/>

¹³⁵ From Sumners April 2009 post we can see that Bernanke was even then already talking about unwinding QE: “Pay close attention to Bernanke’s insistence that the Fed’s liquidity programs are intended to be unwound. If policymakers truly intend a policy of quantitative easing to boost inflation expectations, these are exactly the wrong words to say. Any successful policy of quantitative easing would depend upon a credible commitment to a permanent increase in the money supply. Bernanke is making the opposite commitment ““ a commitment to contract the money supply in the future. Is this any way to boost inflation expectations?” Source: <http://www.themoneyillusion.com/whats-the-point-of-fiscal-stimulus-and-qe/>

¹³⁶ “But in its current form, QE3 allows enough wiggle room to make me uncomfortable.” <http://macromarketmusings.blogspot.com/2012/09/bernankes-little-depression.html>

“Have the Fed start QE3 at \$40 billion per month, and then increase their purchases at a rate of 20% each month, until they have achieved their policy goal (of equating predicted nominal growth with desired nominal growth.)”.

Source: <http://www.themoneyillusion.com/the-next-step/>

¹³⁷ “Regarding the question of where all these assets will come from, consider Zimbabwe. Their banking system increased trillions-fold. I don’t recall them having much trouble finding enough assets for the banks to hold. Germany during 1923 is another example. It is easy for the Fed to massively expand bank balance sheets if they want to, of course I hope everyone knows I think this would be a terrible idea. I only do these thought experiments to show how absurd the “liquidity trap” excuse for Fed inaction is.” If they have trouble boosting AD, just let me at the controls for a while. (Yes, I’m just kidding here.)” Source: <http://www.themoneyillusion.com/response-to-mankiw-and-then-some/>

¹³⁸ “As a general rule I don’t favor having the Fed target real interest rates, nor do I think that they should change their inflation target during a liquidity trap. If zero inflation is normally best, they should continue aiming for zero inflation during a liquidity trap (and use futures targeting, or some other unconventional policy.) So we are not far apart on that issue. Your second argument says that there is no reason why people would believe that an expansionary policy would raise future prices, and hence lower current real rates. There are two possibilities here. If the money is not expected to raise future prices, the Fed should buy up the entire national debt, which will save the taxpayers the future cost on that debt, without the negative consequences of inflation. But Keynes did not recommend this policy, as I am sure that he did believe that this sort of extreme policy would eventually produce inflation. But if it will eventually produce inflation, it will, ipso facto, immediately reduce real rates when nominal rates are stuck at zero.” Source: <http://www.themoneyillusion.com/what-is-the-point-of-the-general-theory/>

¹³⁹ For good measure, we list a few of the best articles that critique market monetarism and N.G.D.P. targeting: <https://www.pragcap.com/critique-market-monetarism/>; <https://www.pragcap.com/market-monetarism-monetary-base-overdrive/>

¹⁴⁰ “Again, the issue is what monetary regime is best. One key issue is specialization. Entrepreneurs specialize in particular products. The requirement that everyone set their prices and wages to make the real quantity of money accommodate the demand to hold money balances (i.e. a world with no N.G.D.P. targeting and unstable spending levels) requires every entrepreneur to specialize in two areas--the production and demand for their particular product, but ALSO the production and demand for money.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2015/03/salerno-on-market-monetarism.html>

¹⁴¹ “I support a target growth path for nominal GDP with a 3% growth rate rather than 5% or 2% because I favor a stable price level and nominal income growing with real income. I favor nominal income targeting because I think trying to stabilize the price level when there are supply shocks is very disruptive. Still, why the trend of 3%? Obviously, this is based upon an assumption of a 3% trend growth rate for potential output. It is hard to understand why one nominal GDP growth rate would be better than another without some assumption regarding trend growth of potential output. (Frankly, I find 2% inflation to be a complete puzzle. Why 2 rather than 1, .2, or 3?)” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2012/03/koenig-on-nominal-income-targeting.html>

¹⁴² Some critiques of N.G.D.P. targeting: <https://mises.org/library/nominal-gdp-targeting-new-fangled-monetarism-or-old-fashioned-keynesianism-can-new-fad-save>; <http://www.basilhalperin.com/blog/2015/01/a-practical-critique-of-N.G.D.P.-targeting/>; <https://krugman.blogs.nytimes.com/2013/04/28/monetarism-falls-short-somewhat-wonkish/>

¹⁴³ “Households and companies alike are trying to “deleverage,” or pay down their debts. But deflation makes it harder to pay down debts, because debts are fixed in dollars and those dollars are becoming worth more and more. Moderate inflation in the neighborhood of 4 percent, by contrast, makes it easier for borrowers to manage their debt loads, and stimulates the economy.” Source: <http://www.themoneyillusion.com/whats-the-point-of-fiscal-stimulus-and-qe/>

¹⁴⁴ “the goal is not to reduce long rates, but to raise them. Any policy that is truly expansionary will raise long rates through the “income and expected inflation effects.”” Source: <http://www.themoneyillusion.com/an-open-letter-to-mr-krugman/>

¹⁴⁵ As to how these N.G.D.P. scenarios relate to equity valuations, we outline 4 possible scenarios below: For scenarios #1 and #4 (which are the extremes of monetary policy) the denominator (earnings) dictate future stock returns. However in between, in the middle ground (scenarios #2 and #3) it is the interest rates (and its effect on the equity risk premium) that affect stock prices:

Scenario #1: Fed does nothing or not nearly enough. Money supply falls (20%+) and stocks drop severely (Great Depression) mainly because of the fall in absolute levels of earnings and a reduction in P/E multiples. The Great Depression is an example of scenario #1.

Scenario #2: Fed does something but not quite enough to be ideal. Growth is lower than it would be otherwise, and so interest rates remain in the -1% to 3% range. As a result, as dictated by the equity risk premium, this low amount of money printing counterintuitively raises stock prices as a result of a rising P/E ratio (Similar to 2008 to 2016 environment)

Scenario #3: Fed prints a bit more money than is ideal. Growth is higher than the long run average of say 5% N.G.D.P. growth. Instead N.G.D.P. averages 7% to 10% or higher. Interest rates match this, and as a result, despite faster nominal earnings growth, stocks drop or exhibit lower returns in the short run because of a declining P/E ratio (again dictated by equity risk premium).

Scenario #4: Fed prints way too much money (i.e. MB increases by 10x or more for example). Very high inflation or hyperinflation is the result. As a result, stocks rise in nominal terms (but real returns likely remain muted) because of the rapid rise in nominal earnings.

Equity risk premium is relevant most of the time because most of the time the economy is in between scenario #2 and #3. However, it's important to consider the extreme scenarios. We can see how the Fed didn't quite print enough money during the 2008 crisis and this lack of money printing may be causing the beginning of asset bubbles via low interest rates (which demand higher PE ratios)

¹⁴⁶ Sumner even suggests that too big to fail might even be eliminated or greatly reduced if N.G.D.P. targeting was established (something we agree is certainly *possible*): “Yes, ending too big to fail would be a huge advantage of N.G.D.P. targeting. If we could go back and do it all over again, it would have been better to have let LTCM fail, to reduce the reckless behavior of other large financial institutions. Ditto for Bear Stearns. Plus if we had to have a financial crash, it would have been better to have it in 1998, or early 2008, rather than late 2008 when the economy was much weaker” Source: <http://www.themoneyillusion.com/did-the-fed-cause-the-crash-and-what-does-cause-mean/>

“I see very little evidence that mis-allocation plays a significant role in business cycles. Labor and capital was re-allocated out of residential construction during the long decline from mid-2006 to mid-2008, and there was little impact on unemployment because other sectors picked up the slack. Only when what Austrians call the “secondary depression” (which occurred in late 2008) happens does the unemployment rate rise sharply.” Source: <http://www.themoneyillusion.com/i-thought-so-too-dr-friedman/>

“I’m confused, because you don’t need more loans to get more money, you just need more reserves. If the Fed creates new money, only one of the following three things can happen:

1. Currency held by the public increases.
 2. Bank deposits increase.
 3. Reserves increase but deposits are unchanged. The reserve increase is offset by a fall in the money multiplier.
- In the first two cases the money supply increases. In the third it might not. But even then the “worst case” is that the broad money multiplier falls to one. At that point all bank assets are reserves, and bank liabilities must rise one for one with central bank injections of reserves. (Of course the narrow M1 multiplier could fall below one.)” Source: <http://www.themoneyillusion.com/how-bad-banks-create-money-reply-to-nick-rowe-pt-2/>

“I think falling N.G.D.P. was the biggest cause of deleveraging. So I definitely think that N.G.D.P. targeting would reduce that problem significantly (albeit not completely as borrowers were somewhat overextended even if N.G.D.P. growth had continued at 5%.) I don’t think deleveraging is a problem, but rather a response to earlier mistakes.” Source: <http://www.themoneyillusion.com/its-chinas-world-we-just-live-in-it-krugman-round-two/>

“Stability in inflation or N.G.D.P. growth expectations are actually what we care about. As long as expectations are anchored, any transitory movements in actual inflation or actual N.G.D.P. will have little effect on employment. That’s why Katrina was such a tiny blip on the macro radar screen, despite disrupting Gulf of Mexico oil production for months.” Source: <http://www.themoneyillusion.com/a-solution-without-a-problem/>

“I argued that the financial crisis was 25% moral hazard (including TBTF) and 75% tight money.” Source: <http://www.themoneyillusion.com/reply-to-mcardle/>

“In my view their key mistake was to misinterpret the role of monetary policy. In each case, housing continued to decline further after the period I cited. And in each case N.G.D.P., which had been growing, suddenly began declining as well. It was the decline in N.G.D.P., not the additional fall in housing, which caused the severe recession and the job losses all across the economy. If N.G.D.P. had kept growing at 3% to 5% after 1929, and after 2008:2, the housing downturn probably would have ended, and the economy would have avoided a severe recession.” Source: <http://www.themoneyillusion.com/why-didnt-the-housing-crash-cause-high-unemployment/>

“Some might argue that my idea is crazy; we have never gone 10 years without a recession, what makes me think we can cure the business cycle? One answer is that we have gradually lengthened the cycle, as monetary policy has gotten better. Why rest on our laurels? Another answer is that Australia just had a 17 year expansion. If the Aussies can do it, why can't we?” Source: <http://www.themoneyillusion.com/the-fed-should-create-the-mother-of-all-stock-bubbles-permanently/>

Finally, the below quotes are from Bill Woolsey: “From a quasi-monetarist perspective, what is important is that total spending be maintained. In particular, that as Firm A reduces investment as it borrows less or repays debt, then Firm B, which is no longer lending and perhaps receiving funds in repayment of loans, invests more. Whether leverage grows, stays the same, or shrinks is not important.” || “Why the (incorrect) view that overleverage leads to reduced investment? The reason is simple. The lenders are ignored, with the implicit assumption being that funds that aren't lent are held. That is, a reduction in the supply of credit is the same thing as an increase in the demand for money. For example, suppose when Firm A stopped borrowing and began paying back loans, Firm B received the money. Rather than spending it on capital goods (or lending it to some other firm that wasn't so highly leveraged,) suppose Firm B just left the money sitting in its checking account. If the quantity of money is unchanged, the increase in the demand for money results in less spending. Since the actual reduction in spending was by Firm A, it is investment spending that falls.” || “From a quasi-monetarist perspective, the key is to prevent deleveraging from reducing total spending. And what that means is that to the degree that those who lend less choose to hold more money, the quantity of money should be increased to match. To say that there is "too much" leverage, means that firms should invest internally rather than shift funds by borrowing and lending to take advantage of higher returns.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/01/problems-with-austrian-economics.html>

¹⁴⁷ “If we can get to a policy of N.G.D.P.L.T, then policymakers will no longer have to worry about the consequences of the failure of a big bank. Unfortunately, that's likely to take many decades, as we first need to implement the policy, and then see how it does during a period of financial distress. Only then would policymakers begin to feel comfortable rolling back TBTF. (And even then, special interest groups will try to keep it in place.)” Source: <http://www.themoneyillusion.com/the-only-real-solution-to-too-big-to-fail/>

¹⁴⁸ That said, we should credit Fed president Charles Evans for exploring an N.G.D.P. targeting regime. Source: <https://www.theatlantic.com/business/archive/2012/05/a-rebellion-at-the-federal-reserve/256601/>;

¹⁴⁹ Bill Woolsey looks at the political issues with N.G.D.P. targeting all the way back in 1982: “What is the political problem (with N.G.D.P. targeting discussed in 1982 fed minutes)? It had to do with the Fed creating less nominal GDP than the President proposed. If the President were to propose 12 percent nominal GDP, and the Fed said that it would only create 9 percent, this would put the Fed at cross purposes with the President. This is very closely related to Sumner's view that the central bank acts last. At least in 1982, the Fed was not willing to openly take this role. On the other hand, they did seem to be willing to really play the role--just not openly.” || “Volcker downplays the ability of the Fed to control nominal GDP (and interest rates, of all things,) and suggests that the Fed watch exchange rates as well as inflation. Volcker also sees ‘obvious dangers’ to targeting nominal GDP. What are those dangers exactly? Volcker doesn't say, but his next remark is ‘that there is great overemphasis on what monetary policy can do.’ To me, that looks like nominal GDP targeting creating too much accountability for the Fed.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2011/11/nominal-gdp-targeting-in-1982.html>

¹⁵⁰ As a counterpoint, “The fact that yields have remained so low is, if anything, an indication that monetary policy has been too tight”. <http://macromarketmusings.blogspot.com/2012/06/its-2012-not-2002.html>

¹⁵¹ One reason Japan debt is so high is because much of Japan's debt is held domestically: “Then, of course, there is Japan's staggering national debt, now over 200 percent of GDP – a cause of endless and seemingly insoluble

concern. Japan's large household wealth and its trade and current account surpluses make the huge debt possible. Thanks to all the wealth the Japanese have sitting around, much of Japanese debt is held internally – by its households, corporations, pension funds and insurance companies – with only about 5 percent of Japanese government bonds (JGBs) held overseas, in comparison to nearly 50 percent of net U.S. debt (after central bank and other government holdings) and over 50 percent of Germany's." Source: p. 105 from "The Age of Oversupply: Overcoming the Greatest Challenge to the Global Economy" by Daniel Alpert.

¹⁵² Increasing the debt to G.D.P. ratio from 130% to 140% has much *more* impact on inflation and G.D.P. compared to increasing the debt to G.D.P. from 330% to 340%. In the United States, this increase from 130% to 140% occurred in the 1950s through 1980s time frame, the later part of which saw significant inflation. Conversely, since 1990, the United States has seen a much larger increase in debt to G.D.P. ratio (increasing from 220% in 1990 to 360% in 2009) yet a consistently *lower* inflation rate. This is partially caused by the diminishing effect of debt on inflation, especially as debt levels rise. Even if debt levels rose from their present levels in the United States, it is far from certain that inflation rates would rise. Under such a scenario, inflation rates could potentially *fall* or remain low as they have in Japan since 1990, despite a rising level of Japanese debt to G.D.P. during that same time frame. Sumner on more debt causing *lower* rates: "I don't think that easy credit stimulates the economy, in fact I think (ceteris paribus) it is exactly the reverse. Easy credit lowers nominal interest rates. This lowers velocity, which lowers N.G.D.P. I think that easy money stimulated the economy. If the money supply grows fast enough so that $M \cdot V$ increases by more than 5% then the economy tends to get overheated." Source: <http://www.themoneyillusion.com/its-not-different-this-time/>

¹⁵³ Source: <http://www.ftense.com/2013/10/how-qe-will-end-why-commodities-are.html>

¹⁵⁴ Source: <https://fred.stlouisfed.org/graph/?g=f32O>

¹⁵⁵ Sources: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=JP-US> ; <https://fred.stlouisfed.org/graph/?g=f36j>

¹⁵⁶ Source: <https://fred.stlouisfed.org/graph/?g=f335>

¹⁵⁷ We'd also like to suggest Japan as a model for why low or negative population growth isn't the end of the world. Japan has done fine increasing G.D.P. per capita. The transition period between high growth and low growth may be unpleasant, but once this transition is complete, there shouldn't be any major problems with low growth (nominal growth of say 4%, 2% of that being productivity growth and 2% inflation, 0% population growth). Even 2% nominal growth (2% productivity growth, 0% inflation, 0% population growth) wouldn't be a big problem once the adjustment was made. As stated above, in Chapter 3, 0% inflation (or 0% population growth for that matter) doesn't seem to affect real G.D.P. per capita (i.e. per person wellbeing).

¹⁵⁸ Sources: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=JP-US> ; <https://fred.stlouisfed.org/graph/?g=f36j>

¹⁵⁹ Source: <https://fred.stlouisfed.org/graph/?g=eOV8>

¹⁶⁰ Source: <https://fred.stlouisfed.org/graph/?g=f38d>

¹⁶¹ Scott Sumner notes the lack of action from Japanese officials at 21:54: <https://bloggingheads.tv/videos/2043>

¹⁶² "If the Bank of Japan really wanted to end their deflation, why did they not adopt unconventional monetary policies like currency depreciation, which offers what Svensson calls a "foolproof" escape from the liquidity trap?" | "Why did they let the yen strongly appreciate ? And why did they raise rates in 2000, despite the fact that the GDP deflator continued to fall? Let's again give the BOJ the benefit of the doubt, and assume they made a mistake in raising rates in 2000. They did quickly reduce rates to zero again in 2001. But why did they again raise rates in 2006, despite the continual fall in the GDP deflator? And why was the BOJ unable to even agree on a 1/4 point cut in late 2008, as their economy was slipping back into severe recession. At some point one has to stop giving the BOJ the benefit of the doubt, and assume that the steady 1% to 2% percent deflation experienced almost continually from 1994 to today reflects the BOJ policy preferences, and is not a "trap" at all." | "I don't believe the Fed is as conservative as the BOJ Unlike the BOJ, they probably do sincerely wish to avoid mild deflation" Source: <http://www.themoneyillusion.com/no-two-liquidity-traps-are-alike/>

¹⁶³ Source: <https://www.boj.or.jp/en/mopo/outline/qqe.htm/>

¹⁶⁴ Source: <https://fred.stlouisfed.org/series/DDDI06JPA156NWDB>

¹⁶⁵ <https://www.rba.gov.au/publications/conf/2004/ito.html>

¹⁶⁶ Source: p. 33, "The Asian Financial Crisis: Lessons for a Resilient Asia" by Wing Thyee Woo

¹⁶⁷ i.e. Trump complaining that China and Japan are engaging in unfair currency manipulation results (at least partially) in China and Japan keeping their currencies higher than would be otherwise, in order to preserve amicable relations with the U.S.

¹⁶⁸ Scott Sumner notes the lack of action from Japanese officials at 21m54seconds:

<https://bloggingheads.tv/videos/2043>

¹⁶⁹ Source: <https://fred.stlouisfed.org/series/EXJPUS>

¹⁷⁰ <http://www.themoneyillusion.com/abonomics-after-5-years/>

¹⁷¹ <http://www.themoneyillusion.com/why-will-abonomics-succeed-is-the-wrong-question/>

¹⁷² http://econlog.econlib.org/archives/2016/10/open_market_op.html

¹⁷³ “The inflationary effect of the BOJ buying up the entire world does not come from the BOJ absorbing risk (as Keynesians might tell you), but rather from the fact that the rest of the world does not feel too happy about selling off their entire stock of wealth for some dubious Japanese currency notes, denominated in yen. They would quite rightly smell inflation ahead, and thus the thought experiment would never actually be carried out. The mere intention to do monetary stimulus “à outrance”, if necessary, would create any desired inflation rate. And that means that the policy even lacks its one supposed drawback—it does not in fact add risk to the central bank balance sheet. The balance sheet never gets very large (as a share of GDP), in a truly inflation policy regime. People seem to miss the entire point of Bernanke’s thought experiment. The point is not that central banks must buy up massive quantities of assets at the zero bound. Rather that it is not necessary to buy up lots of assets, if the central bank is truly committed to inflation. If BOJ officials unanimously said, “we will do this if necessary”, it would not be necessary.” (See graph at link location). Source: http://econlog.econlib.org/archives/2016/10/open_market_op.html

¹⁷⁴ Source: <https://fred.stlouisfed.org/graph/?g=jdHY>

¹⁷⁵ Sources: <https://data.worldbank.org/indicator/FM.LBL.BMNY.GD.ZS?view=chart> ; <https://fred.stlouisfed.org/graph/?g=f3J2> ; US Data: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; Pre 1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS> ; Pre 1959 source for US M1: <https://research.stlouisfed.org/aggreg/> and <https://research.stlouisfed.org/aggreg/m1sa.xls>

¹⁷⁶ Sources: <https://data.worldbank.org/indicator/FM.LBL.BMNY.GD.ZS?view=chart> ; <https://fred.stlouisfed.org/graph/?g=f3J2> ; US Data: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; Pre 1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS> ; Pre 1959 source for US M1: <https://research.stlouisfed.org/aggreg/> and <https://research.stlouisfed.org/aggreg/m1sa.xls>

¹⁷⁷ Sources: <https://data.worldbank.org/indicator/FM.LBL.BMNY.GD.ZS?view=chart> ; <https://fred.stlouisfed.org/graph/?g=f3J2> ; US Data: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; Pre 1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS> ; Pre 1959 source for US M1: <https://research.stlouisfed.org/aggreg/> and <https://research.stlouisfed.org/aggreg/m1sa.xls>

¹⁷⁸ Source: <https://fred.stlouisfed.org/series/CPMNACSCAB1GQEU28>

¹⁷⁹ David Beckworth on optimal currency areas: <http://macromarketmusings.blogspot.com/2010/05/krugman-mankiw-and-us-as-oa.html>

¹⁸⁰ Source: <https://www.ft.com/content/db64606a-bd3b-11e6-8b45-b8b81dd5d080>

¹⁸¹ Source: Figure 2 at <https://www.stlouisfed.org/publications/regional-economist/january-2014/the-rise-and-eventual-fall-in-the-feds-balance-sheet>

¹⁸² Source: Figure 2 at <https://www.stlouisfed.org/publications/regional-economist/january-2014/the-rise-and-eventual-fall-in-the-feds-balance-sheet>

¹⁸³ Source: <https://fred.stlouisfed.org/series/CLF16OV>

¹⁸⁴ The Fed’s lack of control of interest rates is made clearer on page 207, “Money Mischief: Episodes in Monetary History” by Milton Friedman

¹⁸⁵ Scott Sumner on the market being largely responsible for long term interest rates (interest rates are not being “held down”): 48:15 at the following podcast: http://www.econtalk.org/archives/2015/04/scott_sumner_on.html

¹⁸⁶ While unlikely, there remains the risk that raising short term rates too early in the cycle, even if just a small amount, can snuff out any recovery. We would point to the ECB raising interest rates only 0.5% in 2011 which partially caused the European double dip recession. Another similar example would be the Federal Reserve raising reserve requirements in 1937, which also (at least partially) caused a double dip recession

¹⁸⁷ Sources: <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm> ; <https://fred.stlouisfed.org/series/FEDFUNDS> ; for Fed projections we use the projection 2 years prior to the actual date. For example, for the 2014 data value, we use the Fed’s projections of 2014 rates at the 2012 Meeting. We use

a weighted average of all Fed members votes. Fed futures data as of 8/25/2017, with “Longer Run” value for “Fed Futures” series equal to the futures value in June 2020. ; updated data: <http://www.cmegroup.com/trading/interest-rates/stir/30-day-federal-fund.html>

¹⁸⁸ Source: <http://macromarketmusings.blogspot.com/2012/09/is-fed-really-causing-sustained-drop-in.html>

¹⁸⁹ Source: <https://fred.stlouisfed.org/graph/?g=f4yA>

¹⁹⁰ “And worse is the notion that the Fed should manipulate interest rates to “normalize” them, that is to fix them at a level from the past. The job of prices is to coordinate, not be at some traditional level. It is the notion that there is something to “normalize” about any price, including an interest rate, that is the fallacy of price fixing. Of course, some free marketers have in the back of their mind some notion that the quantity of money should remain fixed, and so present or even past increases in the quantity of money imply that interest rates are below the appropriate level. It is only when one considers both the quantity of money and the demand to hold it, and then dig deeper into the concept of the nominal anchor of the economy, that any notion any change in the quantity of money is distortionary is shown to be empty.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2015/10/david-beckworth-makes-great-point-here.html>

¹⁹¹ “I don’t believe in “inflationary time bombs” hidden in money supply increases. And I don’t believe in “long and variable lags” from monetary policy shocks.” Source: <http://www.themoneyillusion.com/those-magical-mystical-long-and-variable-lags/>

Also Sumner talking about it here: “The Real Problem was Nominal: N.G.D.P. targeting and the Great Recession | Scott Sumner” https://www.youtube.com/watch?v=XIYxb6c87aw&list=PLOdXrdpuU5ignn-gAHO9FqXcwqZm6SP_1&index=2&t=60m41s

¹⁹² David Beckworth on the Fed buying only a small percentage of treasuries and other Fed myths: <http://macromarketmusings.blogspot.com/2012/11/the-biggest-myth-about-fed.html>

¹⁹³ Source: Exhibit 2.1 from “The Map and the Territory 2.0: Risk, Human Nature and the Future of Forecasting” by Alan Greenspan

¹⁹⁴ Another primary motivation for the Federal Reserve, besides a lender of last resort, was to improve the interoperability of the economy. Before the Fed, the economy was somewhat disconnected across the country, with differing economic conditions existing in say Cleveland vs San Francisco. In an effort to reduce these discrepancies, the Fed was created.

¹⁹⁵ One of the main contributing factors to the rise of fractional reserve banking was the relatively high cost of securely storing clients’ money. It was not practical for a person to safely and securely store all their savings, so they used institutions, such as banks, to protect their money. A bank is able to charge clients much less if they are fractionally reserved (as opposed to fully reserved). In general, there is only rarely a problem with fractional reserve banks (a banking crisis every 10 years) or so. Particularly in developing countries cryptocurrencies, such as Bitcoin and others, have the potential to allow clients to safely store their entire savings electronically, thus potentially reducing the need for banks as well as fractional reserve banking (a client storing their entire checking account on a thumb drive is obviously fully reserved). Bitcoin and crypto in general is an interesting development. It could potentially be a supplement or replacement for some currencies or stores of value like gold.

¹⁹⁶ Furthermore, current capital ratios likely understate the true leverage in the system, as many financial institutions held significant assets off balance sheet. We use this to further illustrate both the inherent highly levered nature of the US banking system and the necessity for a lender of last resort in such a levered system (though some argue that a fully private banking system would never have such low capital ratios so it is instead the existence of a lender of last resort that is the *cause* of the low capital ratios).

¹⁹⁷ “A capital requirement of 10% would mean the banking system must own at least \$10 trillion of assets. Increasing the capital requirement to 50% would translate into an asset portfolio of at least \$18 trillion—an increase of 80%. Portfolio constraints would need to be relaxed to accommodate the larger asset size; riskier assets would need to be made admissible. Capital requirements and portfolio constraints would be working at cross-purposes. Capital requirements must therefore be calibrated in conjunction with portfolio constraints. The monetary authority optimizes the PPP system, in theory at least, by selecting the combination of portfolio constraints and capital requirements that maximizes the safety of the government’s senior claim. Chapter 6 argued that portfolio constraints and capital requirements are ineffective tools for preventing runs and panics.” Source: p. 210 of “The Money Problem: Rethinking Financial Regulation” by Morgan Ricks

“In addition these models generally consider just the fixed credit exposures without taking into account how such exposures are reduced in practice through the use of hedging collateral. For example, if Bank B’s credit quality declines, Bank A may purchase credit default swaps, which will pay off if Bank B does fail, to reduce its exposure to a Bank B failure. The literature concludes that while it is theoretically possible to have chain reactions of default, there would have to be implausibly large shocks for this to occur. This conclusion is supported by the historical record, as no large bank has ever failed as a result of losses incurred in the interbank lending market.² Furthermore, even the existence of asset connectedness does not imply the presence of substantial risk, since much of the risk from asset connectedness exposure can be reduced through collateral, hedging, and diversification. For a detailed overview of the academic literature on asset connectedness, see the appendix.” Source: Kindle location 297 from “Connectedness and Contagion: Protecting the Financial System from Panics” by Hal S. Scott

¹⁹⁸ “I should note that one key difference between what I am suggesting and what is contained in the Basel III rules and the IRCF is the use of total assets, as opposed to risk-weighted assets, in the denominator of the capital requirements calculation. Why? The bottom line is that total assets is a much larger number than risk-weighted assets. Assessing capital requirements against solely risk-weighted assets is a false test, because the notion of what is safe versus what is risky continues to be highly speculative.” || “In practice, the system of risk weights has encouraged banks to invest in assets that are treated as safe by regulators even though they are risky, such as AAA rated mortgage-backed securities or Greek sovereign debt. The system also allows banks to manipulate their own equity requirements by using their own risk models to determine risk weights. . . . For example, the roughly €55 billion (\$74 billion) in equity that Deutsche Bank AG had on its balance sheet at the end of 2011 represented more than 14 percent of the bank’s risk-weighted assets—far more than required by Basel III—but only 2.5 percent of the bank’s total assets.” Source: p. 168 to 169 of “The Age of Oversupply: Overcoming the Greatest Challenge to the Global Economy” by Daniel Alpert

“If the regulatory capital requirements created incentives for banks to tilt their portfolios toward some of the assets that experienced distress during the crisis, the question still remains: How could such small changes in holdings lead to bank distress? To see how, Erel and others⁴² estimate that at the end of 2006 the average bank holding company had about 1 percent of its total assets allocated to the highly rated tranches. The largest trading banks had 5 percent of total assets allocated to the highly rated tranches, or 6.6 percent if off-balance-sheet items were included in the calculation. However, some banks had even larger exposures. For instance, Citigroup had 10.7 percent of total assets in the form of private label MBS and Structured Finance (SF) CDOs. At the same time Citigroup had only 6.3 percent common equity to cover its assets. With those values, write-downs of just under 60 percent would have wiped out common equity, exposing Citigroup to insolvency risk. While 60 percent write-downs might seem extreme, Larry Cordell and others⁴³ estimate that SF CDO write-downs between 1999 and 2007 averaged 65 percent; write-downs on tranches originated in 2006 and 2007 were on average even higher. Losses of this magnitude help explain why a few large banks like Citigroup faced distress during the recent crisis. If the collapse of the SF CDO helps explain why there was a crisis, in principle, a simple way to address the problem is to introduce simpler, higher capital requirements.” Source: kindle location 1197 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

“Simpler capital requirements imply returning to pre-Basel capital adequacy standards by eliminating the risk-weighting of assets and using a flat leverage ratio and by limiting what capital consists of to equity and possibly long-term debt. Higher capital requirements imply increasing banks’ distance to default.” Source: kindle location 1219 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

It not just the capital ratio, but how safe are those assets that go into capital ratio. Occasionally the government may say they are safe, when they aren’t as was the case with mortgages: “The regulators gave this issue no consideration in putting highly rated mortgage-backed securities into a low-risk bucket. Moreover, the rating agencies to which regulators delegated the authority to assign AA and AAA ratings also paid little or no attention to the specific characteristics of the mortgages or borrowers involved. Risk-based capital requirements serve to centralize the process of assessing the relative risk of different investments.” Source: kindle location 712 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

“A simple capital rule, which sets a minimum ratio of capital to total assets, only affects financial leverage. It does not affect operating leverage. A bank could meet the requirement of a simple capital rule while taking inordinate risks simply by investing in risky assets.” Source: kindle location 798 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

“CONCLUSION Risk-based capital rules put the wrong agents in charge of assessing the relative risk of different assets. Bank regulators do not possess the information, particularly at a detailed level, that is needed for this task.” Source: kindle location 829 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

Page 94 of “Unfinished Business: The Unexplored Causes of the Financial Crisis and the Lessons Yet to be Learned” by Tamim Bayoumi has a great graph showing how thinly capitalized banks did much worse in the crisis. For example, per this chart, the equity to asset ratio for Freddie Mac and Lehman were below 5%, while Wells Fargo was 8%, Bank of Mellon and Capital One were about 15%

¹⁹⁹ Steve Eisman on the errors in capital risk weightings that led to the financial crisis: ““You need three things for a financial crisis to happen: 1) You need too much leverage 2) Very big asset class that blows up and 3) important large companies (i.e. banks) to actually own the asset class. You need all three. Unfortunately for planet earth, we had all three in 2007 and 2008. So how’d we get there? Well let’s start with the leverage. So between 1997 and 2007, leverage in the financial system more than tripled. To put some numbers with respect to one company, Citigroup, which could all call the poster child for the financial crisis. In 2002, Citigroup’s assets reached \$1 trillion, and on that day, the company was levered 22 to 1. It had taken Citigroup almost 100 years to get to 1 trillion in assets, and 5 years later, in June of 2007, just before the crisis started, \$1 trillion had grown to 2T, and 22 to 1 had become 35 to 1, in a mere 5 years. So why was leverage up so much? There are really two reasons, the first of which was the role of risk weighted assets. The financial system developed a methodology to measure both capital and risk by creating what’s called the risk weighting system, where every asset on the balance sheet gets a risk weighting. It was a flawed system, it remains a flawed system, nothing is perfect. It was horribly abused. It relied on rating agencies with respect to anything rated AAA, gets a low risk weighting, it relied on the models of the banks themselves to grade themselves. It was also very backward looking, because it looked at historical loss rates, and if something had a very low loss rate historically, it would get a low risk weighting and never took into account the idea that underwriting standards can change, and that something that historically had a low level of losses, if the underwriting goes crazy, could have a very high level of losses. And something that has a low risk weighting really should have had a higher risk weighting. These are all the things that happened. The result was that banks all over the world always viewed their capital on a risk weighted basis, not on an absolute basis, so that by the time the crisis had happened, leverage had gone up three to four times, but the way the banks look at their capital ratios on a risk weighted basis, over the same period, their leverage ratios were flat. So, the people who ran these institutions, literally thought that they were no more levered than they had been 10 years before, whereas in fact, they were levered 3 or 4 times more.” Source: 2:20 Steve Eisman speech at the CFA Ottawa 2017 Dinner

<https://www.youtube.com/watch?v=N329a7ZLL7A>

²⁰⁰ Portfolio requirements deal with what *type* of assets a bank can hold, whereas capital requirements deal with how *much* of these assets the bank holds. This essentially means that banks would be allowed to hold other (potentially less safe) assets in order to get capital ratios up to 75% or so.

There are many issues with 100% reserve banks. In this case, why not just have everyone store money at the central bank? After all, with 100% reserve banks, banks are not really making any loans to private individuals at all. And then what happens if there is no government debt? How would any money be issued at all if banks can’t lend and the govt has no treasuries outstanding? Furthermore, if you have 100% reserve banking how to you prevent shadow banking sector from making loans/and becoming fractional reserve banks themselves. It could be tough to regulate.

“The basic idea of narrow banking is to divorce the issuance of monetary instruments (checkable deposits in particular) from portfolios of risky assets. Under the original and purest version of narrow banking, called 100% reserve banking, entities with demand deposit liabilities would own nothing but base money. Fractional reserve banking would be abolished; deposit banks would resemble the currency warehouses described in chapter 2. Less stringent narrow banking proposals would give deposit banks slightly broader investment powers, allowing them to invest in ultra safe assets like Treasury bills. Narrow banking proposals have been very influential within the

economics profession. Henry Simons, a founding father of the Chicago school of economics, was a leading advocate of 100% reserve banking in the early 1930s. Irving Fisher, one of the greatest economists in US history, was a forceful proponent too. So was Milton Friedman, another towering American economist. Other proponents of versions of narrow banking have included Nobel Prize-winning economists Merton Miller, Robert Merton, and James Tobin. More recently, Gregory Mankiw has expressed tentative support, and Laurence Kotlikoff has pushed for a variant of narrow banking that he calls limited purpose banking. What's the trouble with narrow banking? The main problem has to do with the question we encountered above: whether such a system can issue "enough" money. Suppose that both the central bank and deposit banks confine their asset portfolios to Treasury bills. In that case the quantity of T-bills outstanding serves as an upper bound on the money supply (assuming there is no "shadow" banking). If the supply of T-bills is too small, then the economy's demand for monetary instruments will not be satisfied." Source: p. 169 of "The Money Problem: Rethinking Financial Regulation" by Morgan Ricks

"This discussion raises a fundamental question for narrow banking enthusiasts: if it makes sense to let the central bank (and not deposit banks) do private credit allocation, then why have any deposit banks at all—why not just let everyone hold an account at the central bank? After all, if the central bank can handle the front-office task of credit allocation, then surely it can handle the back-office task of transaction processing." Source: p. 171 of "The Money Problem: Rethinking Financial Regulation" by Morgan Ricks

In 2008, even the safest banks would have gone down if not for the government stepping in to bail them out. Again, none of the large banks had more than 20% reserves. This is a relatively minor amount of reserves for a true financial panic, and 20% of customers could easily have demanded money in the form of cash if not for regulations/FDIC. Even Warren Buffett and his fortress balance at Berkshire would've gone under (by his own admission) if not for the lender of last resort. "If the commercial-paper market had frozen completely, more major financial institutions and possibly even household names such as GE would have failed, Mr. Buffett says, "because their checks would have failed to clear." That would have triggered panic in the nation's money-market funds, which held about \$3.5 trillion in assets, because some of them held commercial paper. The resulting chaos, Mr. Buffett concluded, could have crashed global financial markets, threatening Berkshire. 'I felt that this is something like I've never seen before, and the American public and Congress don't fully understand the gravity' of the problems, he recalls. 'I thought, we are really looking into the abyss.'" Source: <https://www.wsj.com/articles/SB126056572135687829>

"it is worth touching on one other issue that narrow banking proponents have had to confront: how to prevent financial institutions from evading the system by developing close substitutes for bank accounts. Henry Simons became so preoccupied with this problem that he ultimately soured on the proposal he had spearheaded. Simons worried that the development of near monies "might render our drastic reform quite empty, nominal, and unsubstantial." He remarked that "the whole problem which we now associate with commercial banking might easily reappear in other forms of financial arrangements." That such near monies "cannot serve as a circulating medium is not decisively important," he wrote, "for they are an effective substitute medium for purposes of cash balances." Hence "the problem of runs would still be with us." In retrospect, Simons's concerns look remarkably prescient: he was describing shadow banking. By 1936 Simons had concluded that the 100% reserve plan, standing on its own, "would promise little but evasion." Unlike Simons, other narrow banking proponents have downplayed the evasion problem. Irving Fisher, for one, believed the problem was fairly minor; he thought transaction accounts were the main issue. Milton Friedman thought the evasion problem could be handled by paying interest on reserves to 100% reserve banks. Bob Litan suggested that the evasion problem was "a valid concern but one that should not be overstated." In Litan's view, issuers of near monies would be likely to maintain capital ratios significantly higher than those of narrow banks. Simons was clearly right. The problem of substitute forms of money is critical. Indeed, I argue that facing up to this problem—the shadow banking problem—is the central challenge of financial reform. But I don't share Simons's occasional defeatism on this score (see chapter 9)." Source: p. 172 of "The Money Problem: Rethinking Financial Regulation" by Morgan Ricks

Finally, even during this period of relative calm, there were instances of the Fed rescuing parts of the banking system. As an example, see: https://www.federalreservehistory.org/essays/failure_of_continental_illinois

²⁰¹ Sumner on the proposed 100% reserve requirements for banks in Switzerland: "Even under this proposed regime, the 100% reserve requirement would only apply to demand deposits. Banks could still lend out funds in saving

deposits, and hence the same risks to the system would still exist. I don't know about Switzerland, but in America demand deposits are only a small share of bank liabilities. More importantly, if 100% reserve requirements were adopted they would become an even smaller share of liabilities. So, no, this doesn't solve the fundamental problem of financial instability, which is mostly caused by government policies that create moral hazard, such as deposit insurance and "Too-Big-To-Fail". It would not prevent another 'Lehman moment' || "So how could the government's footprint on the financial system be reduced? One option would be for the government to stop re-lending demand deposits to commercial banks. Instead, the Fed would provide checking account services, rather than providing the reserves that back up commercial bank checking accounts. That's equivalent to 100% reserve banking (for demand deposits), except the Fed handles the paperwork instead of commercial banks handling the paperwork. " || "I have no opinion on which system is best, as I don't know enough about the Fed's ability to provide efficient transactions services to the public. If this form of socialized checking accounts is superior to our current system, then I suspect it's on standard "second best" grounds---it slightly reduces the moral hazard created by other government programs. At the same time, it takes us even further from my ideal, which is a completely unregulated financial system. The first best solution is to reduce moral hazard." Source:

http://econlog.econlib.org/archives/2018/02/will_the_swiss.html

²⁰² The current banking system is primarily debt financed via deposits that are fixed dollar amount. If deposits were able to float up or down in price based on the market's judgment of the banks solvency, then runs on banks would be drastically reduced or eliminated. John Cochrane explains further: "The answer then is simple too: we should have (in our banking system) no more large-scale funding of risky or potentially illiquid assets by run-prone securities – short term debt in particular, but any promise that is fixed-value, first-come first-served, if unpaid instantly bankrupts the company, and in volumes that could even remotely trigger such bankruptcy. Banks and shadow banks must get the money they use to hold risky and potentially illiquid loans and securities overwhelmingly from run-proof, floating-value assets – common equity mostly, some long-term debt." || "Once we have done this, financial crises are over. A 100% equity-financed institution cannot fail and cannot suffer a run. Fail means fail to pay your debts, and if you have no debts you cannot fail. " || "In this structure, households provide the same amount of money, and shoulder the same amount of risk, and the bank makes the same amount of loans. But runs and crises are now eliminated. You will laugh, but I'd like to take this structure seriously. With today's technology, people can have floating-value accounts. This was not technically possible in the 1930s, when our country chose instead the path of deposit insurance and risk regulation. But now, you could easily go to an ATM, ask for \$20, and it sells \$20 of bank shares at the current market value, within milliseconds. "Liquidity" now is divorced from "fixed-value" and "runnable." Even better, you could go to the ATM, or swipe your card or smartphone, and instantly sell shares in an ETF that holds mortgage-backed securities. This is a "bank," providing transactions services based on a pool of mortgages and shows that money still flows from people to mortgages. But with floating value, it is run proof."

Source: <https://johnhcochrane.blogspot.com/2016/05/equity-financed-banking.html> ; <https://youtu.be/QcidqjmxPyk?t=2h3m33s>

²⁰³ Scott Sumner also seems to like Cochrane's idea regarding equity financed banks: "Ken, Cochrane has lots of good ideas on banking." Source: <http://www.themoneyillusion.com/the-problem-with-deposit-insurance/#comment-2060929>

²⁰⁴ Size of subprime mortgage market was over \$600 billion in 2006 accounting for over 23% of all mortgages. Source:

https://en.wikipedia.org/wiki/Subprime_mortgage_crisis#/media/File:Subprime_mortgage_originations,_1996-2008.GIF

²⁰⁵ Bill Woolsey has a great explanation of capital ratios vs reserve requirements, and what 100% capital ratio banks, etc. would look like: <http://monetaryfreedom-billwoolsey.blogspot.com/2010/03/reserves-and-capital-confused.html>

²⁰⁶ A central reason why bond holders were largely bailed out in the 2008 crisis (and equity holders were not bailed out) is that banks' equity was composed of a lot of bonds. Any haircuts to those bonds would further reduce the bank's capital ratio and therefore increase leverage in the banking system right in the middle of a crisis. Source: <http://macromarketmusings.blogspot.com/2009/03/why-are-bank-creditors-being-protected.html>

²⁰⁷ "Figure 3 also helps understand the relationship between capital adequacy and banking crises, and in particular why so many banks failed throughout US history, even though capital requirements had been high. For instance, the frequent crises observed during the pre-FDIC era may have occurred because banks were too small, even though they had historically high levels of capital. In more recent times, just as the number of banks has been declining, bank capital has been relatively low by historical standards. One implication could be that bank capital alone cannot

ensure stability of the banking system if regulations, such as interstate banking and branching restrictions, interfere with bank size as driven by market demands for banking services. With no geographical limits on where banks can operate and with higher capital requirements, banks might diversify their risks while increasing their distance to default. To elaborate, Bordo and others discuss how Canadian banks never experienced a major banking crisis since Confederation in 1867 because they could diversify their loan risks and pool deposits from across Canada.” Source: kindle location 1058 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

²⁰⁸ The mere fact that the Fed is there as a lender of last resort keeps the system in check. Remove it, and you’ll have big problems very quickly. After all, bank customers and banks themselves have setup the current capital ratios assuming a lender of last resort. Remove that and the entire math changes.

²⁰⁹ For breakouts of what a banks’ balance sheet looks like under various capital ratios (asset and liabilities broken out by sub category), see “Figure 4. A Stylized Bank Balance Sheet under Precrisis Basel Guidelines” (10% capital ratio bank balance sheet, most like the current system) and “Figure 9. Admata and Hellwig’s Proposal” (20-30% capital ratio bank balance sheet) and “Figure 10. Black’s Dollar-for-Dollar Proposal” (50% capital ratio bank balance sheet) and “Figure 11. Cochrane’s Proposal without Deposits” (100% capital ratio bank balance sheet). Under the Figure 10 plan, Assets = 90% Bonds Loans + 10% Reserves; Liabilities = 50% Deposits + 50% Equity Debt. Under Figure 11 Plan, Assets = 100% Bonds Loans; Liabilities = 100% Equity. Source: kindle location 1222 from “Reframing Financial Regulation: Enhancing Stability and Protecting Consumers” by Hester Peirce

“We find that substantially higher capital requirements (in the 20% to 30% range) would have substantially reduced the vulnerability of these financial institutions, and consequently they would have significantly reduced the need of a public bailout.” Source: <https://www.minneapolisfed.org/research/staff-reports/capital-requirements-and-bailouts>

²¹⁰ We should also note that splitting up the banks can be helpful, however would not fix the general necessity of a government rescue of the banking system when capital adequacy ratios are below 20%. While shrinking the size of the largest firms, would be helpful, it would still be possible for many smaller banks to fail simultaneously. Banking crisis tend to be contagious and it is not difficult to imagine a scenario where 100s of smaller banks all need rescuing at the same time. While technically not “too big to fail” it’s still the government coming in and injecting money as in too big to fail. What we find is that even in a system where no bank owns more than 1% of the banking assets in an economy, if the banks all collectively implement bad lending practices, then we still have a too big to fail system. It’s just that now its 30 smaller banks that are too big to fail, instead of 5 “superbanks”. Again, what matters is the total equity to assets for the banking system as a whole as well as how similar these banks’ practices are. If everyone invests in bad mortgages like in 2005, it doesn’t matter how small the banks are, the system still will eventually need to be rescued

²¹¹ <http://www.themoneyillusion.com/a-very-depressing-interview/>

²¹² While the Fed raised rates (in order to curb gold outflows), Scott Sumner argues that the much more important indication that the Fed was tight during the Great Depression was its increase in gold hoarding in the early 1930s. To stop gold outflows, you can either raise rates, or devalue. The Fed tried the first option and it didn’t work. Finally, FDR implemented the second option which did work. See more at kindle book location 2834 of “The Midas Paradox: Financial Markets, Government Policy Shocks, and the Great Depression” by Scott Sumner

²¹³ Sources: https://www.federalreservehistory.org/essays/great_depression ; https://www.federalreservehistory.org/essays/banking_panic_1931_33

²¹⁴ Source: <https://inflationdata.com/articles/inflation-cpi-consumer-price-index-1930-1939/>

²¹⁵ The creation of FDIC and other factors also helped to prevent future bank runs

²¹⁶ We note that the stock market bottomed about 6 months earlier than this, but the rumors were strong that FDR was considering a devaluation. In addition, there were other measures (creation of the F.D.I.C., etc.) that were put in place in 1933 and 1934 which helped end the Great Depression.

“Keynes viewed a liquidity trap as a situation in which further increases in the money supply would have no impact on aggregate demand, or prices. We have no real evidence that such a trap existed in 1932. Instead, the problem was that the gold standard limited the amount by which central banks could increase the monetary base. More recently, a number of economists have argued that monetary injections that are viewed as being temporary might fail to boost aggregate demand, even under a fiat money regime. This sort of “expectations trap” is even more likely to form under an international gold standard regime, where monetary injections can lead to gold outflows. The public may

have understood this and thus been skeptical of any proposal to inflate within the confines of a gold standard regime. (See Appendix 4.b for a fascinating example of how interwar policymakers also intuited the importance of this distinction.) Friedman and Schwartz's central hypothesis is that the Federal Reserve should have, and could have, done much more to prevent the Great Contraction. Although the gold market model developed in this book is not capable of refuting this hypothesis, it does suggest that they may have placed too much emphasis on specific policy steps that might have been more effective under a fiat money regime, including the discount rate increases of October 1931, the OMPs of 1932, and the reserve requirement increases of 1936–1937. And more importantly, they placed too little emphasis on events that changed expectations of the future path of monetary policy, such as private and central bank gold hoarding, Glass-Steagall, and especially changes in the price of gold during 1933–1934.” Source: see kindle book location 2738 in “The Midas Paradox: Financial Markets, Government Policy Shocks, and the Great Depression” by Scott Sumner

²¹⁷ Scott Sumner has a great flow chart of causes that contributed to the Great Depression at kindle book location 7464 in “The Midas Paradox: Financial Markets, Government Policy Shocks, and the Great Depression” by Scott Sumner

²¹⁸ Sources: Pre 1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS> ;

²¹⁹ Sources: Pre 1959 M2 Data from http://www.econdataus.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS> ;

²²⁰ Some have argued that the Fed should only be a lender of last resort and not do any capital injections. While lending is certainly preferable to injections, it is not difficult to imagine a scenario where a deflationary spiral causes loans from the Fed (to banks) to in effect become injections when said banks go into further crisis. Any loan from the Fed can be overwhelmed by the increase in liabilities or decrease in asset values, in effect making the former loan into an injection. Again, the capital ratio is what ultimately matters, and with an undercapitalized banking system, what at first appears to be a *loan* from the lender of last resort to the banking system (to solve liquidity problems) can quickly turn into a *gift* (used to solve solvency problems) that is never repaid.

²²¹ Source: [http://www.mauldineconomics.com/images/uploads/overmyshoulder/Bridgewater - an-in-depth-look-at-deleveragings--ray-dalio-bridgewater.pdf](http://www.mauldineconomics.com/images/uploads/overmyshoulder/Bridgewater_-_an-in-depth-look-at-deleveragings--ray-dalio-bridgewater.pdf)

²²² Sumner disagrees a bit that higher leverage increases interest rates. Instead, he states that more credit would tend to keep interest rates down: “I don’t think that easy credit stimulates the economy, in fact I think (ceteris paribus) it is exactly the reverse. Easy credit lowers nominal interest rates. This lowers velocity, which lowers N.G.D.P. I think that easy money stimulated the economy. If the money supply grows fast enough so that $M \cdot V$ increases by more than 5% then the economy tends to get overheated.” Source: <http://www.themoneyillusion.com/its-not-different-this-time/>

²²³ Sometimes institutions like AIG, which aren’t banks, also need to be brought in line to prevent trillion-dollar asset companies from leveraging up 30 to 1 and becoming too big to fail.

“contagious runs are likely to overwhelm any plausible capital requirement, due to the staggering losses that inevitably follow from asset fire sales. Indeed capital requirements at any plausible level will be insufficient to prevent contagion, as it is unlikely that short-term debt-holders even take an institution’s solvency into account (which in any event will be difficult for them to determine) during a run—better safe than sorry. Further, and crucially, capital requirements only apply to banking organizations and a few specific nonbanks (e.g., the three nonbank SIFs, for which the requirements have not yet been determined). So they cannot stop contagion in the nonbanking sector, an important feature of the 2008 crisis.” Source: Kindle location 5909 from “Connectedness and Contagion: Protecting the Financial System from Panics” by Hal S. Scott

“This bad odor is still with us. The current attack against the Fed’s power as lender of last resort is often premised on the idea that the federal government should not make any loans to the private sector, whether those loans are made to commercial establishments, banks or other financial institutions. As a result of the anti-bailout sentiment following the 2008 crisis, the Fed’s power as lender of last resort was significantly restricted by the Dodd–Frank Act, particularly as a lender of last resort to nonbanks under Section 13(3) of the Federal Reserve Act. Having a strong lender of last resort for nonbanks is increasingly important, as nonbanks have issued approximately 60 percent of the estimated \$7.4 to \$8.2 trillion in runnable short-term liabilities in the financial system.” Source: Kindle location 9540 from “Connectedness and Contagion: Protecting the Financial System from Panics” by Hal S. Scott

²²⁴ We point out this scenario to highlight the inconsistency between those arguing *against* too big to fail yet at the same time arguing *for* a 10% or less capital ratios. It is our view that one must pick from following options: 1) 30%-100% reserved banks with no need for a lender of last resort or 2) 10% reserved banks *with* a lender of last resort. Having banks with only 10% capital ratios and expecting them to survive for any considerable amount of time without needed a central bank or lender of last resort is pure fantasy in our mind. The in between scenario of say 40% capital adequacy ratios banks without a central bank is certainly possible, though crisis will still occur as they did in the mid-19th century. These banking crises won't be nearly as bad as a crisis with 10% capital ratio and no central bank, but they will still be severe. Furthermore, we are not confident that 40% capital adequacy ratios is enough over the very long term. We've seen a few decades period in the 19th century where it partially worked, but this may not be a large enough of a sample size.

²²⁵ Dodd frank may delay next crisis but won't prevent it. Moving capital ratios from 8% to 12% doesn't change much long term.

²²⁶ As Jeff Snider says, "In other words, you could be concerned about the Bank of Japan and the government of Japan's ability to pay back Japanese debt. However, if the economy is atrocious, and the monetary system is tight, then liquidity risks overwhelm credit risk. And so, you're going to hold Japanese government debt because it's the most liquid interest instrument, even though it embeds a whole lot of credit risk. That's why interest rates stay low, is because there are other risk considerations that have become paramount over and above credit risk. And I think we have a similar situation in the United States." Source: 1:04:44 to 1:09:31 in the following podcast: "Macro voices podcast, Jeff Snider: U.S. Treasury Yield Curve Deep Dive" : <https://www.macrovoices.com/macro-voices-research/podcast-mp3-files/1709-macrovoices-2018-03-22-jeff-snider> ; (transcript) <https://www.macrovoices.com/macro-voices-research/podcast-transcripts/1694-2018-03-22-transcript-of-the-podcast-interview-between-erik-townsend-and-jeffrey-snider>

²²⁷ In theory, if a government issued all its debt in inflation linked bonds, is it possible that the government would have to default or other problems would arise. Money printing would lead to a runaway feedback cycle where the more they print, the higher the rate on the inflation linked bonds.

²²⁸ A leading frontrunner to replace Mario Draghi as ECB President is Jens Weidmann. He has expressed skepticism regarding recent ECB efforts to ease policy. If Weidmann implemented severely contractionary policy, it would further scour our views of the European economy going forward. Source: <http://www.spiegel.de/international/business/interview-with-bundesbank-head-jens-weidmann-on-euro-crisis-and-ecb-a-993409.html>

²²⁹ It is also our view that the 1970s inflation was primarily a struggle between the Feds mandate to maintain full employment and its mandate to maintain stable prices (with some political pressures from the executive branch mixed in there). It eventually reached a point where, in order to keep prices from increasing rapidly, the government would've had to reduce the new supply of money which would have increase unemployment. The choice was made to keep unemployment low and money printing high through the 1980s. It was eventually Paul Volker who decided to make the alternative approach and choose stable prices over low unemployment rates. This contracted the economy severely in the early 1980s (rising unemployment), but successfully reduced the level of inflation.

"To summarize, inflation has become less attractive as a political option. Given a voting public very sensitive to inflation, it may currently be politically profitable to establish monetary arrangements that will make the present irredeemable paper standard an exception to Fisher's generalization. Recent experience provides some support for that view. The inflationary episode of the 1970s was severe by the standards that had become accepted in the United States, the United Kingdom, Japan, and other advanced countries during the nineteenth and most of the twentieth century (though it was mild by comparison with the experience of many other countries of the world). It was sufficiently severe to generate political pressures that led to policies of disinflation throughout the Western world, policies of restraining monetary growth and of accepting substantial temporary unemployment in order to avoid continued inflation. Inflation has come down in the United States from double digits to low single digits, and there is widespread support for the Federal Reserve's repeatedly stated intention to reduce inflation still further from the 3 percent to 5 percent level that has prevailed from 1983 on." Source: p. 258, "Money Mischief: Episodes in Monetary History" by Milton Friedman

“Because of the emphasis on full employment, governments are unwilling to restrict monetary expansion long enough to restore price and cost stability” Source: Page 60, The Phenomenon of Worldwide Inflation by David I. Meiselman (1975)

“It will be shown that worldwide inflation has been closely associated with the rapid worldwide increase in money made possible by the Bretton Woods system and the IMF and its associated fixed exchange rate system, which turned into an engine of worldwide inflation by encouraging worldwide monetary expansion (translation: expansionary US monetary policy was exported to the rest of the world via fixed exchange rates). Source: Page 70, The Phenomenon of Worldwide Inflation by David I. Meiselman (1975)

²³⁰ Sources: M1 from <https://fred.stlouisfed.org/series/AMBNS> ; Pre 1959 M2 Data from http://www.econdatas.com/cpi_m2.html ; 1959 and after M2 data from <https://fred.stlouisfed.org/series/M2NS>

²³¹ Source: <https://fred.stlouisfed.org/graph/?g=ipVy>

²³² Source: <https://fred.stlouisfed.org/series/AMBSL>

²³³ “CPI inflation, which had been running at double digit rates from mid-1979 to mid-1981, fell almost immediately to rate of about 4% in late 1981, and basically stayed around that rate for the rest of the decade. Doesn’t this show the power of monetary policy to quickly change the rate of inflation?” Source: <http://www.themoneyillusion.com/the-gmu-onslaught-continues/>

²³⁴ Source: <https://www.bloomberg.com/view/articles/2017-10-12/low-bond-yields-have-little-to-do-with-lax-monetary-policies>

²³⁵ “However, the unemployment rate is not the right measure of labor market slack right now. If instead we look at the prime age non-employment rate (which is 100% minus the prime aged employment rate), we see an even tighter wage Phillips curve. According to this curve, wage growth is exactly where we would expect given the level of slack in the labor market. To get to 3.5% to 4% or higher wage growth, this graph suggests another 3 percentage points of improvement in the non-employment rate will be needed. Whether you use the unemployment rate or prime non-employment Phillips curves, both suggest there is room to improve. The unemployment rate Phillips curve fails to explain the last two years of wage growth. The prime non-employment rate curve in contrast suggests wage growth should be exactly where it is. The better fit extends throughout the sample period: The r-squareds from the lines of best fit indicate that the prime-age non-employment rate can explain 87% of the variation in wage growth since 1994 compared with 64% for the unemployment rate.” (In addition, see graph “Wage Growth Right on Target for EPOP”). Source: <https://www.economy.com/dismal/analysis/datapoints/296127/There-Is-No-US-Wage-Growth-Mystery/>

²³⁶ “The base may appear endogenous as well, as the Fed often uses a short term interest rate target. But in practice the Fed is merely using fed funds rate changes to signal an intention to change the MB path relative to changes in the expected future demand for base money. So the fundamental tool has been control of the base.” Source: <http://www.themoneyillusion.com/good-monetarism-bad-monetarism/>

Also see: <http://www.themoneyillusion.com/the-things-that-you-think-cause-inflation-are-merely-the-symptoms-of-price-stickiness/>

²³⁷ Source: <https://fred.stlouisfed.org/graph/?g=jdQI>

²³⁸ Source: <https://fred.stlouisfed.org/graph/?g=jdQI>

²³⁹ Unfortunately, recent Fed minutes suggest a continued belief in the Phillips curve: “Almost all participants who commented agreed that a Phillips curve-type of inflation framework remained useful as one of their tools for understanding inflation dynamics and informing their decisions on monetary policy.” Source: Minutes of the Federal Open Market Committee, January 30–31, 2018 (Page 10) :

<https://www.federalreserve.gov/monetarypolicy/files/fomcminutes20180131.pdf>

²⁴⁰ Source: <https://fred.stlouisfed.org/graph/?g=jdQI>

²⁴¹ Source: <https://www.cnbc.com/2016/04/29/buffett-says-dont-put-too-much-stock-in-icahns-market-reckoning-warning.html>

²⁴² Zero Coupon Bond Value = Face Value of Bond / [(1+yield)^(time to maturity)]. Source: http://financeformulas.net/Zero_Coupon_Bond_Value.html

²⁴³ A few other factors that could contribute to low rates: 1) A rising Share of intangible investments vs. tangible investments 2) the well-known phenomenon of productivity improvements being greater in the manufacturing sector than the services sector 3) A declining share of manufacturing as a percent of GDP could all lead to lower rates of investment, lower productivity growth and lower rates going forward. || “The final fact surrounding secular

stagnation is that the sustained decrease in productivity growth that we have seen in developed countries does not seem to be driven solely by lower investment. Labor productivity growth (see box 5.1 for a fuller explanation of labor productivity, profitability, and total factor productivity) can fall for two broad reasons. It can fall because investment falls, thus giving workers less capital to work with. Or it can fall because workers are working less effectively with whatever capital they have; this is called a fall in “multi-factor” or “total factor” productivity (TFP). Now, since the financial crisis, investment has fallen, but not by enough to account for all the loss in labor productivity. In fact, the bulk of the slowdown in productivity growth has been a decline in total factor productivity. Figure 5.5 shows, since about the mid-2000s, a fall in OECD multi-factor productivity growth.” || “Suppose a farmer claims productivity (output per laborer) on the farm has doubled. If the farmer has only brought in more tractors (not changing other inputs), then multi-factor productivity growth will have stayed the same and any productivity growth in the economy as a whole will be due to improvements in the tractor industry. If the farmer has improved the efficiency of operations, maybe innovated in crop rotation or improved work practices on the farm, then multi-factor productivity growth in farming will have risen.” Source: p. 24, p.31, p.92, p.96, p.100 “Capitalism without Capital: The Rise of the Intangible Economy” by Jonathan Haskel and Stian Westlake.

²⁴⁴ Date ranges (“1800 – 1900” etc.) reference the annual population growth for that time frame, not necessarily the average P/E during that time frame. All data assumes inflation of 3% per year, productivity growth of 1.75% per year, and 0% equity risk premium (nominal G.D.P. growth = earnings yield) Sources:

<https://esa.un.org/unpd/wpp/Download/Probabilistic/Population/> ; <https://www.measuringworth.com/usgdp/>

²⁴⁵ <http://econlog.econlib.org/archives/2018/01/bullseye.html>

²⁴⁶ “Larry White mentioned that Alchain and Klein showed long ago that the measure of the purchasing power of money should include asset prices. I don't agree. I strongly agree that it is a mistake to measure the purchasing power of money solely by the prices of consumer goods and services--the CPI or CEP.” || “Now, suppose the market interest rate should fall, and the lower discount of future returns results in higher prices of equities and existing long term bonds. Superficially, the purchasing power of money is less. It is necessary to pay more for the same quantity of future goods.” || “But I don't think that the prices of financial assets should be included in a measure of inflation.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2015/05/asset-price-inflation.html>

²⁴⁷ Source: <https://www.measuringworth.com/usG.D.P./>

²⁴⁸ The Economic Role of the State in the 21st Century by Vito Tanzi. Cato Journal, Vol. 25, No. 3 (Fall 2005). Page 619

²⁴⁹ Source: https://fred.stlouisfed.org/graph/?graph_id=268056

²⁵⁰ Sources: http://www.usgovernmentspending.com/spending_chart_1798_2020USp_18s2li011mcn_F0f ;

<https://www.measuringworth.com/usG.D.P./> ;

https://www.usgovernmentspending.com/spending_chart_1820_2019USp_19s2li011mcn_F0t (State + Local + Federal Spending included)

²⁵¹ Sources: <https://www.measuringworth.com/usG.D.P./>

²⁵² Source: https://fred.stlouisfed.org/graph/?graph_id=343328

²⁵³ Sources:

http://www.usgovernmentdebt.us/spending_chart_1792_2020USp_XXs2li011tcn_H0f_Accumulated_Gross_Federal_Debt ; <https://www.measuringworth.com/usG.D.P./>

²⁵⁴ Regarding the effect of low population growth on income distribution, there is an economic theory that states that lower population growth should reduce income inequality as “slower labor force growth allows a faster buildup of skills per worker, bidding down the skill premium and lowering wage inequality”. The faster growth in labor we saw since 1970 corresponded to rising income inequality, whereas the relatively slower growth in workers from 1910 to 1970 saw a reduction in income inequality. Despite the rise in income inequality since 1970 there has been positive progress for both females and African Americans. Since 1970, the incomes for those two demographics has risen vs. the population as a whole. Source: pages. 209, 225, 227 “Unequal Gains: American Growth and Inequality since 1700” by Peter H. Lindert.

²⁵⁵ Sources: Wealth data at Table 10.5 at <http://piketty.pse.ens.fr/en/capital21c2> ; Income data at <https://www.theatlantic.com/business/archive/2012/09/us-income-inequality-its-worse-today-than-it-was-in-1774/262537/> ; <https://www.measuringworth.com/usG.D.P./> ; Split Rock estimates

²⁵⁶ Bill Woolsey on the recent productivity decrease: “Still, even after four years, most of us doubt that there was just a happy coincidence that spending on output fell in near exact proportion to a decrease in productive capacity. And further, we see substantial evidence that firms would be willing and able to produce more if their sales were to increase. Few of us ever bought into Dourado's market clearing approach--shifts in supply due to confusion--

anyway. But we see the experience of the last four years as providing evidence that it isn't even a close approximation.” Source: <http://monetaryfreedom-billwoolsey.blogspot.com/2012/09/eli-dourado-on-short-and-long-run.html>

²⁵⁷ Source: <https://fred.stlouisfed.org/graph/?g=f1km>

²⁵⁸ Sources: <https://esa.un.org/unpd/wpp/Download/Probabilistic/Population/> ; <https://www.measuringworth.com/usgdp/>

²⁵⁹ Sources: <https://esa.un.org/unpd/wpp/Download/Probabilistic/Population/> ; <https://www.measuringworth.com/usgdp/> ; <http://www.migrationpolicy.org/programs/data-hub/charts/Annual-Number-of-US-Legal-Permanent-Residents>

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