# Helicopter Money – A Primer

By James Sly

July 2016

## Introduction

Helicopter money sounds like a somewhat fanciful concept. Milton Friedman popularized the idea in a 1969 paper, and other economists have pointed out that central banks have unlimited power to stimulate the economy because even in the worst case they could always print money and give it to consumers by dropping it from helicopters.(1)

The developed world has been mired in crisis since 2008, trying ever more aggressive policies to bring about recovery, but still being left with inflation below target, growth not as high as people would like, and an enormous output gap that never seems to get any smaller.(2) With long run interest rates in Japan and Germany near zero (3), commentators have started to debate whether central banks have the tools to get the economy back to reasonable levels of performance. We know however that central banks always have the tools available, all they need is the political will to utilize the full range of policy instruments at their disposal, in this case helicopter money.

As a result, helicopter money, radical as it may seem, has been getting increasing attention in the economic policy debate, yet discussions of helicopter money often get mired down in economic minutia that only someone with an economics PhD could understand. This paper is an attempt, hopefully successful, to answer the basic questions surrounding helicopter money in a way that is more accessible to more people who might not have a PhD in economics, but still provide insights that even advanced students would appreciate.

## Section 1 – The Core Argument for Helicopter Money

In 2008, the world was beset by the most severe economic crisis since the great depression. Countries around the world responded by lowering interest rates nearly to zero and running surprisingly high budget deficits to stimulate their economy.(1) This created a difficult but fundamental tradeoff where countries wanted to keep running high deficits in order to improve their economies, but if you run deficits too long then you risk a Greek style debt crisis. Policymakers then faced a difficult choice. On the one hand, they could do what Europe did and do dramatic amounts of austerity and face high unemployment, low growth, inflation significantly below target, and a growing output gap.(2) On the other hand, you could do what Japan did and keep running significant deficits for decades and deal with debt nearly 250% as a percent of GDP, the highest in the world among advanced countries.(3)

The way to get around this difficult tradeoff is to use helicopter money. Debt crises only occur because you usually need to pay back the debt with tax money, and there is a limit to how much tax money you

can raise in any economy. If you pay back the debt with printed money, then there is no limit to how much you can repay and no longer any risk of not being able to pay your debts. This sounds like a radical dangerous solution, but after the financial crisis, the US government was issuing debt worth 8-10% of GDP for the first few years and the central bank was periodically buying debt with printed money worth approximately 6-7% of GDP (known as quantitative easing or QE).(4) The result was positive (core inflation rose to 2% after the second round of QE), but not particularly dramatic since growth never rose above 2.5%.(5) This is not exactly helicopter money, printing money and giving it directly to citizens, but if the government gives money to citizens by issuing debt, and then the central bank buys government debt with printed money, this is close to helicopter money just using banks as the middle man.

Now central banks would adamantly deny that they are experimenting with helicopter money. The first key point is that QE in its current form is explicitly temporary. Central banks buy government debt with printed money, but they all plan to eventually sell the bonds back to banks, thereby removing all the printed money from the economy, and forcing governments to eventually repay all the debt with tax money. Helicopter money is explicitly designed to be permanent. With helicopter money, policymakers print the money and distribute it directly to citizens and though technically reversible (governments could collect the money through taxes and burn it), this is much more difficult to do. As a result, QE is seen as a temporary influx of printed money into the economy and helicopter money is seen as a permanent distribution of printed money into the economy. Therefore, combining permanent QE with higher deficits is basically equivalent to helicopter money.

The goal of quantitative easing was to provide a short run monetary stimulus to the economy. The temporary QE definitely helped. Core inflation rose to 2%. Growth returned to 1.5-2.5% enough to keep the output gap from rapidly growing but not fast enough to close it. Unemployment gradually declined but for a long time almost all of this was due to people who stopped looking for work entirely. However, as a result of this continually moderate economic performance, the working age employment to population ratio is still well below the pre-crisis level and the output gap appears to be continuing on indefinitely. (6)

In order to overcome these continuing economic difficulties, one approach would be to significantly increase the levels of fiscal stimulus. In this case, temporary QE was not enough since the fear of rising debt levels caused the US government to significantly reduce the deficit during and after the 2012 election.(7) In order to overcome the fear of a debt crisis, you need to pair additional fiscal stimulus with permanent QE, essentially helicopter money. Once the government knows the central bank will be buying the debt and holding it in perpetuity (including giving the interest back to the government), then the government knows it will not need tax money to repay the debt and can try higher levels of fiscal stimulus with less risk. Only by removing this fear of debt crisis will we be able to get the levels of fiscal stimulus we need to get the economy to full recovery.

Of course there are concerns when trying helicopter money. About 30 seconds into any conversation about helicopter money someone will inevitably bring up the case of Weimar Germany. Between 1921 and 1924, the Weimar government printed money to pay for government expenses, but did it in such ridiculous amounts that there was severe hyperinflation across all of Germany. Technically, it was the

later economic crisis of 1931 that caused the economic malaise that helped bring Hitler to power (8), but the example is so ingrained in the consciousness of economists of the potential disaster of using printed money to directly pay for government spending that the EU treaties regulating the European Central Bank included an explicit ban on this type of policy. (9)

One important point to make, however, is that circumstances are different now. Helicopter money is less likely to cause inflation when the economy is depressed and interest rates are stuck at zero because the money multiplier is broken. In fact, as pointed out before, we already know we can print lots of money temporarily with only a modest effect on inflation, so the problem is not that printing money will cause inflation when the economy is depressed, the argument is that inflation will start to increase once the economy recovers and the money multiplier starts working again.

The highly controversial though I think increasingly correct response to this concern is that there is a good chance the economy will not recover, that interest rates will not rise above zero, and the money multiplier will stay broken forever. Japan accumulated a massive asset bubble in the late 1980s that burst in the early 1990s, and they still have interest rates stuck at zero 25 years later.(10) Following their own economic crises, a variety of central banks have tried raising interest rates above zero (including Japan), but all of them have had to declare the policy unsuccessful and reduce rates back to zero except for one case. The United States tried raising interest rates once in December 2015 and encountered enough trouble to make raising rates even higher somewhat difficult. Already 8 years after the crisis, the biggest success in raising interest rates above zero is to have the US raise rates once by a quarter point, and even this is still potentially considered problematic.(11)

If interest rates really are stuck at zero forever, then we do not need to worry about the economy recovering and inflation starting to rise once the money multiplier starts working again. If, however, this assumption is wrong, then there are still policy approaches available to make sure inflation does not start increasing. The most important idea is that if we print a bunch of money to pay off debt and then the economy recovers, we can just raise the reserve requirement to limit the effect of the money multiplier and ensure inflation stays low and steady. If the interest rates stay at zero forever, which I think is a significant possibility, then there is no need to worry about printed money causing inflation, and if the economy recovers and rates rise above zero, then we have tools, the reserve requirement, which can prevent inflation from causing any problems.

The second key argument against helicopter money is that once you start doing helicopter money, it is so easy and so popular that government will not be able to stop doing it and the stimulus levels will spiral out of control. There is some validity to this argument since Weimar Germany clearly could not control their plans. On the other hand, when Japan's government in the early 1930s tried funding deficits directly with printed money under finance minister Takahashi Korekiyo, he successfully stimulated the economy out of recession without causing too much inflation. Unfortunately, when the finance minister tried to reduce its use, he was assassinated and inflation rose dramatically afterwards. Perhaps this example shows that funding deficits with printed money without causing excess inflation might be possible, but that directly financing government spending with printed money might be a difficult policy to end successfully.(12)

The trick to making sure helicopter money does not spiral out of control is to develop a strong intellectual and institutional framework for a moderate limited policy. Most central banks in advanced countries have an explicit policy of inflation targeting,(13) ensuring that concerns over rapid inflation are seriously considered when making policy. Plus, there has been a decades long push to make central banks more independent,(14) so that as a result, many institutions are designed to resist popular pressure (and the risk of assassination) for more stimulus and well situated to balance the worries of inflation against the need for more helicopter money.

The real dilemma is whether we should even try and experiment with some use of helicopter money to see if it can work and can be used in moderation, or do we declare the whole project to be too risky and ban it outright from ever being tried. In this case, the economic stakes seem too high. The US, Japan, and Europe all face the prospect of decades of mediocre economic performance with Europe maintaining unemployment rates in the Eurozone above 10%, and Japan never quite being able to make their modest 2% inflation target, and the US continuing to suffer large output gaps in perpetuity.(15)

The trick to keeping a few lost decades from materializing in all the advanced economies is to carefully experiment with more aggressive forms of stimulus, including helicopter money, in ways we can learn what works and what does not, and can figure out ways to ensure policy does not spiral out of control. To assume the impossibility of cautiously finding a solution seems too pessimistic to me.

The most problematic intellectual mistake in the current debate is the idea that the economy is just about to recover, policy is just about to return to normal, and the primary goal of policy should be to end unconventional policy as quickly as possible. In this view, the best way to manage the economy is to manipulate interest rates, but if the economy remains depressed from this point on, then we might need unconventional policy in perpetuity too. Maybe we are entering a new era of economic policy where interest rates are no longer needed and we find other ways like helicopter money to manage the ups and downs of the business cycle. The longer this crisis lasts, and the longer current policy is seen as inadequate, then the closer we get to more aggressive approaches and the closer we get to trying helicopter money.

The real question is whether or not we blindly accept decades of mediocre economic performance or do we experiment with new approaches to try and improve upon what we have been able to achieve before. The real question is how fast can we learn from our past policy mistakes to ensure a bright outlook for our economic future. The real question is can helicopter money actually be the solution we have been desperately seeking.

## Section 2 – Why do we need helicopter money?

In order to understand why we need helicopter money, we first need to come up with a theory of economic fluctuations. To understand economic fluctuations you first need to consider the money supply spent on goods and services, and the first thing to ponder about the money supply spent on goods and services is whether or not prices are sticky. If prices are sticky then when the money supply

spent on goods and services fluctuates then output fluctuates and we get recessions and expansions. If prices are flexible, then if the money supply spent on goods and services fluctuates, then prices fluctuate and output stays the same. The theory of economic fluctuations I am explaining here is basically a Keynesian theory, and the first key assumption in Keynesian theory is that prices are sticky and fluctuations in the money supply spent on goods and services effect the actual output produced in an economy.(1)

The next thing to ponder when considering the money supply is that you can spend money on goods and services but you can also spend money on assets. The key to understanding the relationship between money spent on goods and services and money spent on assets is savings (S) and investment (I). Savings is when you take money that was spent on goods and services and spend it on assets. Investment is when you take money spent on assets and spend it on goods and services.

The key relationship for understanding how much of the money supply is spent on goods and services is the relationship between savings and investment. If savings is greater than investment or S>I, then more money is being taken from the goods and services economy and spent on assets than the other way around, so the money spent on goods and services shrinks. If prices are sticky, which we assume they are, then this will cause the economy to contract and cause fewer goods and services to actually be produced.

If on the other hand savings is less than investment or S<I, then more money is being diverted from assets and spent on goods and services then the other way around, so the money spent on goods and services grows. If prices are sticky, then the amount of goods and services produced expands with the money supply and we get an economic expansion. If savings and investment are equal or S=I, then the economy is in equilibrium and is neither expanding nor contracting.

As a result, small changes in the relative amounts of S and I can have big effects on economic output. One of the key insights of Keynesian economics which is not always well taught in Econ 1 is that S and I will eventually end up in equilibrium. If savings is proportional to income, a key assumption of Keynesian economics, and if income is equal to output, a basic accounting identity, then If S>I the economy will shrink and savings will shrink until S=I again. If S<I then the economy will expand and savings will expand until S=I again.(2)

Another key insight of Keynesian economics is that even if the economy ends up in equilibrium it might not be at full employment. For example if the savings rate is 20% of income and investment is equal to 20% of output, then S and I are in equilibrium. If, however, investment for some reason declines to 19% and savings stays at 20%, then S>I and the money spent on goods and services gradually declines as more money is spent on assets. In fact, Keynesian theory says that the economy will keep declining until output reaches 95% of its previous level (19%/20%), and savings declines to 19% (20%*95%) of the previous higher level of output, or 20% of the new lower level of output. Then the economy is back in equilibrium with savings worth 20% of the new smaller economy and investment worth 20% of the new smaller economy, but output is still 5% below what is was before, and unemployment is higher because you only need 95% of the employees to produce 95% of the output.

The key then to maintaining full employment is to make sure you have the right amount of investment necessary to achieve it. If output adjusts so that savings adjusts to make sure S=I, then you need the right amount of investment to make sure output, once savings adjusts, is large enough to ensure full employment. In modern economies, the usual way to do this is to have central banks adjust interest rates. If the economy was at full employment and S=I with interest rates at 5%, and then suddenly I declines due to some economic shock, then now S>I and the economy will shrink until S=I again and the economy is below full employment. What the central bank does is to decrease interest rates to 4% to make sure investment goes back up to the previous level. There is usually a lag in how fast investment responds to changes in interest rates, even if the rates could be changed instantaneously, so that for a while S>I and the economy will shrink, but then once interest rates are adjusted to the right level, S<I for a little bit, and the economy expands back to full employment.

Now we can define a new concept, the natural rate of interest. If r denotes the interest rate then r* denotes the natural rate of interest. The natural rate of interest is the interest rate that achieves full employment and stable inflation when the economy is in equilibrium. If actual interest rates, r, is higher than the natural rate of interest, r* (meaning r>r*), then investment will be too low and the economy will shrink making the economy function at less than full employment while inflation comes in below target. If actual interest rates are too low, if r<r*, then investment will be too high, and the economy will expand until the economy is running at higher than full employment and inflation is rising above target.(3)

In the past, economists have generally recommended that policymakers try and control economic fluctuations using monetary policy and interest rates, but this tool is imperfect, as mentioned before, because of the lags in monetary policy. If the economy is in equilibrium and at full employment when interest rates are 5% (which means the natural rate of interest is 5%), and then investment shifts so that the natural rate of interest is now 4%, then for a while S>I and the economy will shrink until the lower interest rate kicks in and raises investment enough to get the economy back to full employment.

In the meantime, fiscal policy can be useful. Just like investment shifts money spent on assets to the goods and services economy, issuing government debt does much the same thing. Consumers spend money they devoted to buy assets on government debt and then the government takes the money and spends it on goods and services. The government can use it to fund government spending on investment (like roads and bridges) or on direct transfer payments to individuals. The key is that the money that was being spent by consumers on assets is now spent on goods and services.

Therefore, if S is temporarily greater than I due to the lags in interest rate policy, running a budget deficit can close this gap, and make sure the money diverted from the goods and services economy to be spent on assets is equal to the amount diverted from the asset economy to be spent on goods and services. If the budget deficit is equal to the gap in S and I, then the economy will not shrink, and this will buy some time for interest rates to adjust and to have investment adjust to interest rates. In most recessions, the budget deficits only need to be run for a short period of time (say 1-2 years) to make up for the delay in how quickly investment responds to interest rates. After this lag of 1-2 years is over, then monetary policy can be used to control the fluctuations and the budget deficit can be safely closed.

Budget deficits might also be needed in other circumstances if the natural rate of interest falls below zero. In the current debate this eventuality is often described as secular stagnation.(4) In this case, in order to get the level of investment necessary for full employment you need interest rates below zero. The whole idea of interest rates is that banks pay you interest when you give them money, and if interest rates go below zero, then that means you start paying the banks to hold on to your money. This basic structure of interest rates makes it much more difficult to lower rates below zero (even if a few countries have experimented with negative interest rates)(5), and it is generally assumed that central banks are subject to a zero lower bound, where interest rates cannot go below zero.

If the natural rate of interest goes negative but interest rates are stuck at the zero lower bound, then investment will be too low to achieve full employment and at first S>I but then the economy will shrink until S=I again but at a level of output below what is necessary to achieve full employment. In this case, we might be stuck with perpetually low output and perpetually high unemployment until investment adjusts and the natural rate of interest rises above zero again.

In order to avoid this fate of low output and high unemployment we can use budget deficits to close the gap between S and I when interest rates are stuck at zero. If we run budget deficits equal to the gap, then the money supply spent on goods and services will not shrink, and output will not shrink, and S will stay perpetually higher than I. While in past recessions we only needed to run budget deficits for a year or two until we got past the lag in monetary policy, when interest rates hit zero we need to run budget deficits until investment recovers and the natural rate of interest rises above zero again.

If we only need budget deficits for a short period of time, we can easily pay for it with tax money (which is what we used to do), but if investment does not recover and the natural rate of interest stays below zero in perpetuity, then that means to achieve full employment we need to run deficits in perpetuity as well. If this happens we will be faced with the choice of closing the budget deficit and contracting the economy, or to continue to run budget deficits indefinitely until we reach a debt crisis. If we only pay for deficits with tax money then eventually we will hit a debt crisis, but if we pay for the deficits with printed money we can run budget deficits in perpetuity and keep the economy at full employment in perpetuity.

Now it is also quite possible that investment might recover and the natural rate of interest might rise back above zero in which case we would only need to run budget deficits for a limited amount of time. If the government debt levels are relatively low and the government has a lot of fiscal space, then it is perfectly possible that even when you hit the zero lower bound the economy might recover quickly enough to not need to pay for any deficits with printed money. If, however, the government has high levels of debt and relatively little fiscal space, then the government might need to use printed money to pay for debt even if investment eventually recovers.

This then is how you get helicopter money. The economy experiences a shock to investment that drives the natural rate of interest below zero, and to keep the economy at full employment the government needs to run budget deficits to make up for the gap between S and I. Usually, when the government runs budget deficits during a recession it only needs to last a year or two due to the monetary policy lag,

at which point lower interest rates become effective and the government can close the deficit. When central banks hit the zero lower bound however we need to run budget deficits for a longer period of time, until investment recovers, and if this occurs quickly enough then the government might be able to pay for the deficits with tax money, but if investment never recovers and we end up with a natural rate of interest below zero in perpetuity, then the only way we can keep the economy at full employment is to run budget deficits in perpetuity. Since there is a limit to how much tax money can be raised to pay for deficits, in the case of the natural rate of interest perpetually below zero, we need to pay for deficits with printed money as well.

The key to determining whether or not we actually need helicopter money is determining how long it will take for investment to recover.

## Section 3 – How long will we need helicopter money?

Perhaps a more accurate question to be answered would be how long will it take for investment to recover and the natural rate of interest to rise above zero. If the natural rate of interest is stuck below zero indefinitely, then we need to run deficits indefinitely, and will need to eventually pay for those deficits with printed money. If the natural rate of interest is below zero for only a short period of time, then we only need deficits for a short period of time and tax money will suffice.

There is an ongoing argument in economics whether low interest rates are the result of short term cyclical forces or whether the low interest rates represent a long term trend. Technically, this is a false choice. Both cyclical and long term forces have contributed to the problem. If you look at a graph of interest rates set by the Federal Reserve, in the early 1980s interest rates peak around 19% and then steadily decline over the next 30 years, going up during boom times and then falling by about 5 percentage points during recessions.(1)

The reason interest rates are currently at zero is partly because of a long term trend from the early 1980s and partly because we were in the trough of the business cycle. By 2008, the long term trend put interest rates close enough to zero that a bad recession would push interest rates all the way to zero. The key empirical question now is what will interest rates be in the peak of the next business cycle. Will interest rates rise above zero when the short term cyclical factors go away? Or will the long term forces overwhelm the short term cyclical forces and keep interest rates below zero in perpetuity?

The big question is why are rates declining overall. We know the short term cyclical component of zero interest rates is partly due to higher savings as a result of the debt accumulated and still lingering after the housing bubble popped, and part of it is lower investment due to fewer homes being built again as a result of the housing bubble.(2) The real mystery is why are rates declining long term. One argument says the growth of China has led to a massive accumulation of savings (their savings rate is really high) and much of that savings from China and other foreign countries gets invested in the United States by buying US Treasury bonds. (3) My personal view is that the key component of low interest rates is a shortage of useful investment opportunities.

An important insight that might explain the shortage of useful investment is the idea there might be a limit to useful capital accumulation. In models of long term growth, economists usually assume production is the result of labor, physical capital, and technology.(4) Usually we have an endless stream of growth in labor, and growth in physical capital, and improvement in technology so that growth will continue on endlessly into the future. My argument is that one component of this, physical capital, is limited. In the beginning, our economy starts with very low levels of physical capital and for many centuries part of economic growth was due to the accumulation of more tools and machines. Eventually, however, there is a limit to how much physical capital is useful and at some point this process (that appeared to be endless in the past) will come to a stop.

A useful example is to think of the case of automobiles. Technically, auto sales are considered consumption in GDP calculations, but still clearly counts as physical capital accumulation, and the factories used to produce automobiles are an important part of investment. You can think of the production of physical capital as having three components. First, you need investment to build new technology recently created. Second, you need investment to increase the amount of physical capital accumulation, or increase the number of people who have cars. Third, you need investment to replace existing capital that has depreciated, that you need to build cars to replace the ones that broke down.

Most economists assume that the accumulation of physical capital is an endless process, and since it takes a very long time, it may seem that way. We had almost no cars in 1900 and it took us approximately 100 years for everyone who needs a car to own one in the US.(5) If there is a limit to useful physical capital accumulation, then at some point we will reach the point where more people do not need cars (one is enough for each person), they just need to replace the existing ones that break down, and once we reach this point the sale of new cars every year will fall off, potentially abruptly.

To understand this in terms of interest rates, you can think that if interest rates are 5% then corporations do all the investment that yields a rate of return higher than 5%. Once all these projects are done, there will not be enough useful investment with a rate of return higher than 5% to use up all the resources available for investment. To keep investment high enough to achieve full employment, interest rates need to go down to 4% so that corporations will start doing investments with rates of return between 4% and 5%. Once all the useful projects between 4% and 5% are done, interest rates need to keep going down to keep the economy at full employment, so that the long term trend for lower interest rates might be an indicator that we are completing more and more of the high return investments. Once interest rates get to zero, then there are not enough useful projects to use up all the resources available for investment, resources we need to use to keep the economy at full employment. If this is in fact the process that is driving the interest rates to zero, then we really have entered a new era where interest rates will be stuck at zero in perpetuity.

Technically, it is too soon to tell whether interest rates will be stuck at zero in perpetuity. If the main driver of low interest rates is short term cyclical considerations, then it should only take a few years to work off the accumulation of debt and the decline in housing investment. If the problem is too much savings from China (and other foreign countries) being invested in the US, then this could go on longer and it is only when China saves less or invests less in US Treasury bonds that the US will see interest rise

above zero again. When this would happen is entirely difficult to predict. If in fact it is the lack of useful investment opportunities that is driving the long term decline in rates, as I believe, then the zero interest rate problem could be with us indefinitely into the future.

The crucial indicator whether this problem is primarily cyclical or primarily structural is how high interest rates rise at the peak of the business cycle. If interest rates eventually rise in the peak of this business cycle to the same place they rose to in the peak of the previous business cycle, then perhaps the long term trend of lower interest rates has stopped and we can expect the economy to return to normal in a few years. To get this result, interest rates would have to rise to around 5.25% before the next recession hits.(6)

If on the other hand, interest rates do not rise to that level, then this indicates the long term trend is continuing. Currently members of the Federal Reserve board predict interest rates will eventually rise to around 3% (their estimate of this number keeps declining), which means the long term trends still exist, and even if interest rates rise above zero in the peak of this business cycle, in the next business cycle they might not rise above zero at all.(7) If the long term trends continue, we might not be stuck with interest rates at zero in perpetuity right away, but it just a matter of time before we get there.

Since the recession hit us in 2008, we have already had 8 years to work our way from the trough to the peak of the business cycle, and at this point the Federal Reserve has raised rates only once putting us only slightly above zero.(8) By this point most of the cyclical component of low interest rates should have gone away, indicating that the low interest rates we currently have may be due to long term trends. Since inflation has been below target for a long time now, this indicates that the natural rate of interest is lower than the actual interest rate (the natural rate is the rate where the economy achieves full employment at stable inflation), and that interest rates even slightly above zero might still be too high and could end up quickly returning back to zero. Once back at zero in the very near future, interest rates could be stuck there permanently.

If the cyclical component has already largely had its effect and the natural rate of interest is still below zero, then the long term trends indicate that we will eventually face interest rates stuck at the zero lower bound in perpetuity, possibly immediately (which I believe is most likely), but if not immediately then perhaps over the next decade. In this case, we will need to run budget deficits to offset the gap between S and I and keep the economy at full employment. And since we need to do this in perpetuity, then we will eventually need to print money to pay for those deficits, and the era of managing the economy with helicopter money will have begun.

## Section 4 – Will helicopter money cause inflation?

To understand inflation it is important to understand how the money supply works. Earlier we assumed the amount of money spent on goods and services determined the amount of output. If, however, the money supply spent on goods and services grows too quickly and output cannot increase any further, then prices will start increasing. In order to keep prices constant, the money supply needs to grow at

the same rate as the output, and if you want the economy to experience 2% inflation you need the money supply to grow 2% faster than output. If an economy has 2% growth and wants 2% inflation then the money supply spent on goods and services needs to grow by 4%.

When talking about the total money supply, the money spent on goods and services plus the money spent on assets, the central bank prints small amounts of money and buys bonds from banks in the process of controlling interest rates. This causes what economists call the monetary base (the amount of cash in an economy plus the reserves held by banks at the Federal Reserve) to gradually grow. The monetary base is important because of the reserve requirement.

Banks are allowed to hold deposits and make loans but the actual amount of cash and reserves held by banks is much lower than the total amount in their checking accounts. The central bank sets a reserve requirement, in the US it is 10%, where banks need to hold reserves worth at least 10% of the total amount in accounts to cover cash withdrawals and payments to other banks. When the central bank gradually increases the monetary base, the banks can actually create new money by issuing loans until the monetary base represents 10% of deposits again. This seems bizarre, but when banks issue loans they really are just creating money by simply increasing the balance of the bank account available to the borrower. This is all perfectly normal, and central banks permanently print money all the time, they just do it in small amounts because banks can create 10 times that amount of money by issuing new loans. As long as they hold reserves worth 10% of accounts, the central bank is perfectly fine with that.

When interest rates are at zero, however, everything is different. When interest rates are zero, banks cannot find enough useful investment to spend all the savings they have, so when the central bank prints money the banks themselves do not issue new loans since they cannot find acceptable borrowers. Instead of loaning out more funds, they just hold the increase in monetary base in their own accounts at the Federal Reserve. In this case, the monetary base goes up, but the money multiplier does not work, the money supply does not grow by 10 times the increase in the monetary base, so the effect on the total money supply is much less. In fact, when interest rates are at zero, the total money supply grows so slowly that it is tough to hit a 2% inflation target, even when printing money and increasing the monetary base by dramatic amounts.

The solution is to print money and give it directly to individuals, basically helicopter money. Printing money and giving it to individuals increases the monetary base, but instead of giving the money to banks by buying bonds from them, giving money to individuals injects the money into the goods and services part of the economy. When interest rates are at zero and the central banks prints money and buys bonds, the banks just take the money and deposit it at the Federal Reserve and the money never makes it into the economy. The common perception is that you can only do a little bit of helicopter money without causing lots of inflation, but if interest rates are at zero, the money multiplier is broken and you can now print 10 times as much money as you used to while still keeping inflation low and stable.

The next predicament is calculating how much helicopter money you can distribute without causing runaway inflation. The money supply can safely grow by around 4% in normal circumstances in order to get 2% growth and 2% inflation. If interest rates are at zero, then we also have a gap between S and I,

and we would need to distribute enough helicopter money to offset that gap as well. Clearly if you do too much then you can get significant inflation, and if you do too little you will have little effect on the economy and inflation will remain too low. The question is how much is a moderate amount of helicopter money that will keep inflation around 2%.

This is particularly tricky to calculate for two reasons. First, inflation is largely concerned with the money supply spent on goods and services, but the central bank tries to control the total money supply, the money spent on goods and services and the money spent on assets. Second, there is the problem of money velocity. Money velocity is basically a concept describing how fast money gets spent. If money only gets spent once or twice you need to create a lot more money compared to an economy where money is spent 10 times in a given year. Milton Friedman also proposed trying to manage the economy and manage inflation by carefully controlling growth in the total money supply (and we tried doing this in the early 1980s), but the relationship between total money supply and inflation was so loose, that they gave up and went back to targeting interest rates. (1) However, since interest rates are stuck at zero, we do not have the luxury of controlling the money supply through interest rates and need to calculate how much money we can create through helicopter money in order to get 2% inflation.

To do this we need to use rules of thumb. After the financial crisis the US ran deficits worth 8-10% of GDP and periodically printed money worth 6-7% of GDP, and this dramatic stimulus (similar to doing around 7% of GDP in helicopter money) got core inflation up to around 2%.(2) After the 2012 election, the deficit fell to 2-4% of GDP and the Federal Reserve stopped doing QE, and inflation fell below target to around 1-1.6% for most years.(3) This means that in the US, 7% of GDP in helicopter money in the worst of the crisis is about right to get 2% inflation and that 3% is probably too low after a bit of recovery, so as a rule of thumb I generally think we need about 5-7% of GDP in helicopter money just to get us back to 2% inflation when interest rates are stuck at zero. Japan has been even more aggressive with QE than the US recently and they still cannot keep inflation at or above 2%,(4) so Japan (and Europe) probably needs more helicopter money (perhaps 10% of GDP) just to get to 2% inflation, possibly because of a larger gap between S and I.

Now this proposal again seems radical, even though the US, Europe, and Japan have tried a combination of deficits and QE quite similar to helicopter money without causing massive inflation. There must be some catch. The real trick is what happens over the long term. Over the short term, helicopter money type policies do not cause inflation because the money multiplier is broken. What if the economy eventually returns to normal and the money multiplier starts working again?

There are two constructive answers to this question. First, there is a good chance the interest rates will not rise above zero, that the economy will never recover, and the money multiplier will lie permanently dormant. This is a bit of a radical idea, though the one I think is increasingly correct. This result is not guaranteed however and contingency plans are often necessary. If the economy does eventually recover then central banks can just raise the reserve requirement. If the reserve requirement was 10% but a policy of aggressive helicopter money doubled the monetary base, the Federal Reserve could just raise the reserve requirement to 20% and banks would not be able to cause inflation by creating any additional money. If the Federal Reserve did not do this, then doubling the monetary base could lead to

a doubling of the money supply as banks start creating new money by creating new loans and dramatic inflation could result.

As a result of this strategy, if the central bank embarks on a new policy creating and distributing lots of helicopter money, then we know from experience that this will not create inflation in the short run because interest rates are stuck at zero and the money multiplier is broken. We also know that inflation will not be a problem long term, because, on the one hand, the economy might not return to normal and the money multiplier might be broken forever. On the other hand, if the economy does recover and the money multiplier starts working again, the Federal Reserve can circumvent this process and prevent banks from creating new money by simply raising the reserve requirement. This might be a little unconventional, but we live in unconventional times with a need for creative new solutions. Once we realize how the impact of helicopter money on inflation might in fact be limited and easily controlled, then what seems like a radical option becomes a real possibility that can achieve significant positive effects without any major downside.

## Section 5 – How should we distribute helicopter money?

As we have learned, helicopter money can be a useful way to stimulate the economy without risking a debt crisis, and when interest rates are stuck at zero then you can distribute significantly more helicopter money than you might expect without causing inflation. In the US, we could implement helicopter money worth 5-7% of GDP and still get about 2% inflation, and since there is a good chance the economy will not return to normal and get interest rates above zero, then we might need to do 5-7% of GDP in helicopter money in perpetuity.

These unique circumstances provide a boon for the government's budget. The government now has a new revenue source worth 5-7% of GDP, and has a lot of flexibility as to how to spend it. One of the important unanswered questions regarding helicopter money is what is the best way to distribute it.

There are four basic options for distributing helicopter money: infrastructure spending, tax cuts on work, a universal basic income, and automatic stabilizers. The first, greater infrastructure investment, has gotten a lot of attention lately, and with 10 year interest rates in the United States at record lows more infrastructure investment makes a lot of sense.(1) Remember, in the private sector when interest rates decline from 5% to 4% businesses previously only constructed projects when the rate of return was over 5%. When interest rates decline to 4%, then now they have a whole new set of project to implement, those with rates of return between 4% and 5%. Long run interest rates in the US are now around 2%,(2) so the government can borrow money at these lower interest rates and should be doing all public infrastructure investment projects with rates of return as low as 2%. Just as the private sector should be doing more long term capital construction projects, the public sector should be doing the same.

The real question however is whether or not the free money made available when using printed money to fund government spending should be used to pay for these new infrastructure projects. I see a

variety of potential problems. First, we could easily have 5-7% of GDP to distribute every year and the available projects ready for construction would not even come close to using up all this money. Even doing 1% of GDP a year would add $180 billion a year to infrastructure spending, and we only spend $95 billion each year on our entire transportation budget at the federal level. (3)

The second problem is that we need to do 5-7% of GDP in helicopter money permanently and greater infrastructure spending only represents a temporary solution. If interest rates have gone down to 2%, then we should construct projects with rates of return as low as 2%, but eventually we will finish all those projects, and then interest rates will have to decline to 1%, and eventually we will finish all the projects with rates of return between 1% and 2%. Eventually rates will go down to zero, and we will finish all the projects with rates of return above zero, and we will be left with no more public projects to implement, except those to replace existing crumbling infrastructure. This process may take decades, but eventually we will see a perhaps abrupt decline in useful public projects to construct, and we might have to look elsewhere to find ways to spend all the helicopter money.

The third problem is a political economy problem where if infrastructure spending is paid for with helicopter money then you might end up doing too much infrastructure spending. If there are benefits to the public (or perhaps well connected construction companies), then there is a motivation to do more projects, and if there is no offsetting political cost to doing the spending we might do too much.

Finally, the last problem is that specialized taxes are used to pay for infrastructure spending. Gas taxes for example largely go to pay for highway funding, and this represents a sort of user fee, where the people who use the infrastructure help pay for its cost. (4) This is a fundamentally fairer way to fund infrastructure, using helicopter money would in a sense make users and non-users alike pay for the infrastructure, and using the well targeted taxes might be a fairer way to pay for it.

Even as more infrastructure spending would clearly be useful, and getting more fiscal stimulus from the higher government spending would also be useful (remember helicopter money is designed to make more fiscal stimulus easier), ultimately it would be fairer to pay for the new infrastructure with well targeted taxes, and even if we did use helicopter money we would need to come up with other ideas to spend it.

The second idea for spending helicopter money is to cut taxes on work. After the crisis, when the government was looking to enact a broad based fiscal stimulus, the Obama administration turned to the Make Work Pay tax cut which provided a maximum $800 income tax credit on earned income in 2009 and 2010, and in 2011 and 2012 this tax cut morphed into a 2% cut in Social Security payroll taxes.(5) In some ways, this is a very attractive option. Cutting taxes on work is broad based, it does little to distort economic behavior, and it is much more progressive than cutting other taxes that almost exclusively benefit the rich.

Despite being attractive in some ways, there are also disadvantages to cutting taxes on work. First, the retired, the unemployed, the disabled, children, and stay at home parents are all excluded from the tax cut. You only get a piece of the helicopter money if you work, and a large portion of society does not work. Second, since the payroll tax cut is proportional to how much you earn families with higher

incomes would get a much larger benefit (though the income subject to the payroll tax is capped) and poor families would get relatively little.(6) The Make Work Pay tax cut phases in more quickly than the payroll tax cut so the poor get a somewhat better deal. Third, payroll taxes directly fund Social Security benefits and part of the political appeal of Social Security is that everyone funded their own benefits by paying payroll taxes. If payroll taxes are cut too much, then this philosophical link is broken and could undermine political support for Social Security. Finally, though cutting payroll taxes could provide a generous way to distribute helicopter money, if we need to do 5-7% of GDP, even cutting payroll taxes might not be enough. A 2% cut in payroll taxes is costs less than 1% of GDP and even if we cut the entire 7.65% in payroll taxes for individuals this would amount to less than 3% of GDP. (7) Payroll taxes could get us much of the way there but not all of the way there.

As a result, even though payroll taxes are broad based and non-distortionary, people who do not work would be excluded entirely from the benefits and the poor would get relatively little, while at the same time the philosophical rationale for Social Security could be undermined and we would still need more ideas to use up 5-7% of GDP in helicopter money.

The third idea for distributing helicopter money is to use it to fund a universal basic income. A universal basic income is a flat equal payment, given to everyone, young and old, single or married, working or not working. Everyone could give Social Security or the IRS their bank account number and the government could deposit a check in their account every month. If we had 5-7% of GDP to work with we could distribute payments worth approximately $3,000 to $4,000 annually for every man woman and child in the country.(8) The amount could be fixed over long periods of time, or could vary across the economic cycle, becoming more generous when the economy is struggling and declining when the economy is overheating.

Fundamentally, if the government has a large pile of free money to give away, then the fairest way to do it would be to give the same amount to every person, which is what a universal basic income does. Alaska takes this approach when distributing the revenue generated from oil sales.(9) The US also tends to lag other advanced countries when providing for the poor,(10) and a universal basic income, by providing the same amount regardless of income, could do a tremendous amount to reduce poverty. Some people want to use a universal basic income to replace anti-poverty programs, but in this case, if we take benefits away then the poor would be denied their full equal payment which could be considered unfair. Plus, since $3,000-$4,000 per person is not enough to live on by itself, you would still need anti-poverty programs, and on the positive side, this amount would not be enough to let people quit working entirely. In the end, if you want to take away benefits from the poor based on the universal basic income, you should also tax the rich on the same income.

Since infrastructure spending by itself is not enough and cutting payroll taxes by itself is not enough, turning to a universal basic income is nice because it is infinitely scalable to use up all the helicopter money we have available. Plus since it gives an equal amount to everyone it is fundamentally fairer, especially to those who do not work, and since it does not vary by income, it could do a lot to reduce poverty, especially among children, in this country.

The final option for spending helicopter money is to use it to fund automatic stabilizers. Automatic stabilizers are programs that vary across the business cycle. Social insurance programs like food stamps or unemployment insurance become more generous, flooding the economy with money, when the economy experiences a downturn. Taxes also vary across the business cycle, going down when incomes go down.

One advantage of using helicopter money on automatic stabilizers is that it is well targeted to those in need. Spending goes up for those doing the worst, and taxes go down for those whose incomes have declined. The other advantage to using economic stabilizers is that they vary across the business cycle, much like the amount of helicopter money created will have to vary across the business cycle.

In the end, when deciding how to distribute helicopter money, we should be doing more infrastructure spending but pay for it with well targeted taxes. Cutting taxes on work has its advantages but is also fundamentally unfair because it excludes benefits for people not working. A universal basic income is fairer since everyone gets an equal amount and also is infinitely scalable. In distributing helicopter money there will have to be a fixed component that exists in all parts of the business cycle, which could be handed out through a universal basic income, though helicopter money will also have to vary across the business cycle, and this varying amount could be used to pay for automatic stabilizers as economic conditions change.

Ultimately we could be entering an entirely new era of economic policy where instead of having central banks control interest rates and governments control deficits, we have a unified system where the peaks and troughs of the business cycle are managed by varying the amount of helicopter money created and distributed through a universal basic income.

## Section 6 – How should we administer helicopter money?

In order for us to be able to start implementing helicopter money, we must first overcome the legal obstacles. There are three basic legal approaches to administering helicopter money. The first approach divides the responsibilities, letting central banks control the money printing and governments control the distribution. This is the easiest route since central banks already have the power to print money and governments already have the power to spend it. This approach is also the closest to what we are already doing, where central banks do quantitative easing and governments run budget deficits. The only real difference between what we do now and actual helicopter money is that central banks would have to make their quantitative easing permanent and governments would have to take the opportunity to run even higher budget deficits. Currently central banks only do temporary QE and governments are inclined to reduce deficits for fear of running up too much debt.

The second approach to achieving helicopter money is to have governments pass a law giving central banks the power to print money and distribute it. This approach is much more controversial than the first approach since governments are not inclined to give up their power to hand out money to other institutions. Still, legislatures pose their own political problems to achieving the best policy, and an

independent central bank might have a better institutional structure to manage the distribution of helicopter money. In this case, giving central banks the power to hand out the money might solve some political problems for the legislature, and governments might be willing to grant central banks the ability to pass out money broadly to large swaths of the population.

The third approach would have the central banks print the money and hand it out without any specific granting of legal authority by the legislature. This would be of dubious legality, and would definitely push the envelope as to what acceptable policy might be. The government, however, might be restricted politically from adopting a radical policy like helicopter money, yet might be willing to look the other way if the central bank took on the responsibility and political risks of such an unconventional step. Then it would be up to the courts whether or not to allow the central banks to actually implement such a policy.

The United States seems most likely to try the first approach. Having the federal reserve print money and promise to hold on to it permanently seems like a relatively small step, the real difficulty is getting Congress to respond by increasing the amount of fiscal stimulus. Printing money is so controversial among Republicans that knowing the resources came from money printing might make them less likely to spend it. If, however, political paralysis reigned supreme in the face of another recession, perhaps the Federal Reserve could bend the law and start handing out money to individuals without specific legislative approval, and hope they get a sympathetic hearing from the courts.

Legally, Europe, like the US, would have the easiest time trying the first approach. The European Central Bank is already doing temporary QE, and all the European Union would have to do is lift the deficit targets in individual countries to get more fiscal stimulus.(1) On the other hand, the second approach is quite difficult since the EU Lisbon Treaty includes a ban on financing government spending directly with printed money, so a massive renegotiation of the EU treaty among all the EU nations would be necessary for the change.(2) The ECB has already sort of adopted the third approach when it comes to QE, where the ban on directly financing governments with printed money might also make QE illegal, but the economic circumstances were dire enough that the ECB was willing to push the legal limits and do it anyway. This approach has ultimately been successful so far with courts up to this point upholding the extraordinary approaches taken by the ECB.(3)

Japan offers an unusual case where the government is much more inclined to take aggressive measures than the central bank. In 2013, the independence of the Bank of Japan was questioned when the Prime Minister pressured the central bank to raise the inflation target and expand their policy of quantitative easing while also appointing a new governor (and two new deputies) to run the central bank.(4) Even though the first approach would still be the easiest legally, Japan is probably likely to prefer the second approach to the more radical third. The government could pass a law granting the central bank extra powers to implement helicopter money, and might need to do so since the new head of the Bank of Japan appointed in 2013 believes that implementing helicopter money by the central bank would currently be illegal. (5)

Beyond providing the proper legal justification, the next crucial step in administering helicopter money is to come up with an effective institutional framework. This is particularly important since one of the arguments against helicopter money is that once we do a little we are guaranteed to do a lot, so that any move to even attempt helicopter money is therefore too risky. Under this argument, anyone who tries helicopter money is going to become Weimar Germany and is guaranteed to destroy their country's economy.

The proper response to this argument is to acknowledge this is a serious concern and to directly address this concern by developing a strong intellectual and institutional framework to prevent their worst fears from materializing. Intellectually, central banks all around the world have adopted explicit inflation targets, and this could also be an important tool in making sure helicopter money is implemented responsibly.(6) If, institutionally, we put the power to print money in the hands of an independent central bank, and also make sure the central bank adopts an explicit inflation target, then we will have a dedicated system to make sure the needs for greater stimulus are properly weighed against the risks of higher inflation.

The next key decision in providing a strong institutional framework for helicopter money is to make sure the money is distributed appropriately. In some circumstances it might make sense for the legislature to decide where the money goes, but if there are significant political barriers to implementing proper policy, then it might make sense to have the central bank distribute the money. The key is to have the central bank distribute the money broadly in an administratively simple way, so that the central bank is not subject to direct lobbying to try and pick winners and losers. Institutionally, central banks are not set up to make those decisions, and therefore something like a universal basic income would make sense, rather than trying to get central banks to control tax policy or make specific decisions on infrastructure spending.

The problem is that when helicopter money has been tried in the past, like in Weimar Germany, we did not have the intellectual framework of inflation targeting and did not really have independent central banks like we do now. As a result, we simply do not know whether our new intellectual and institutional set up will be able to resist the temptations of excessive helicopter money, or whether they will break down and do too much, or perhaps become corrupt and give the money to the wrong people.

The argument against helicopter money says the risks are too high and the policy is too dangerous, so we need to ban it entirely from ever being used or even experimented with. I believe the economic risks are too high, that the US, Europe, and Japan all risk decades of mediocre economic performance unless we try new more aggressive approaches to stimulating the economy. If we are careful and cautious in our experimentation with helicopter money, we can achieve the most valuable goal of improved knowledge about optimal policy while minimizing the potential risks to economies around the world. If we do it right, the potential gains are enormous and the risks become quite manageable.

## Section 7 – Are there alternatives to helicopter money?

To most people, helicopter money is a bit of a radical proposal. The most attractive intellectual approach would exhaust all the other possible alternatives and only if they fail do we consider more aggressive and risky approaches. To get to this point, we need to examine the efficacy of other policy alternatives, so that we can speed along our intellectual journey on to helicopter money. There are five main alternatives to helicopter money: low interest rates, quantitative easing, fiscal policy, currency interventions, and raising the inflation target.

### Interest Rates

Clearly, interest rates are an important tool for managing the economy, and the first thing to do, and the first thing the United States did do, is to lower interest rates down to zero.(1) This provided important stimulus to the economy, but the reason we are even having this discussion about helicopter money is that zero interest rates are not enough to achieve the economic performance we want.(2) The next step to stimulating the economy would be to promise to keep interest rates at zero for a long time. This helps lower long term interest rates, but this technique has been less effective, partly because the Federal Reserve keeps predicting a rise in interest rates about a year or two into the future.(3) Since the economy is unpredictable, forecasting far into the future and guaranteeing zero interest rates is a difficult proposition.

Another approach getting more attention lately is the idea of implementing negative interest rates. Before we argued that central banks face a limit to how low interest rates can go and that zero is that limit. Positive interest rates occur when you give money to the bank and they pay you interest on the money you deposited. Negative interest rates occur when you give money to the bank and then pay the bank interest in order to keep your money safe.

The problem with negative interest rates is that people can always hold cash themselves (which pays a zero interest rate) instead of holding it at a bank. As a result, central banks can only lower interest rates a little below zero for fear consumers will just withdraw all their funds and hoard cash at home. Switzerland and Denmark been most aggressive with negative interest rates by experimenting with rates as low as 0.75%, but even this level is probably not enough to improve economic performance significantly.(4) Negative interest rates probably help, but they help in proportion to how negative they go, and if they can only go negative a little bit, they probably only help a little bit.

### Quantitative Easing

The most common approach to stimulating the economy when interest rates are at zero is to try quantitative easing. Quantitative easing occurs when central banks buy government bonds from banks, reducing the number of bonds available to invest in, and increasing the amount of cash banks have available to invest. If you remember, the money supply can be spent on goods and services or spent on assets, and quantitative easing directly intervenes in the asset market, not the goods and services market. Quantitative easing tries to raise asset prices by reducing the supply of assets to buy and increasing demand by providing cash to banks, both of which drive asset prices higher. The effect on the

goods and services market is secondary, where higher asset prices increases wealth and causes increases in spending (and a reduction in saving). At the same time, buying lots of bonds raises bond prices and lowers long term interest rates, which increases investment. Through these secondary effects, quantitative easing helps reduce S and increase I, and thereby close the gap between S and I, bringing us closer to full employment.

The problem is that in many places where quantitative easing has been tried, the economy has improved, but still has not gotten us to where we want to be.(5) What we really need, in combination with the QE, is to increase the amount of fiscal stimulus. If the central banks buy government bonds, and then the government issues the same amount in new bonds, the amount of bonds on the market stays the same and asset prices (as well as the risk of bubbles) does not go up. Instead, the money printed by the central bank gets diverted from the asset market to the goods and services market by the additional government spending that goes with the additional government debt. This causes the quantitative easing to have a much stronger effect on the goods and services economy, while also reducing the risk of asset bubbles. In fact, one of the best ways to reduce the risk of asset bubbles when the economy is weak is to raise long term interest rates and lower asset prices by increasing the amount of government debt issued.

The problem is that central banks have been doing temporary QE and not permanent QE, and if you do temporary QE than eventually the bonds purchased by the central bank will be put back on the market and long term the government will have to pay off all this debt with tax money. Since there is a limit to how much tax money governments can produce, that means there is still risk of a debt crisis. As a result of this ongoing fear, governments suppress the amount of fiscal stimulus they do by adopting premature austerity before the economy has fully recovered.(6) Only permanent QE, where the central banks hold the bonds forever and return the interest to the government, has the ability to overcome the fears of a debt crisis and increase fiscal stimulus enough to get the economy performing at our desired level.

## Fiscal Policy

Fiscal policy is an essential tool for stimulating the economy when monetary policy has limitations. When the economy contracts, taxes go down as incomes decline and spending goes up as more people become poor. This results in higher deficits, and since a declining economy is usually the sign of a temporary gap between S and I, these higher deficits can be useful diverting the additional savings back into the goods and services economy. Under usual circumstances, monetary policy only takes a year or so to properly respond to a negative shock, so deficits can be cut back only a year or two after the initial recession hits.

If, however, interest rates are stuck at zero, then even zero interest rates cannot get investment high enough to achieve full employment and the gap between S and I that opens up would cause the economy to contract unless we can offset it with a significant budget deficit. The problem is that we would need to keep running deficits as long as interest rates are stuck at zero, and we do not know how long this will last. Investment might be permanently lower because of the limit to useful capital accumulation, and if in fact this is the cause, then interest rates might be stuck at zero in perpetuity as

well. This means we need to keep running deficits in perpetuity and since there is a limit to how much debt tax money can repay, in order to keep these deficits running, we need to pay for it with printed money.

As a result, the only way we can get enough fiscal stimulus to keep the economy at full employment is to pay for deficits with printed money. As I just argued above, temporary QE does not overcome the debt crisis problem, and even countries that do lots of temporary QE still do premature austerity. (7) A combination of permanent QE and higher budget deficits are the key to properly stimulating the economy, and this combination is just a basic form of helicopter money.

## Currency Interventions

Another approach that has been tried to stimulate the economy has been to print lots of money and use it to weaken your currency. Switzerland was beset by a lot of capital inflows from abroad which was causing the Swiss franc to strengthen, resulting in a weaker economy through lower exports. In response the Swiss central bank decided to spend as much money as necessary to keep the Swiss franc from appreciating by keeping the exchange rate with the Euro at a fixed peg. Since so much money was flowing into the country, the Swiss central bank had to spend enormous amounts of money to defend the peg.(8)

In some ways, the Swiss intervention was somewhat like helicopter money in that the central bank printed money and handed it out to individuals. The difference is that the Swiss central bank handed out the printed money only to foreigners who wanted to buy Swiss exports. This leads to the unusual result that printing money and handing it out to foreigners is politically acceptable when maintaining an exchange rate peg, but printing money and handing it out to its own citizens is deemed much too risky. Printing money to intervene in a currency might be useful in overcoming political barriers, but only handing out money to foreigners skews the economy towards exports, and domestic citizens deserve their own proper share of the printed money as a matter of fairness.

## Inflation Target

Another popular recommendation to improving the economy is to have the central bank raise the inflation target. The basic idea is that if the natural rate of interest is below zero, then we want to reduce real interest rates below zero. Nominal interest rates are the headline rates, and real interest rates are just nominal interest rates minus the inflation rate. If nominal interest rates are 5% and inflation is 2%, then real interest rates are 3%. If nominal interest rates are 0% and inflation is 1%, then real interest rates are negative 1%. People do not actually pay interest to banks when real rates are negative, only the value of their money erodes due to the fact they can buy fewer goods with their money as prices rise into the future. Raising the inflation target becomes effective because if nominal rates are zero and you increase inflation to 4%, then real rates decline to negative 4%. If the natural rate of interest is say negative 3%, then with the higher inflation, the economy should be able to reach full employment without the need for unconventional policies and you can even raise nominal interest rates above zero to 1%.

The main problem with raising the inflation target is that you not only need to raise the target you also need to raise actual inflation to improve the economy. Now most people like the idea of raising the inflation target because the policy lets you return to normal and manage the economy by raising the nominal rates above zero. The trick is that right now with lower inflation nominal rates are stuck at zero so you need unconventional policies to raise inflation. Most people have not really thought through what kind and how much unconventional policy you need to get the economy back to normal.

As I argued before, when interest rates are stuck at zero, the economy needs helicopter money worth 5-7% of GDP to get the economy up to 2% inflation. If you want to raise the inflation target up to 4%, you need to enact policies to get actual inflation up to 4%, and this could require helicopter money worth 7-9% of GDP. The idea is that if you can get inflation up to 4% then you can raise nominal rates above zero, and the economy returns to normal and you no longer need the aggressive unconventional policies. At this point, you end the use of helicopter money which means ending any money printing and reducing the deficit to sustainable levels. This dramatic reduction of the deficit from say 7-9% of GDP to say 2-3% of GDP would itself be a significant economic shock and could drive the economy into recession.

The problem then is that if 4% inflation might be enough to get real rates low enough and nominal rates above zero in the peak of the business cycle, 4% might not be high enough to get nominal rates above zero in the trough of the business cycle. At this point you might need inflation at 6% to get nominal rates above zero over the entire cycle, and to get inflation up to 6% you might need helicopter money worth 9-11% of GDP. Recommending a higher inflation target sounds really easy, in theory the Federal Reserve only needs to distribute a press release, but getting inflation actually up to the amount where you can keep nominal interest rates above zero in perpetuity requires so much unconventional policy that this approach starts to look unattractive.

Another problem is that even if 6% inflation might keep nominal rates above zero for this business cycle, if long term trends continue, then the natural rate of interest might keep falling over time, so that maybe in 10 years we will need 8% inflation to keep nominal rates above zero and in 20 years we will need 10% inflation to reach that goal. Since the primary motivation for raising the inflation target is to return to normal and no longer need unconventional policy, maybe we need to rethink that assumption. Perhaps conventional policy with high inflation (say at 6%, 8%, or 10%) might be less attractive than simply adopting helicopter money in perpetuity with inflation at 2%, in part because we will need aggressive unconventional policy in the short run anyway to get inflation up to the higher target.

## Summary

Most people would not want to try helicopter money until all other approaches have been exhausted. We have tried lowering interest rates to zero, which has not done enough, and even negative interest rates can only do a little since they can only go slightly below zero. Quantitative easing can help close the gap between S and I by raising asset prices, but even this is a weaker indirect effect, and we need higher budget deficits to get the money spent on assets into the goods and services economy in order to stimulate the economy directly. Temporary QE is not powerful enough to get the necessary increase in

the deficit since the risk of a debt crisis long term is still a looming problem. Currency intervention can prove effective and might be more politically palatable, but if we are going to be printing money and giving it to foreigners we might as well print money and give it to domestic citizens instead.

Raising the inflation target can seem attractive since in theory you no longer need unconventional policy, but practically you might need inflation to go higher than you expect long term to achieve your goals, and as a result need dramatic levels of unconventional policy in the short term just to get inflation up to the new higher target. Instead of being obsessed with ending unconventional policy and returning to normal, perhaps we just need to realize unconventional policy with lower inflation in perpetuity might be preferred to conventional policy with much higher inflation.

As we can see, there are alternatives to helicopter money, but all of them have their flaws. Without additional fiscal stimulus achieving our economic goals appears difficult, and only by paying for deficits with printed money can we get the fiscal stimulus we need. This gets us to the conclusion that helicopter money might be inevitable, but perhaps not until all the other approaches have been tried and failed.

## Section 8 – How would helicopter money work in Europe?

Europe might be facing similar economic problems, but at the same time is different from the US in certain respects. Europe, like the US, has had to deal with housing bubbles, interest rates stuck at zero, and a large output gap that unfortunately persists.(1) Europe, however, has the Euro, which poses its own unique set of problems, and instead of having one debt market for the entire Euro zone, each country issues its own debt.

To deal with the unique circumstances of Europe, solving the economic ills of the region requires three specific steps. The first step is to rationalize the inflation target. The European Central Bank currently targets inflation below but close to 2%, so that no country in the Euro zone should have inflation ever rise above this level.(2) The ECB should change this explicit policy by making the target symmetric, so that inflation below target is just as bad as inflation above target, and that inflation is not biased to be too low for long periods of time. The ECB should also make the 2% target an average over the entire Euro zone so that some countries might have inflation above the 2% target as long as other countries have inflation below the 2% target.

This would address one unique problem in the Euro zone, the fact that since they all share the same currency prices cannot easily adjust between the countries through appreciation or depreciation of exchange rates. When a country experiences a significant negative shock that results in high unemployment, if the country has its own currency, the currency can depreciate. If the currency depreciates, labor and production become cheaper in the affected country relative to other countries, making exports cheaper. Businesses take advantage of these relatively low prices and move production into the country where exports expand and this provides a boost to the economy by creating jobs and reducing unemployment.

In the Euro zone, each country does not have its own currency so relative prices can only adjust through different rates of inflation. If inflation is lower in one country, then the costs of labor and production rise more slowly in that country compared to one with higher inflation, again making exports cheaper. This is basically what Germany did in the early and mid-2000s, keeping wage growth and inflation quite low compared to the surrounding countries for several years, encouraging companies to invest there by making production and exports relatively cheap.(3) These differences in prices were then locked in by the Euro, so that other countries could only make their economies more attractive for investment after the crisis by achieving lower inflation rates than Germany for many years in a row.

A rationalized inflation target could help speed up this adjustment process. If each country has to have inflation fall below 2%, and a country wants relative prices to adjust by 4% a year relative to Germany's, then inflation in the target country needs to fall to negative 2% since Germany's inflation rate cannot rise above 2%. Deflation is very difficult on a country, and experiencing significant deflation for several years in row basically means having a significantly depressed economy for several years in a row. If inflation were allowed to rise to 4% in Germany however, then a country could still adjust relative prices by 4% a year and also have inflation near zero. This would allow relative price adjustment, which is the only way countries can adjust to shocks when sharing the same currency, to occur much more quickly and much less painfully. Currently, the asymmetric shocks are ripping apart the Euro zone because they never get resolved and result in many years of difficult economic performance. Speeding up these adjustments and reducing the economic difficulties is essential to saving the Euro. The trick is simply giving countries with high unemployment a lower inflation target and countries with low unemployment a higher inflation target.

The second step to solving the economic crisis in Europe is to provide different levels of QE in different countries. If each country has a different inflation target, than you also need to customize the monetary policy for each country, and since each country in the Euro zone has its own specific debt market, then the ECB can buy different amounts of government debt in each country. Currently, the ECB distributes the QE across the Euro zone in the simplest way possible. The ECB decides on a level of QE for the entire Euro zone and buys bonds in each individual country proportional to the relative size of each economy. (4) If each country has its own inflation target, however, you could do higher levels of QE in countries with higher inflation targets, and less QE in countries with lower inflation targets. If a country were in crisis, however, their inflation rate might be particularly low and need extra QE to bring it up to the lower target. The trick is to find the perfect amount of QE to achieve the desired inflation target, and to do this you can vary the QE based on how much a country misses its inflation target.

This new approach to distributing QE I call a QE vs inflation schedule. A QE vs inflation schedule is specific policy rule, kind of like a Taylor rule, but instead of using inflation rates and output gaps to determine interest rates, the level of QE is determined by inflation rates and inflation targets. The key feature of the QE vs inflation schedule is that QE automatically goes up as inflation goes further below target and QE declines if inflation rises above target. If a country is experiencing low and declining inflation, and the central bank needs to decide how much QE will stabilize inflation, then a QE vs inflation schedule is the perfect tool. The central bank can make its best guess as to what level of QE will achieve their desired inflation target, and if the central bank guesses a QE too low, then inflation will

fall further, and the QE will automatically rise as a result of the schedule. In fact the optimal QE is kind of determined by a market equilibrium, where if inflation keeps falling then the QE will keep rising until inflation stabilizes, at which point you now know how much QE you need to do to keep inflation stable. If the central bank guesses a QE too high and inflation goes above target, then the QE will gradually phase out.

The ECB currently uses the simplest system, a flat amount, to determine how much QE to implement.(5) The basic idea is to guess the amount of QE you need to get inflation to target, and then keep the QE at that amount regardless of what the inflation rate is and hope you reach the equilibrium you want. There is almost a mathematical proof showing how a QE vs inflation schedule is superior to a flat QE amount, where if the central bank guesses right, then both policy rules reach the same equilibrium, though the QE vs inflation schedule converges faster. If the central bank guesses wrong, the resulting equilibrium will result in less deviation from target if you use a QE vs inflation schedule.

Since the ECB now has a different inflation target for each country and needs to find the correct amount of QE to try in each country, the ECB can just implement a unique QE vs inflation schedule for each one. Eventually, the policy rule will illuminate what level of QE will stabilize inflation and the ECB can consistently adjust the QE vs inflation schedule until you hit the inflation target perfectly for each individual country.

Of course a crucial assumption is that QE by itself will be powerful enough to hit your desired inflation target, and the problem in Europe right now is that despite doing significant amounts of QE, inflation has come in consistently below target.(6) This means we need a third step in order to solve the European economic crisis, and this step simply has the European Union increase the deficit target by the amount of QE implemented in a country.(7)

The basic idea is that if QE is not able to get inflation to back to target, then you need to try additional fiscal stimulus by running larger budget deficits. Of course, one problem is that if a country is doing poorly economically, they are also fairly likely to have accumulated a lot of debt, so the countries that need the stimulus are also the ones least able to afford it. By linking the increase in the deficit target to the amount of QE, this means in the short run the new deficits will be completely paid for with printed money so there is little risk of debt crisis. Central banks, however, like to do temporary QE and as we well know by now, temporary QE does not solve the debt crisis problem long term, since eventually the printed money will be removed from the economy and all the debt will need to be paid for with tax money. If the ECB did start to do permanent QE, then increasing the deficit by the amount of the QE and linking the amount of QE to specific levels of inflation ends up creating a sort of helicopter money vs inflation schedule. The most likely chain of events is that the ECB does QE it says will be temporary, but then the economic difficulties last so long it never gets unwound and the QE essentially becomes permanent.

Once you combine all three steps then you have a comprehensive solution to the economic problems in Europe. By adopting different inflation targets in each country you can speed up the relative price adjustment between countries so that asymmetric shocks do not become the horrible ordeals they are

today. In order to discover the necessary policies you need to hit the inflation target in each country, you can use a QE vs inflation schedule to let the market help you determine the optimal policy, and if QE by itself is not enough, you can have the EU raise the deficit target in each country by the amount of QE to make the stimulus even more powerful.

Many commentators talk about how the Euro will not work and inevitably break up because Europe lacks a fiscal union to help countries adjust to asymmetric shocks. Creating a fiscal union is very difficult in Europe because each country wants to have its own unique policies for taxes and spending, and no individual country wants to give the EU significant independent budgetary powers.(8) My proposal overcomes this problem, because if interest rates remain stuck at zero in perpetuity in Europe, then the ECB will also need to do QE in perpetuity as a result, essentially giving the Euro zone a centralized source of revenue that it can distribute to each country to offset economic shocks. The need for perpetual QE could sort of create a de-facto fiscal union, one that provides greater payments to countries in crisis based solely on their low inflation rate relative to individualized target (perhaps even to Greece(9)), without having to provide the EU with broad powers of taxation.

The result is that Europe could avoid decades of high unemployment and a persistent output gap by printing money and increasing deficits, and could save the Euro by providing different amounts of stimulus (and different rates of inflation) specially targeted to each country using a QE vs inflation schedule.

## Section 9 – How do we get countries to try helicopter money?

The United States, Europe, and Japan each face unique circumstances, but the path to helicopter money is in many ways similar for all of them. Japan provides the role model, where central banks try temporary QE and governments feel the need to run deficits in order to stimulate the economy. Economic weakness continues indefinitely as attempts to pare back the QE or reduce deficits through austerity is met by even more economic weakness. As the QE lasts for longer periods of time and no real plan develops to unwind it, the QE in all important respects becomes permanent, even if the central bank refuses to admit it. As debt quickly accumulates due to the high deficits, eventually you reach the point where the QE prevents any crisis from developing in the short run, even as it becomes increasingly clear the debt will never be paid for with tax money. The final step is to admit the QE is permanent and once policymakers realize this step does not lead to financial market meltdown and rapidly increasing inflation,(1) then they can start to increase deficits even more knowing a debt crisis can always be avoided. This combination of permanent QE and persistently high deficits ultimately gets us helicopter money.

Each country, however, is in a slightly different place in this progression and faces slightly different economic circumstances. In the US, the central bank needs to reduce interest rates back to zero (like every other central bank who tried to raise rates after hitting the zero lower bound in modern times) and promise not to raise rates until inflation goes above 2%.(2) If inflation stays below 2% and long

term inflation expectations start to decline, the government should increase the deficit from 3% to say 5% in order to stimulate the economy.

The real push toward helicopter money in the US can only occur once the next recession hits. I think the recovery has gone on long enough that the business cycle has reached its peak and interest rates are unlikely to stay above zero before the next recession. Many economists believe the economy is just about to return to normal any day now, and members of the Federal Reserve generally predict that interest rates will rise to about 3%. This number keeps getting revised downward as raising rates keeps getting increasingly difficult, and most importantly, even in the most optimistic scenarios, this higher interest rate is still below the peak of the last recession, meaning the long term 30 year trend toward lower interest rates is continuing.(3) Soon, perhaps even within 10 years, that could mean interest rates are stuck at zero throughout the business cycle, which means they are stuck at zero in perpetuity.

This realization will not come until the next recession hits, where we realize for sure that interest rates will not be going significantly above zero, and new dramatic unconventional policies are needed in order to get the economy to full employment. Since interest rates will not be able to decline much, the next recession will most likely bring a new round of QE and a new wave of higher deficits, and the Federal Reserve needs to start laying the intellectual groundwork for aggressive new stimulus measures before they need them. The path to helicopter money becomes the story of Japan, where the QE and higher deficits are never unwound, where debt starts accumulating to levels clearly unable to be paid for solely with tax money, and the QE implemented by the central bank keeps us from any short run debt crisis.

Europe faces slightly different problems. The ECB could immediately announce a rationalized inflation target, where each country has their own target, some above 2% and some below, and the average across the Euro zone is as close to 2% as they can get, and deviations below target are viewed as problematic as deviations above target. The ECB could also immediately announce that QE will vary by individual country and that they are planning to use a QE vs inflation schedule to figure out how much QE will get inflation back to target.

The real difficulties in the Euro zone arise when trying to get the EU to raise deficit targets. Eventually, the central banks will realize that QE, though helpful, by itself does not do enough to get the economy up to their desired performance. Already, long term interest rates in Germany are close to zero percent and the central bank is starting to run out of bonds to buy with QE in some countries.(4) Clearly, more fiscal stimulus will be needed eventually, and this is most likely to take the form of letting countries with low debt, lots of fiscal space, and relatively weak economies (like Finland) to experiment with higher deficits. Unfortunately, a lot of the weakest countries have high debt and relatively little fiscal space, so getting the EU to raise their deficit target is more difficult to achieve.(5)

Ultimately, only continuous unending economic difficulty in Europe will cause the ECB and EU to experiment with more aggressive approaches. Only after QE has continued for years, and the policymakers become quite comfortable with it will they realize that perhaps QE might have to continue indefinitely. Only after countries experience severe economic weakness and Europe learns that additional fiscal stimulus really can help significantly improve economic performance will they realize

that if QE is permanent than they can also raise deficit targets in countries with high debt, and the steady stream of QE will prevent any debt crisis. Eventually, like Japan, debt will rise so high and QE last so long, that the QE will essentially become permanent and the deficits unable to be paid for with tax money, and then helicopter money for all practical purposes will have arrived.

Japan is already quite far along this path toward helicopter money, and as a result, also plays a key role in experimenting with even more aggressive policies to help the entire world learn what works and what does not. Japan has already tried raising rates and implementing premature fiscal austerity and been forced to reverse course on both policies.(6) Japan has already been doing massive amounts of QE with no real prospect for unwinding it.(7) Japan has already been running high deficits for almost 25 years now, and managed to accumulate the highest amount of debt (as a percent of GDP) among advanced countries.(8) If anyone believes this problem might be permanent, it is Japan

The key step that Japan has not taken, however, is to formally announce that the QE is permanent and to use this realization to expand the deficit even further. The most important helicopter money experiment lies in Japan's hands, where currently QE is still temporary, but Japan could announce, in very small increments, that it is increasing the length of time it plans to hold the government bonds it bought with printed money. The length of time the bonds would be held could gradually grow from say 10 years, to 20, to 30, to 40, to 50, and then indefinitely. The scope of the bonds this extended holding period applied to could also be gradually expanded from say 1% of the debt, to 2%, to 5%, to 10%, to 25%, to 50%, to 75%, to 100% of debt. Once 100% of the debt plans to be held in perpetuity, then we really do have permanent QE, and if the financial markets do not melt down, and inflation does not dramatically increase (some economists think consumers and businesses are extremely forward looking when it comes to inflation(9)) then the government has cautiously and carefully learned that debt can be safely paid for with printed money and deficits can be expanded without risk of debt crisis. The whole experiment is a guaranteed win-win, since if inflation does result, than we have a powerful tool to get inflation up to target in Japan, and if inflation does not increase than we know helicopter money is possible without harmful effects.

This is the key experiment that the world needs to learn if helicopter money is realistic and desirable, and since Japan is the furthest along the path toward helicopter money, they are the country that needs to do it. By proceeding cautiously and incrementally, the grand economic experiment can be done safely, and the whole world can learn essential policy lessons to guide future economic policy. The real trick to solving this worldwide economic crisis among advanced economies is to avoid trying the same failed policies decade after decade, but instead to carefully experiment with much more aggressive policies to learn what works and what does not. The key to reducing the amount of human suffering is to increase the pace of learning, and economic experimentation is the way to do it. All we need is the intellectual insight and the political will to try it.

# End Notes

## Introduction

#1 – Helicopter money was popularized from Friedman (1969). Buiter (2014) offers a formalized model showing how helicopter money provides central banks with a potentially unlimited tool to stimulate the economy.

#2 – For the year 2015, inflation in the US was below 1.5%, while inflation in Europe and Japan was close to 0%. Growth in 2015 for the US came in around 2.4%, while Europe achieved growth of 1.5% and Japan only managed growth of 0.5%. When calculating the output gap, I use a simpler method calculating trends in output before the crisis, and then comparing current output to the level of output that would have occurred had the pre-crisis trend continued. By this measure, the US, Europe, and Japan have not been able to make up the loss in output brought about by the crisis, and even though growth has returned in these areas, it has at best been only fast enough to keep the output gap from growing. More sophisticated measures try and calculate a level of potential output, and they show a declining output gap in some cases due to a slower growth in potential output, not due to higher levels of growth that allows output to catch up to pre-crisis trends.

#3 – The interest rate on German 10 year government bonds is currently -0.2%, while in Japan the interest rate is -0.3% on 10 year government bonds.

## Section 1

#1 – The United States, Europe, and Japan all lowered rates to a quarter point or below after the crisis, and deficits ballooned to 9.8% of GDP in the US, 8.8% of GDP in Japan, and 6.5% of GDP in the Eurozone.

#2 – Europe cuts it deficit from 6.5% of GDP in 2010 to 2% of GDP most recently, while growth plummeted to negative levels in 2012 and 2013 and still has not recovered to pre-crisis levels. Inflation did rise above 2% for a while after the crisis but for the past 3 years inflation has come in below 2%, while unemployment in the Eurozone has stayed at or above 10% since 2010.

#3 – Japan ran deficits worth more than 6.0% of GDP every year since 1998, except from 2005-2008 when the deficit declined to 1-2% of GDP, but then climbed back up above 8% during the years immediately following the crisis. Debt as a percent of GDP rose to 247% of GDP in 2014, by far the highest among OECD countries.

#4 – Between FY 2009 and FY 2011, the deficit in the US ranged between 9.8% of GDP and 8.5% of GDP. There were three rounds of QE. The first round lasted between March 2009 and March 2010 worth about $90 billion a month. The second round lasted for about 8 months from November 2010 to June 2011 worth about $75 billion a month. The third round started in September 2012 worth $40 billion a month, then increased to $85 billion a month in December of 2012, and then started to phase out in

December 2013. When QE varied between $75 and $90 billion a month, this represented approximately 6-7% of GDP.

#5 – Core inflation started declining precipitously from the fall of 2008 to the fall of 2010 eventually going below 0.5%. After the second round of QE began in November 2010, core inflation trends abruptly reversed and quickly rose above 2%. After output declined by 2.8% in 2009, growth rose significantly ranging from 1.6% to 2.5% between 2010 and 2015.

#6 – For inflation and growth trends see end note #5 above. The unemployment rate declined from around 10% in 2010 to less than 5% in 2016, though the working age employment to population ratio did not start rising until just before 2012 and did not start rising more quickly until just before 2014, meaning the decline in unemployment rate largely meant people stopped looking for work rather than getting new jobs. The working age employment to population ratio only reached 78% in 2016, 2 percentage points below the 80% pre-crisis peak. For a more detailed explanation of output gap trends see end note #2 from the Introduction.

#7 – In FY 2011, the budget deficit was 8.5% of GDP and by FY 2012 the deficit fell to 6.8% of GDP and eventually fell to 2.5% of GDP by FY 2015.

#8 – Weimar Germany experienced severe hyperinflation from 1921-1924 while trying to manage its wartime debt and war reparations, because they printed money to pay for government expenses as well. Hitler came into power in 1933 which followed a 1931 economic crisis brought about a severe deflation due to extreme government austerity, again in an attempt to manage elevated wartime debts.

#9 – Article 123 of the EU Lisbon Treaty explicitly bans direct monetary financing of governments.

#10 – Japan had an enormous housing and stock market bubble that started rising in the late 1980s only to finally pop in 1991. By 1999, interest rates had fallen to zero in Japan. The central bank tried unsuccessfully to raise rates just before the 2008 crisis, but later lowered them near zero for a long time just after the crisis. The Bank of Japan just recently lowered interest rates all the way to zero, and has even started experimenting with negative interest rates.

#11 – Seven central banks have tried raising rates and failed. Japan, the Eurozone, Sweden, Israel, Canada, Norway, and Australia all raised rates above zero only to later reverse course and lower them back to zero after the economy struggled. The United States raised rates a quarter point in December of 2015 but had to pare back plans for further increases later in the year, and some commentators argue the rate increase was premature and needs to be undone. No other central bank has been able to successfully lift rates above zero and keep them there since the latest crisis.

#12 – From 1931-1936, finance minister Takahashi Korekiyo successfully lifted Japan out of recession by using printed money to directly fund government spending without causing excess inflation (Turner 2016). When the Japanese finance minister tried to reduce the amount of government spending funded with printed money, the military revolted and assassinated him. After his assassination inflation dramatically increased in Japan as policy became much less constrained.

#13 – All OECD countries except Denmark and Korea have central banks that use an inflation target.

#14 – Increasing evidence of lower inflation rates in countries with independent central banks created pressure to make more central banks independent since the early 1990s. This is most evident in Europe where Britain switched to a more independent central bank in the late 1998, and the highly independent European Central Bank was created in 1998 to serve all the countries using the Euro starting in 1999.

#15 – Europe has experienced unemployment above 10% since 2010 and though unemployment is declining and close to going below 10%, it could take several years before reaching pre-crisis levels, and full employment may still remain elusive if another recession hits. Japan managed to hit its 2% inflation target in 2014, and got close with 1.6% inflation in 2013, however inflation has been near or below zero for every other year since 2007. In the United States, growth has ranged from 1.6% to 2.5% since 2010, while pre-crisis growth averaged at least 2.7% annually, meaning the output gap as measured by pre-crisis trends continues to grow.

## Section 2

#1 – The basic Keynesian theory of economic fluctuations is detailed in Keynes (1936).

#2 – I discovered this key relationship between Savings and Investment not through any of my economics classes nor by serving as a teaching assistant for Econ 1 but from Skidelsky (2004) the one-volume biography of Keynes.

#3 – The theory of the natural rate of interest was developed by Swedish economist Knut Wicksell at the end of the 19$^{th}$ century and explained in Wicksell (1898).

#4 – The term secular stagnation was coined by Alvin Hansen in 1938, when he unsuccessfully predicted a lack of investment would lead to a chronic failure to reach full employment in the economy. Larry Summers brought the term into the current debate in a speech in 2013 where he argued that before the crisis easy monetary policy still did not lead to an overheating of the economy indicating that perhaps the natural rate of interest fell below zero even before the crisis. He also argued that in the post-crisis environment, the natural rate of interest would still be below zero and the zero lower bound on interest rates might pose a significant barrier to positive economic performance far into the future, echoing some of my greatest concerns (Summers 2013).

#5 – Denmark was the first country to experiment with negative interest rates followed by Switzerland, the European Central Bank, Sweden, and now Japan.

## Section 3

#1 – The effective Federal Funds rate, the rate the Federal Reserve currently sets to manage the economy, peaked above 19% in 1981 and eventually declined to just above zero in 2009. In the last two

recessions, the federal funds rate declined by 5.5 percentage points around the 2001 recession and 5.25 percentage points during the 2008 crisis.

#2 – The role of excessive debt in reducing consumption and causing economic difficulties has been detailed most extensively by Atif Mian and Amir Sufi in their recent book House of Debt (Mian 2014).

#3 – Ben Bernanke popularized the idea that interest rates in the United States were unusually low in part because of funds coming into the United States from foreign countries, including China, which he called a global savings glut (Bernanke 2005).

#4 – The Solow growth model is the one most commonly used to model and understand trends in long term growth and primarily looks at the role of labor, physical capital, and technology as the three key factors.

#5 – The number of passenger vehicles used in the United States was extremely low at the beginning of the century and this number did not peak until the mid-2000s.

#6 – In the peak of the last business cycle, the federal funds rate topped off at 5.25%.

#7 – In December of 2015, the members of the Federal Reserve board predicted rates would rise to 3.5% long term, and in March 2016, this estimate declined to only 3.3%. In their most recent meeting in June of 2016, the members estimated rates would rise to only 3% long term.

#8 – The Federal Reserve raised interest rates by 0.25% in December of 2015, but has so far declined to raise rates in 2016.

## Section 4

#1 – Milton Friedman proposed controlling inflation by limiting growth in the money supply to a fixed percent. Paul Volcker became chairman of the Federal Reserve in 1979 and tried managing inflation by targeting money supply growth in the early 1980s, but eventually the Federal Reserve went back to managing the economy by targeting interest rates.

#2 – See section 1, end notes #4 and #5 for a discussion of deficits, QE, and its effect on inflation.

#3 – Budget deficits in the US fell to 4.1% in FY 2013, 2.8% in 2014 and 2.5% in 2015. Inflation based on the CPI rose by almost 3% in 2011, but between 2012 and 2015 inflation fell between 1 and 1.6% except for 2014 where inflation fell to negative 0.1%. Core CPI inflation (inflation excluding volatile food and energy prices) ran at or below 2% from mid-2012 to late 2015 and has only risen slightly above 2% within the last year. Core PCE inflation (the measure the Federal Reserve uses to target inflation) has stayed at or below 2% since 2009.

#4 – Japan has recently been doing QE worth around 16% of GDP, while inflation rose only 0.2% in 2015. Inflation did rise above 2% in 2014 but rose only 1.6% in 2013 and was negative between 2009 to 2012.

## Section 5

#1 – Ten year interest rates on United States Treasury bonds fell below 1.4% in July 2016.

#2 – Thirty year interest rates in the United States were 2.1% in July 2016.

#3 – In 2015, GDP in the United States was $17.9 trillion, so 1% of GDP adds up to around $179 billion a year. In FY 2016, the budget for the US Department of Transportation was $94.8 billion.

#4 – The bulk of the federal 18.4 cents per gallon gas tax currently goes to the federal highway trust fund, but some of it goes to pay for mass transit, and some general fund money helps pay for highways at the federal level as well.

#5 – The Make Work Pay tax cut provided a tax credit worth 6.2% of earned income up to a maximum of $400 for singles and $800 for married couples in 2009 and 2010. For 2011 and 2012, this Make Work Pay tax credit went away and was replaced with a 2% Social Security payroll tax cut which also maxed out due to the cap on income subject to the Social Security payroll tax.

#6 – Social Security imposes a payroll tax of 6.2% for individuals and 6.2% for businesses on income up to $118,500 in 2016. There is also a payroll tax of 1.45% on individuals and 1.45% on business to help pay for Medicare that is not subject to any cap.

#7 – The entire 7.65% payroll tax on individuals brought in about $500 billion in revenue for Social Security and Medicare in FY 2015, less than 3% of GDP. This means the 2% payroll tax cut cost less than 1% of GDP in revenue.

#8 – Helicopter money worth 5% of GDP would add up to $900 billion in 2015 and since there are approximately 320 million people in the United States, this divides into $2,800 per person. Helicopter money worth 7% of GDP would be worth $1,260 billion or around $3,900 per person.

#9 – Alaska distributes a lump sum equal payment to each Alaska resident that varies substantially by year based on how much income the fund gains each year (in 2015 the fund distributed payments worth $2,072 to each person). This is designed primarily to distribute a portion of the proceeds from oil sales to the broader Alaska public.

#10 – The United States spent about 19.1% of GDP on social expenditures in 2014, less than the 21.6% of GDP spent by all OECD countries, and substantially less than the more than 30% of GDP spent by Belgium, Denmark, Finland, and France.

## Section 6

#1 – The European Central Bank is currently doing about 80 billion euros a month in quantitative easing amounting to approximately 10% of GDP. The European Union currently sets deficit targets in each of

the countries on the Euro, and if a country consistently does not meet those targets, it risks financial penalty.

#2 – Article 123 of the Lisbon Treaty negotiated by the European Union explicitly bans direct monetary financing of governments. In order to change an existing EU treaty you need the unanimous consent of every EU nation.

#3 – When the European Central Bank promised to do "whatever it takes" to prevent a run on European bond markets by buying massive amounts of government bonds with high interest rates, it never actually had to buy any bonds since the promise to buy them was enough to stabilize markets at a critical time. Germany challenged this policy in court as violating the ban on direct monetary financing of governments, but the court subsequently ruled that this early promise to buy government bonds was legal. The current round of quantitative easing by the ECB raises similar legal questions, but has not been directly ruled on by any European court.

#4 – Quickly after his election in late 2012 in which he promised much more aggressive monetary policy, Prime Minister Shinzo Abe pressured the Bank of Japan to raise the inflation target to 2%, expand their policy of quantitative easing, and appointed Haruhiku Kuroda as head of the central bank along with two new deputies.

#5 – In a speech to the Japanese legislature in April 2016, Bank of Japan governor Haruhiku Kuroda stated he opposed having the central bank try helicopter money because he believed it was illegal under current law.

#6 – About 61 central banks around the world have explicitly adopted an inflation target.

## Section 7

#1 – The US Federal Funds rate fell to zero in late 2008.

#2 – See Introduction, end note #2 for a description of mediocre economic performance around the world.

#3 – In each year since 2012, the members of the Federal Reserve's board of governors have predicted in their economic projections that interest rates will start increasing above zero within a year or two.

#4 – Denmark, Switzerland, the European Central Bank, and Japan have all tried negative rates. Switzerland and Denmark both lowered rates to negative 0.75%, though Denmark recently increased their rate to negative 0.65%.

#5 – Japan, the United States, and the European Central Bank have all tried quantitative easing, but economic performance has been less than ideal in each area as shown by Introduction, end note #2.

#6 – In the United States the budget deficit has fallen from 9.8% of GDP in FY 2009 to 2.5% in FY2015 despite trying quantitative easing periodically during that time. In Japan, the deficit fell from 7.7% of GDP in 2003 to 1.3% in 2006 before rising again to 8.8% of GDP after the crisis despite implementing quantitative easing from 2001 to 2006. The European Central Bank has recently tried quantitative easing as well since 2015, but the budget deficit in the Eurozone has fallen from 6.5% of GDP around 2010 to 2% now.

#7 – See end note #6 above.

#8 – Switzerland adopted an exchange rate peg of 1.2 Swiss franks for each euro in September of 2011, which the Swiss Central Bank aggressively defended for more than three years before breaking the peg and letting the currency float freely in January of 2015.

## Section 8

#1 – Spain, Ireland, and the Netherlands all had housing prices double over 10 years only to have prices fall by more than 20%. The interest rates in the Eurozone have been negative since 2014. GDP growth rates in the Eurozone has remained below 1.6% since 2011, and actually went negative in 2012 and 2013. This level of growth has not been enough to keep up with pre-crisis trends in output, indicating the output gap continues to grow.

#2 – The ECB's Governing Council announced that "Price Stability is defined as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) for the euro area of below 2%." This indicates the official inflation target is around 2%, but not symmetric, and since inflation in Germany has stayed at or below 2% since 2007, the ECB appears reluctant to let inflation rise above 2% even in well performing economies with relatively low unemployment.

#3 – Germany, for example, experienced inflation at least 1 percentage point below Spain from 1999, when the Euro was created, until 2007.

#4 – The ECB is currently buying government bonds worth around 80 billion euros a month and distributes the quantitative easing between the different countries in proportion to the size of their economy. The exception to this rule is that the ECB does not buy any Greek debt as part of their policy of quantitative easing.

#5 –The ECB does not explicitly link the amount of QE to any economic variable, though it did recently increase the amount of QE to 80 billion euros a month in March of 2016, up from 60 billion euros a month it started implementing in March of 2015.

#6 – Despite initiating significant amount of QE in 2015, the inflation rate in the Eurozone has remained near zero.

#7 – The European Commission currently enforces the deficit targets through the Excessive Deficit Procedure for countries using the Euro, which attempts to keep government from running deficits worth more than 3% of GDP or accumulating debt more than 60% of GDP. If governments are not progressing toward these limits quickly enough than the European Commission can impose financial penalties on recalcitrant governments.

#8 – Currently, almost all of tax and spending power in Europe is not held by the EU, but by individual countries within the EU. The latest EU annual budget amounts to around 1% of Eurozone GDP. In contrast, France's government spends about 57% of GDP on its own programs, and Germany spends around 45% of GDP.

#9 – In the current Greek crisis the ECB so far has largely served as bill collector threatening to shut down Greece's banking system unless it increases payments to its European creditors through additional government austerity. If the ECB were more concerned with stabilizing prices in Greece (which has been experiencing significant deflation), then Greece should be the recipient of generous amounts of monetary stimulus (it currently gets no money from QE), which is difficult to implement in the current political environment due to Greece's past irresponsible behavior. If, however, there was a rigorous system linking monetary stimulus only to inflation levels relative to target, and this system was used uniformly in each individual country independently, then maybe some of the political opposition to providing additional monetary assistance to Greece could be overcome.

## Section 9

#1 – Some economists believe people are extremely forward looking when it comes to inflation, so that if a country promises to make QE permanent, then the effects that take place far into the future have immediate effects on the economy. In this story, making QE permanent causes people to believe all the extra money in the future will lead to inflation in the future, and higher expected prices later lead to higher prices now. I believe people are primarily backwards looking when making inflation expectations so that people will only believe inflation will be higher in the future if inflation rises higher in the immediate past.

#2 – See section 1, end note #11

#3 – See section 3, end note #7

#4 – The Interest rate on 10 year German government bonds is currently -0.2%. If the ECB keeps buying governments bonds in each country at the current rate, then the central bank may reach its own self-imposed limit on the percent of bonds held by the ECB in Germany, Finland, and Portugal before the QE is scheduled to end.

#5 – Finland currently has growth below 1% a year and unemployment above 9%, even while deficits in 2015 were only 2.7% of GDP and debt was only 63.1% of GDP. Greece, Italy, Portugal, and Spain all had unemployment rates above 10% and also had debt worth around 100% of GDP or more.

#6 – See section 1, end note #10 for an explanation of Japan's interest rate policy, and see section 1, end note #3 for an explanation of Japan's changing fiscal policy.

#7 – Japan has been doing massive amounts of QE worth around 16% of GDP, and economic growth came in around 0.5% in 2015. This means Japan is nowhere close to getting the improved economic performance it needs to stop doing QE, and especially far away from what it needs to unwind the QE by selling all the bonds the Bank of Japan has already purchased.

#8 – See section 1, end note #3

#9 – See section 9, end note #1

## References


Bernanke, Ben (2005) "The Global Savings Glut and the U.S. Current Account Deficit." Remarks at the Sandridge Lecture, Virginia Association of Economists, Richmond, Virginia, March 10.

Buiter, Willem (2014) "The Simple Analytics of Helicopter Money: Why It Works – Always." Economics: The Open-Access, Open-Assessment E-journal. Vol. 8 p. 2014-28. http://dx.doi.org/10.5018/economics-ejournal.ja.2014-28

Friedman, Milton (1969) "The Optimum Quantity of Money." In Milton Friedman, The Optimum Quantity of Money and Other Essays, Chapter 1, Adline Publishing Company, Chicago, pp. 4-5.

Keynes, John Maynard (1936) "The General Theory of Employment, Interest, and Money." London: MacMillan (reprinted 2007).

Mian, Atif and Amir Sufi (2014) "House of Debt: How They (and You) Caused the Great Recession and How We Can Prevent It From Happening Again." Chicago: University of Chicago Press.

Skidelsky, Robert (2004) "John Maynard Keynes: 1883-1946: Economist, Philosopher, Statesman." London: Penguin.

Summers, Larry (2013). IMF Fourteenth Annual Research Conference in Honor of Stanley Fisher. November 8.

Turner, Adair (2016). "Between Debt and the Devil: Money Credit, and Fixing Global Finance." Princeton, New Jersey: Princeton University Press, p. 112.

Wicksell, Knut (1898) "Interest and Prices." English translation, New York 1936: Sentry Press.