How to Make Monetary Policy More Effective

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Abstract

Nine years after the beginning of the Great Recession in 2008 and at least seven years since the recovery from the Great Recession began, industrialized economies are experiencing sluggish growth and inflation that is persistently under targeted rates. The unconventional monetary policies that have been tried by different central banks have not generally been successful in achieving their goals. We suggest here that quantitative easing could be made much more effective by making expansions of the monetary base permanent. In turn, a commitment to permanent monetary expansion would be more credible if central banks adopted targets for nominal aggregates such as the price level or nominal GDP. A level target would also allay fears of runaway inflation.

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1 Introduction

It is now nine years since the beginning of the Great Recession. Depending on the country, it is seven or eight years since the recovery from that recession began. Industrialized economies are experiencing sluggish real growth. Inflation rates have been systematically below their targets since 2012. There is some controversy over whether supply-side or demand-side factors predominate in explaining the slow recovery of economies since the Great Recession, but some blame has been laid at the doorstep of monetary policy.

Due to the persistence of these negative economic outcomes many central banks have gone beyond conventional monetary policy and attempted a series of different unconventional monetary policies (UMPs) including forward guidance (FG), negative policy rates (NIRP), and large scale asset purchases (LSAP) or quantitative easing (QE), with mixed success.

This paper argues that quantitative easing (QE) is the answer to boosting both inflation rates and aggregate demand. The reason it has been relatively unsuccessful to date is that it has not been given a fair chance. In order to be effective, QE must involve a permanent increase in the monetary base (or a permanently higher growth path) and in the supply of broad money. QE that is expected to be temporary will have weak effects on growth and on inflation. This conclusion is supported by a large body of theoretical and empirical evidence. In order to make a commitment to a permanent increase in the money supply credible, central banks should target a nominal

aggregate such as the price level path or a target path for nominal GDP. Such a commitment would also serve to allay fears that inflation would accelerate above long-run targets.

A secondary goal of the paper is to convince the reader that in today's low-inflation environment, short-term interest rates are a relatively ineffective instrument of monetary policy and also a potentially misleading indicator of the stance of monetary policy. Milton Friedman (1997) famously already argued that the short-term nominal interest rate is a poor measure of the stance of monetary policy: "Low interest rates are generally a sign that money has been tight, as in Japan; high interest rates, that money has been easy." The paper argues that low short-term interest rates can also be a sign that monetary policy is expected to be tight in the future. This can help explain the current situation of low interest rates, slow real growth, and low inflation.

The paper is structured as follows. The second section documents the slow recoveries of output and inflation since the Great Recession. It looks at different possible explanations for the slow recovery and argues that the evidence supports the idea that monetary policy has been relatively ineffective in boosting demand. It also looks at one of the main consequences of the slow recovery, low interest rates, and their implication for the conduct of monetary policy. The third section looks at different so-called unconventional monetary policies that have been tried since the financial crisis and why they have all been relatively ineffective, including QE. The fourth section suggests

how to make QE more effective. The fifth section discusses several potential objections to QE The sixth section concludes.

2 The Slow Economic Recovery and the Shortcomings of Monetary Policy

The International Monetary Fund (2017) in the latest edition (at the time of writing) of its *World Economic Outlook* documents the slow recovery around the world since the Great Recession. Table 1 below is taken from Appendix A1 of the IMF report and documents the behaviour of output.[1] For the advanced economies as a whole, the only year for which GDP growth has been higher than the average between 1998 and 2007 is 2010, the first full year of the recovery. It is often the case that the initial stage of recovery from a recession is marked by growth that is faster than normal as the economy catches up with trend growth. In the USA and the euro area, growth rates have never matched the average for 1998 to 2007, even at the beginning of the recovery. Japanese growth exceeded its 1998 to 2007 average in 2010, 2012 and 2013, but only because its average growth in the earlier period was particularly anemic. Canada's growth exceeded the 1998 to 2007 average in both 2010 and 2011: this is an indication that Canada's recession was

[1] The advanced economies in the table are made up of 39 countries: the complete list can be found on page 148 of the *World Economic Outlook* (2017). The numbers for Canada are based on the author's calculations.

relatively mild by international standards.[2]

Table 1: Real GDP Growth Rates

Region/Country	Average*	2008	2009	2010	2011	2012	2013	2014	2015
Advanced Economies	2.8	0.2	-3.4	3.1	1.7	1.2	1.2	1.8	1.9
USA	3.0	-0.3	-2.8	2.5	1.6	2.2	1.5	2.4	2.4
Euro Area	2.4	0.5	-4.5	2.1	1.6	-0.9	-0.3	0.9	1.6
Japan	1.0	-1.0	-5.5	4.7	-0.5	1.7	1.4	0.0	0.5
Other Advanced	3.6	1.1	-2.0	4.5	3.0	1.9	2.3	2.8	1.9
Canada	2.8	4.0	-2.3	2.9	3.3	1.2	1.6	1.9	-0.8

∗: 1998-2007

Table 2 below is taken from Appendix A5 of the IMF's report. It shows the behaviour of inflation during and since the Great Recession.

Table 2: CPI Inflation Rates

Region/Country	Average*	2008	2009	2010	2011	2012	2013	2014	2015
Advanced Economies	2.0	3.4	0.2	1.5	2.7	2.0	1.4	1.4	0.3
USA	2.6	3.8	-0.3	1.6	3.1	3.1	1.5	1.6	0.1
Euro Area	2.0	3.3	0.3	1.6	2.7	2.5	1.3	0.4	0.0

[2]Canada's growth rate also matched or exceeded the average growth rate of advanced economies between 2011 and 2014. However, since 2012 GDP growth in Canada has been below its historical average. It is also the only individual economy listed in the table to suffer negative growth in 2015, because of the negative shock to world oil prices.

Region/Country	Average*	2008	2009	2010	2011	2012	2013	2014	2015
Japan	-0.2	1.4	-1.3	-0.7	-0.3	0.0	0.4	2.7	0.8
Other Advanced	1.9	3.9	1.4	2.4	3.3	2.1	1.7	1.5	0.6
Canada	2.2	1.2	1.3	2.3	2.3	0.8	1.2	1.5	1.6
∗: 1998-2007									

The pattern of inflation is similar across countries and illustrates what some authors (for example Friedrich and Gosselin 2015) call the two "inflation puzzles" of the Great Recession annd recovery.[3] The first puzzle is the "missing disinflation" of the Great Recession itself. Inflation in all economies dipped during the Great Recession itself, with some dips more pronounced than others. For example, Canada's inflation rate over complete years remained above 1%. Then, in 2011, inflation picked up despite the fact that output gaps remained negative: this is the first puzzle. The second puzzle is one of missing inflation. With output gaps gradually closing after 2012, inflation has remained quite muted.

Many of he world's major central banks behave as inflation forecast targeters. They set their monetary policy so that their internal forecasting models predict a return of inflation to target within a planning horizon of eight to twelve quarters. If their models generate forecasts that are on average correct and if economic shocks are symmetric, there should be no systematic

[3]On the first inflation puzzle in the US, see also Coibion and Gorodnichenko (2015). On the second puzzle, see also International Monetary Fund (2013).

bias to realized inflation rates. On average, they should be equal to their targets, even if uncertainty means that they will rarely be exactly equal to target.

Instead, inflation-targeting central banks have been consistently undershooting their targets since 2012. Table 3 below shows the latest inflation numbers (at the time of writing) compared to targets for a large number of inflation-targeting countries as calculated by the OECD.[4] Of the 25 countries in the table, 18 currently have realized rates of inflation below target. The seven countries which had inflation rates higher than target all had inflation rates higher than 4% except for the United Kingdom. For some of the seven countries there are exceptional explanations such as the monetization of high budget deficits (Mexico and Turkey) or, in the case of the United Kingdom, the effects of exchange rate depreciation due to the Brexit referendum. The median gap between target and realized inflation is -0.45%.

The slow recovery has led some authors to propose that low growth rates there and elsewhere may be permanent. This is known as the Great Stagnation hypothesis. Its main proponents have been Cowen (2011), Gordon (2015) and Summers (2014), (2015). The hypothesis has generated much

[4]See http://stats.oecd.org/index.aspx?queryid=22519 for the latest realized inflation rates. The inflation targets are taken from *Central Bank News* (http://centralbanknews.info/p/inflation-targets.html). For the two central banks that express their targets as ceilings (the Swiss National Bank and the European Central Bank – both have targets of inflation rates "near but less than 2%"), we have calculated the gap as the difference between the realized inflation rate and the target ceiling.

Table 3: Inflation: Targets versus Realized Inflation Rates

Country	Target	Realized	Gap	Date
Australia	2% – 3%	1.9%	-0.6%	05/2017
Brazil	4.5% +/- 1.5%	3.6%	-0.9%	05/2017
Canada	2% +/- 1%	1.3%	-0.7%	05/2017
Chile	3% +/- 1%	2.6%	-0.4%	05/2017
China	~ 3%	1.5%	-1.5%	05/2017
Columbia	3% +/- 1%	4.4%	1.4%	05/2017
Czech Republic	2% +/- 1%	2.4%	0.4%	05/2017
Eurozone	< 2%	1.4%	-0.6%	05/2017
Hungary	3% +/- 1%	2.1%	-0.9%	05/2017
Iceland	2.5%	1.5%	-1.0%	06/2017
India	4% +/- 2%	1.1%	-2.9%	05/2017
Indonesia	4% +/- 1%	4.4%	0.4%	06/2017
Israel	1% – 3%	0.8%	-1.2%	05/2017
Japan	2%	0.4%	-1.6%	05/2017
Mexico	3% +/- 1%	6.2%	3.2%	05/2017
New Zealand	2% +/- 1%	2.2%	0.2%	Q1/2017
Norway	2.5%	2.1%	-0.4%	05/2017
Poland	2.5% +/- 1%	2.0%	-0.5%	05/2017
Russia	4%	4.1%	0.1%	05/2017
South Africa	3% – 6%	5.3%	0.8%	05/2017
Sweden	2%	1.7%	-0.3%	05/2017
Switzerland	< 2%	0.5%	-1.5%	05/2017
Turkey	5% +/- 2%	10.9%	5.9%	06/2017
United Kingdom	2%	2.9%	0.9%	05/2017
United States	2%	1.9%	-0.1%	05/2017
Median Gap			-0.45%	
Above			8/25	
Below			17/25	

controversy. Researchers who support the hypothesis have proposed several different competing explanations for it, and skeptics have argued that the slow recovery is temporary and the world economy will be able to return to rates of growth comparable to those that prevailed before the Great Recession.

2.1 Explaining the Slow Recovery

It is possible to distinguish broadly, as do Lo and Rogoff (2015), between supply-side and demand-side explanations. The two are not mutually exclusive. A prolonged period of low demand can affect an economy's potential output, and central banks and statistical agencies have repeatedly revised potential output downwards during the recovery as growth has stagnated. As Baldwin and Teulings (2014) note, it is possible to break down the growth slowdown as follows. "Basic macroeconomics provides a three-pillar framework for thinking about an economy's future growth. First is the economy's long-run potential growth rate. Second is the deviation of actual growth from its potential. Third is one-off changes in the level of GDP without a change in the long-run growth rate."

2.1.1 Supply-side explanations (growth of potential output)

The growth of potential output depends on the growth of inputs into the production process (primarily capital and labour) and on the efficiency with which these inputs can be combined to produce output. Gordon (2015)

focuses on the efficiency of productive inputs (the growth of total factor productivity). He claims that there have been three significant "industrial revolutions" in economic history. The first, associated with steam and railroads, lasted from 1750 to 1830. The second, from 1870 to 1900, was the most important in terms of boosting productivity and saw the introduction of electricity, the internal combustion engine, indoor toilets, and many other significant innovations. The third revolution began in 1960 and is associated with computers, the internet, and mobile phones. Gordon judges that the benefits of the third revolution are now all but exhausted and that per-capita GDP growth will remain permanently lower as a result.

Gordon (2014) looks at the "headwinds" that are slowing the growth of inputs into the production process. These include the four following main factors.

1. Demography: population growth has been slowing down in the advanced economies, leading to a commensurate slowdown in labour force growth.

2. Education: advanced economies have already attained high rates of post-secondary education, so the rate of growth of human capital will be lower in the future.

3. Public debt: the governments of advanced economies are highly indebted, leaving little room for further growth in public services.

4. Inequality: much of recent growth has accrued to the top decile of the

income distribution. Below the top 10 percent, incomes (and labour productivity) have been stagnating.

2.1.2 Level effects and hysteresis

These effects have caused a drop in the **level** of full-capacity output. Recessions are typically periods of low or negative net business investment. This lowers the productive capital stock and thereby reduces full-capacity output. Unless the higher than normal investment leads to a complete reversal of the effect, this puts capital on a lower growth path.

Glaeser (2014) shows that in each US recession since 1970 increases in joblessness were not fully reversed during recoveries. Participation rates of adult males fell substantially in the US during the Great Recession, and have not recovered since. This has had a negative level impact on labour inputs, and increased unemployment during recessions also lead to losses in human capital that affect the level of full-capacity output even if they do not affect its growth rate.

2.1.3 Demand-side explanations (shortfalls in demand)

Demand-side explanations for the slow recovery are about the gap between potential and actual output. Demand-side explanations for slow growth all point to the conclusion that monetary policy itself is partly to blame for the slow recovery. The basic argument is simple. For much of the period of the great recovery, the effective lower bound on policy rates has prevented

central banks from lowering rates to the point where the ex ante real interest rate is as low or lower than the short-run neutral rate.

One factor that has been somewhat neglected in the discussion of demand-side secular stagnation is the idea that inflation targeting has the property that there must be multiple long-run equilibria. This was shown by Benhabib, Schmitt-Grohé and Uribe (2001). If the central bank uses a short-term interest rate as its policy instrument, there must always be two long-run equilibria in the economy. One of these is a "good" equilibrium in which expected and realized inflation are equal to the target and the output gap is zero. The other is a "bad" equilibrium in which the policy rate is stuck at its effective lower bound, there is deflation (realized and anticipated), and the output gap is negative.

With a policy rate at or close to its effective lower bound, it cannot vary strongly in response to fluctuations in inflation. The so-called Taylor principle is not satisfied. This principle says that in order for monetary policy to be stabilizing, the central bank's policy rate must respond by **more** than the change in inflation. This means that when inflation increases, the response in the interest rate guarantees that the ex ante real interest rate increases, which reduces aggregate demand and the output gap, and (via the standard Phillips curve relationship) thereby causes inflation to decrease. If the Taylor principle does not hold at or near the "bad" long-run equilibrium, monetary policy may not be able to push the economy towards higher aggregate demand and less deflation. There may be a range of values where

the economy becomes stuck at or near the bad equilibrium. Bullard (2010) argues strongly that this is more that just a theoretical construct. Japan may have been stuck in this situation during the first decade of the millenium and the US was running the risk of getting stuck near the bad equilibrium.

2.1.4 Other arguments

Several other arguments have been put forward to explain weak aggregate demand and low or negative market real interest rates.

Lo and Rogoff (2015) argue that recovery from the Great Recession has been slow because the recession originated in a financial crisis. Households and firms had high levels of debt going into the recession and have been engaged in a process of deleveraging during the recession and into the recovery. This has depressed their demand for consumption and investment goods, increased their rate of savings and put downward pressure on equilibrium interest rates.

Caballero and Farhi (2014) and Gourinchas (2017) argue that the Great Recession gave rise to an acute shortage of safe assets. Assets that had previously been considered safe such as mortgage-backed securities were revealed by the financial crisis to be risky. They contend that the financial engineering that led to the expansion in the supply of mortgage-backed securities was itself driven by burgeoning demand for safe assets due to demographic factors, a rise in international reserve holdings by many central banks, and regulatory changes. Problems with sovereign debt during the Great Recession by

countries such as Italy and France moved their debt from the safe to the risky column. This has contributed to depressing the real natural rate of interest. The International Monetary Fund (2012) highlights another consequence of changing demographics. Much of the increase in life expectancies in recent years has been unanticipated. Consequently, individuals and households have been faced with planning to stretch their accumulated savings over a longer planning horizon. This in turn has contributed to increased world savings rates and the savings glut that has driven down equilibrium interest rates.

Cochrane (2015) and (2017) argues that excessive regulation has put a brake on the incentive to invest and innovate in the US. Cochrane (2016) calls this a third main category of explanations for the slowdown.

> One camp says that we've run out of ideas. We were supposed to have flying cars and all we got was Twitter. Get used to it, the thinking goes, and start fighting over the shrinking pie. Another camp holds that the culprit is : "secular stagnation," a "savings glut" demanding sharply negative interest rates that the Federal Reserve cannot deliver. That outlook attracts clever new economic theories and promotes vast new stimulus spending of the sort that Japan has fruitlessly followed. The third camp (mine) holds that the U.S. economy is simply overrun by an out-of-control and increasingly politicized regulatory state. If it takes years to get the permits to start projects and mountains of paper to hire people, if every step risks a new criminal investigation,

> people don't invest, hire or innovate. The U.S. needs simple, common-sense Adam Smith policies.

Finally, some authors stress the role played by policy uncertainty in causing the Great Recession and slowing down the subsequent recovery. Bloom (2014) and Baker, Bloom and Davis (2016) have been leading proponents of this explanation.

2.1.5 Low natural interest rates

From the point of view of monetary policy, one of the main consequences of permanent (or very persistent) low growth is that the long-run neutral rate of interest will be lower. The neutral rate of interest in the long run will be equal to the long-run riskless real interest rate plus the central bank's inflation target. The secular stagnation hypothesis is about low growth. Low growth itself will lead to a low real natural interest rate. This is an implication of standard growth theory, which holds that the main factors determining real interest rates in the long run are preferences (the degree of impatience of individuals and households) and real growth.[5]

Laubach and Williams (2016) and Williams (2016) found a close link in the data between average growth rates and the natural rate of interest. Williams (2016) estimated that in the US, the natural rate of interest has declined substantially over time.

[5] Ambler and Alexander (2015) look at the theoretical arguments and the implications for the Canadian economy.

The Bank of Canada estimated[6] that in 2014 the long-run real neutral interest rate in Canada was between 1 and 2 percent, meaning that with an inflation target of 2 percent, the long-run nominal natural interest rate in Canada is in the range of 3 to 4 percent.[7]

The next subsection considers some of the implications of lower interest rates for monetary policy, but before that it is important to note that some authors contest the ideas that interest rates have moved permanently lower since the Great Recession. Beckworth and Ponnuru (2014) point out that ex ante real interest rates at longer horizons also contain a term premium. According to their calculations, the term premium in the US has been falling in lock step with nominal yields, the ex ante real interest rate has remained stable over the last forty years. In 2014 it was below its average over this time period, but this can be attributed to cyclical factors (output well below its potential). Figures 1 and 2 below (from Beckworth 2014) illustrate their argument graphically.

Taylor and Wieland (2016) also argue that the current period of low interest rates is temporary. They contend that the equations typically used to estimate the equilibrium real interest rate contain omitted variables such as regulations, tax policy, and central bank reponses to financial variables that make the estimates highly uncertain. Both of these studies point towards cyclical factors as the culprit for low real interest rates during the recovery.

[6] See Mendes (2014).

[7] At the time of writing, the Bank's estimate of the long-run (nominal) neutral interest rate is from 2.5 to 3.5 percent. See the the Bank's July (2017) *Monetary Policy Report*.

Figure 1: Counterargument

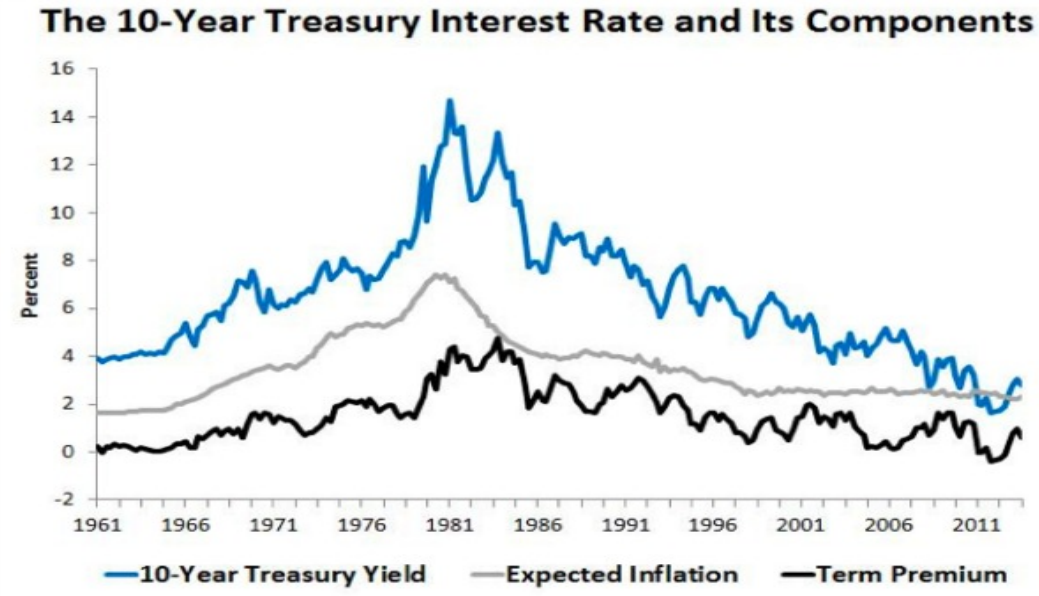
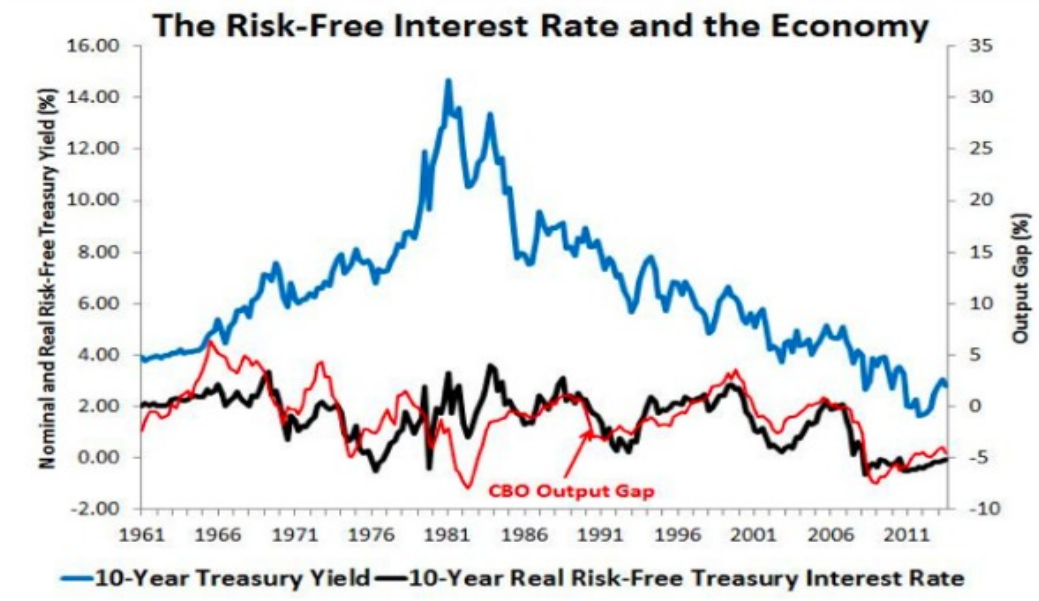


Figure 2: Counterargument (cont.)



Both sets of authors predict a return of real interest rates to their levels before the Great Recession in the longer term.

Two caveats are important in this context. First, if it were true that the term premium was higher before the Great Recession, longer-term real interest rates net of this term premium were already quite low. This would imply that risk-free real interest rates were and will continue to be quite low. Second, some of the same factors highlighted in the literature on secular stagnation are also likely responsible for falling term premia: this would include demographic factors and the shortage of safe assets.

2.2 Broad Implications for Monetary Policy

It seems likely that a combination of demand-side and supply-side factors are responsible for the slow economic recovery since the Great Recession. This would lead us to consider the effectiveness of monetary policy during the recovery period and whether the inflation targeting paradigm is still the appropriate monetary policy framework.

Kiley and Roberts (2017) show that purely as a matter of simple statistics the zero lower bound will bind more often with lower long-term natural interest rates. They note that for the US the average Federal Funds Rate (the policy rate of the Federal Reserve) between 1960 and 2007 was 6.1 percent, with a standard deviation of 3.25 percent. If the rate followed a normal distribution, it would be equal to or less than zero about 5 percent of the

time.[8] If the average Federal Funds Rate were to fall to 3 percent with no change in its dispersion, it would be equal to or less than zero almost 18 percent of the time.

The natural implication of lower neutral interest rates is that if inflation targeting remains the monetary policy framework it will be difficult for central banks to achieve their inflation targets on average if these remain low. Even if central banks hit their inflation targets on average during periods when the effective lower bound is not binding, averaging over periods when policy rates are above their lower bound and periods when they are constrained by the lower bound, this means that average inflation rates will be below target.

This would suggest a more radical rethinking of the monetary policy framework to prepare for future shocks that will push interest rates to their lower bound. The following section discusses the main alternative contenders (aside from the control of a short-term policy rate) that central banks have considered as tools either to reinforce the achievement of inflation targets or as alternative monetary policy frameworks. All of these UMPs were implemented by one or more central banks in response to the financial crisis, and all central banks have analyzed the effects of UMPs as they consider their options to respond to future crises.

[8] More exactly, the value of the cumulative normal distribution at zero with a mean of 0.061 and a standard deviation of 0.0325 is 0.030.

3 Unconventional Monetary Policies

Recall that "conventional" monetary policy in the inflation-targeting era has involved the use of a short-term interest rate as the primary instrument of monetary policy, with the central bank's policy rate influencing other commercial interest rates. For example, the Bank of Canada (2012) describes the effects of a decrease in its policy rate as follows.

> The main transmission channel is the effect that changes in the Bank's policy rate have on various commercial interest rates, e.g., for mortgages, for consumer loans, as well as for deposits at financial institutions. A decline in commercial interest rates reduces both the cost of borrowing and the money paid on interest-bearing deposits, which tends to encourage borrowing, spending and investing, and to discourage saving. As a result, over time, there is typically a boost to overall demand for goods and services. The opposite happens when commercial interest rates rise.

This is the conventional view on the transmission of monetary policy, and applies equally to most inflation-targeting central banks.

The principal UMPs used by central banks since the onset of the financial crisis have been forward guidance (FG), negative interest rate policies (NIRP), and quantitative easing (QE) via large scale asset purchases (LSAP).

3.1 Forward Guidance

Forward guidance involves announcing a path for the short-term policy rate rather than just its current value. The basic idea behind the use of forward guidance can best be explained in the context of a crisis like the Great Recession when policy rates are at their effective lower bound. By committing to keeping interest rates low even after a recovery is well underway and inflation has increased to a level close to the target, this will push down longer term interest rates and stimulate spending, helping to accelerate the recovery.

In one sense, forward guidance is not a radically new or different policy. There are central banks such as the Reserve Bank of New Zealand, the Norges Bank and the Sveriges Riksbank that publish conditional interest rate forecast as a regular part of their communication to the public. Svensson (2006) maintains that conditional interest rate forecasts should be an integral part of inflation targeting regimes. He writes (pages 185–186):

> Since the optimal projection is the best projection in the sense of minimizing expected squared forecast errors, it also provides the private sector with the best aggregate information for making individual decisions. Announcing the optimal projections also allows the most precise and sophisticated external evaluation of the monetary-policy framework and decisions.

There are several potential drawbacks to a policy of "lower for longer" strategy used to boost spending and inflation when the central bank's policy

rate is at its effective lower bound.

The first is the problem of time consistency. If lower future interest rates succeed in encouraging spending, which causes inflation to return to target more quickly, the central bank will be strongly tempted to deviate from its promised interest rate path in order to prevent inflation from overshooting the target. Once the announcement of the interest rate path has had the desired effect on spending, it is in everyone's interest for the central bank to renege on its promise. However, if households and firms realize this, the announcement of the interest rate path will not be credible and will not in fact have the desired impact on aggregate demand. Williams (2011) writes:

> However, there are reasons to be skeptical that forward guidance would be such a panacea in practice. One of these caveats is implicit in the theory itself. The optimal forward guidance policy is not time-consistent. According to the theory, for this policy to have the desired effects, the central bank must commit to two things: keeping the short-term policy rate lower than it otherwise would in the future, and allowing inflation to rise higher than it otherwise would. However, when the time comes for the central bank to fulfill this commitment, it may not want to do so. It might find it hard to resist the temptation to raise rates earlier than promised to avoid the rise in inflation (see Adam and Billi 2007). Indeed, policymakers have generally shied away from policies that promise temporarily high inflation in the future, such as price

> level targeting, that are in theory effective at circumventing the zero bound. This reluctance arises in part out of a concern that such an approach could unmoor inflation expectations.

A second potential problem is that interest rates are notoriously unreliable as an indicator of the stance of monetary policy. Milton Friedman famously argued this repeatedly throughout his career. In the context of Japan in the last decade of the last millenium, he wrote, "Low interest rates are generally a sign that money has been tight, as in Japan; high interest rates, that money has been easy."[9]

The effects of forward guidance are most often thought to work through the term structure of interest rates. They lower the expected **path** of short-term interest rates and, to the extent that longer-term rates are (absent term premia) averages of current and future expected short rates, announcing a path of "lower for longer" would have the main effect of stimulating demand by reducing longer-term interest rates and yields. In the context of the effective lower bound, even an announced path of a policy rate at its lower bound for an extended period of time would not be able to reduce longer-term rates all the way to zero let alone push them into negative territory.

The problem with this is that for the economies that were most severely affected by the Great Recession, including the US, the short-term neutral rate of interest was likely highly negative. Cúrdia (2015) estimated that for the US the short-term natural (or equilibrium) interest rate was as low as -4

[9]The quote is from Friedman (1997). See also Friedman (1998) and Friedman (2003).

percent during the Great Recession and in the early stages of the recovery.

Probably largely because equilibrium interest rates can become highly negative in periods of financial and/or real economic stress, central banks have started to entertain the possibility of **negative** policy rates. Some central banks (notably the Reserve Bank of New Zealand, the Norges Bank and the Sveriges Riksbank) have actually implemented these policies.

3.2 Negative Interest Rate Policies

Negative interest rate policies (NIRP) have to do with pushing the effective lower bound on policy rates even lower than zero. During the Great Recession itself, the Bank of Canada judged that in order to insure the smooth functioning of the payments system it could not reduce the overnight target below 25 basis points, which is where it remained between April 2009 and June 2010. Similarly, before 2010 most central banks thought that it would be operationally difficult to reduce their rates all the way to zero while ensuring the smooth functioning of clearing operations among chartered banks.

Traditionally, zero has been viewed as the effective lower bound because instead of holding reserves at the central bank, banks and individuals always have the option of holding cash, which by definition yields a nominal rate of return of zero.[10] This neglects the costs of storing large amounts of cash and also the security costs. Once these are taken into account, it is clear that

[10]Some authors, for example Buiter and Panagirtzoglou (2003), have proposed somewhat esoteric ways of taxing currency holdings in order that their nominal rate of return becomes negative.

the holding of reserves could be subjected to negative rates of return without creating an incentive for individuals to switch to cash holdings. Witmer and Yang (2016) estimates that the Bank of Canada's effective lower bound in 2016 was -50 basis points instead of the 25 basis points that the Bank took to be its effective lower bound in 2009.

The next logical step towards pushing interest rates even lower is the idea of abolishing cash in order to be able to push policy rates even lower. Rogoff (2015) has been one of the main advocates of this idea. He justifies it as a means of fighting crime as well as a means of tightening monetary control. However, we are in uncharted territory here and not all of the possible unintended consequences of abolishing cash have been explored. Many authors doubt whether financial markets can function efficiently when savers receive highly negative nominal rates of return on some assets. See El-Erian (2016) for a critical review. For example, Dowd and Hutchinson (2017) are extremely skeptical:

> NIRP means that you get paid to borrow and you pay to lend. But if I have to pay to lend, why would I lend at all? NIRP encourages investors to flee from their traditional safe haven, bonds, into cash or into nonfinancial assets. That is the main reason why NIRPers want to abolish cash. NIRP also creates an incentive to make payments quickly and collect them slowly, so, e.g., you rush to pay your taxes but the government doesn't want you to, and one can envisage that NIRP would create an "epochal outburst

> of socially unproductive – even if privately beneficial – financial innovation."

3.3 Quantitative Easing as Practised

The final type of UMP we consider is Quantitative Easing (QE), also known as Large Scale Asset Purchases (LSAP). QE involves the expansion of the central bank's balance sheet by the purchases of large amounts of securities. These can be either government securities issued by the private sector, and the purchases can be made either using traditional open market operations from the banking sector or directly from individuals and firms in the private sector.

QE has been extensively employed by the US Federal Reserve and other central banks such as the European Central Bank. The proponents of QE stress that it is supposed to be effective primarily by affecting the term structure of **nominal** interest rates. This is the so-called "interest rate channel." While the Bank of Canada only allowed settlement balances to remain positive for a limited period of time and to a limited extent in 2009 and 2010, the Bank has studied the possible use of QE in future crisis situations. Discussing the effects of QE, Poloz (2015) described their effects as follows (page).

> First, they create new liquidity in the banking system, which can increase the availability of credit ... Second, large-scale asset

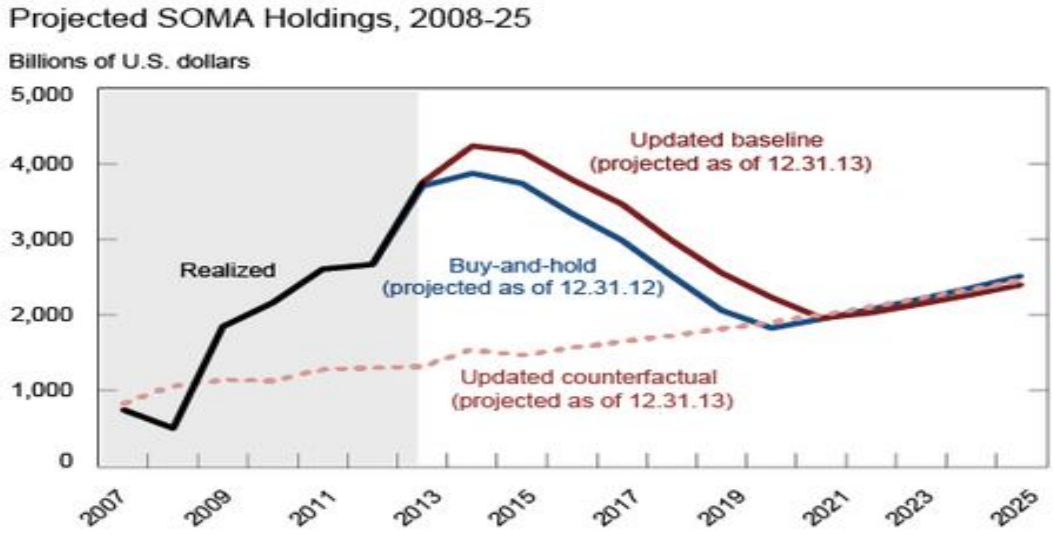
> purchases tend to lower the interest rates on the purchased assets, and on other types of debt of similar duration, which in effect flattens the yield curve, bringing longer-term interest rates down closer to short-term interest rates ... Third, such purchases of assets tend to put downward pressure on the exchange rate ...

Thornton (2015) judged, correctly in our view, that the effects on the term structure of interest rates of QE have been very weak. He surveys the large empirical literature on the impact of QE and notes that the effects are very often not significant. When they are, they are measured as decreases of tens of basis points in longer-term yields.[11] Changes of this order of magnitude are likely to have trivial effects on demand and output. The literature on the empirical effects of QE seems to neglect that it is the ex ante real interest rate that should be important for determining aggregate demand, and not the level of nominal interest rates, either short-term or long-term. Ambler and Rumler (2016) show that QE announcements (even though they were viewed mostly as temporary) did have significant but quantitatively small effects on ex ante real interest rates in the eurozone.

It is clear that QE as it has been used until now was designed to be temporary. In the US case, Beckworth (2014) shows this to be the case for QE by the Federal Reserve. He notes that a study published by the Federal Reserve Bank of New York (Cambron et al. 2014) showed that the Fed's balance sheet was expected to "return to the path it would have been on had

[11] See for example Swanson and Williams (2014).

Figure 3: Projections of SOMA Account, New York Fed



[h]

there been no large scale asset purchases (LSAPs) over the past five years. This projection is a reflection of FOMC's plan to eventually normalize the size of the Fed's balance sheet. Bonds markets have understood this plan from the beginning as is evidenced in their inflation forecasts. The FOMC formally announced its plan to normalize and shrink its balance in its June, 2011 meeting. Subsequent speeches, press conferences, and congressional testimony by Ben Bernanke have reinforced this understanding. The point is the Fed never intended the LSAPs to be permanent." The New York Fed's projections are shown in Figure 3 below.

Beckworth underlines that the key effect of the temporary nature of QE in the US is that market expectations of inflation have remained relatively weak. If it is ex ante real interest rates that affect aggregate demand, and if it

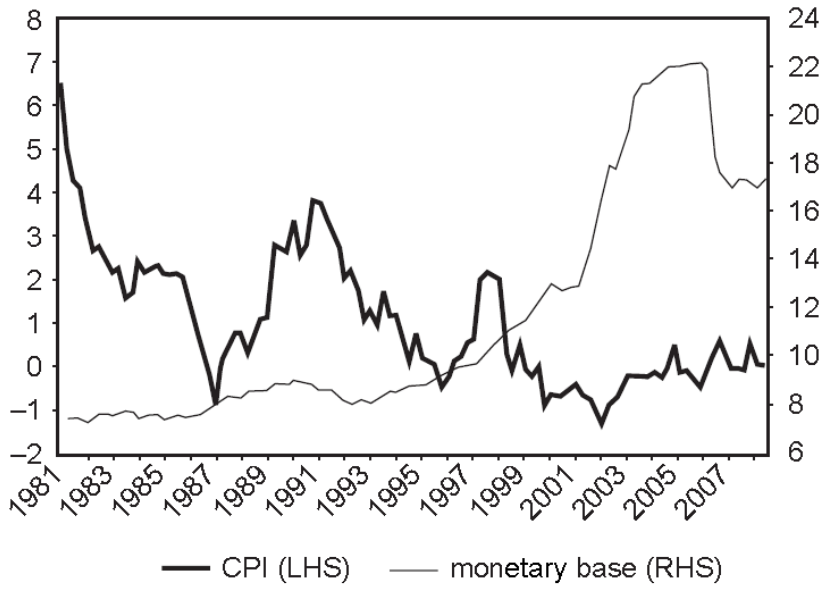
is impossible to push nominal interest rates substantially lower by FG, NIRP or temporary QE, then the only remaining option to stimulate spending is by affecting inflation expectations. For this, QE has to be permanent, as shown in the next section.

The Japanese experience with QE confirms the weak effects of temporary increases in central bank balance sheets. Figure 4 (Figure 6 in Wieland 2010) illustrates the Japanese experience with QE. The Japanese monetary base spiked up sharply in 2001 as QE was implemented. As soon as Japanese inflation turned slightly positive in 2006, the Bank of Japan shrank the monetary base so that it returned to the growth path it was on before 2001. Inflation remained subdued and the real recovery was very weak. The vertical scale in the figure for the monetary base is in levels rather than logs. It is easy to imagine a smooth exponential curve following the expansion of the monetary base up to the year 2000, and rejoining the level of the monetary base from 2007 on.

There is a well-established literature that show why temporary QE should have very weak effects on demand and inflation, while permanent changes in the central bank's balance sheet can be expected to have strong effects on inflation and real variables. We turn to this in the next section.

Figure 4: Japanese Monetary Base and Inflation (Wieland 2010)

Figure 6. Base money and CPI inflation in Japan: 1981 – 2008, quarterly observations.



4 Effective QE

As just noted, the idea that QE needs to be permanent to be effective is extremely well established in the literature. Beckworth (2017) surveys a large number of papers that show that this is an idea that is an idea that is accepted by macroeconomists from all schools of thought.[12] Friedman and Schwarz (1963) long ago described the mechanism in a passage that begins (page) "Let us now suppose that an unexpected rise to a new level occurs in

[12]Table 1 in his paper brings together citations from 14 different peere-reviewed articles and statements by central bankers.

the rate of change in the money stock, and it remains there indefinitely . . . " Krugman (1998) wrote, "A monetary expansion that the market expects to be sustained (that is, matched by equiproportional expansions in all future periods) will always work, whatever structural problems the economy might have; if monetary expansion does not work – if there is a liquidity trap – it must be because the public does not expect it to be sustained." Woodford (2012) put it this way: "If, instead, one were to assume a permanent increase in the size of the monetary base, and assume that it is immediately understood by the everyone in the economy that such a permanent change in policy has occurred, then such a policy would be predicted to have an immediate positive effect on economic activity during the period in which the lower bound binds . . . "

The underlying argument for the effectiveness of permanent QE is based on nothing more than the long-run neutrality of money, which is also generally accepted across all schools of macroeconomic thought and well supported by the data: see Benati (2009) and Nelson (2008). If prices must increase in proportion to the growth of the monetary base (adjusted for any real growth), then inflation must eventually respond positively in order that prices may rise to restore neutrality.

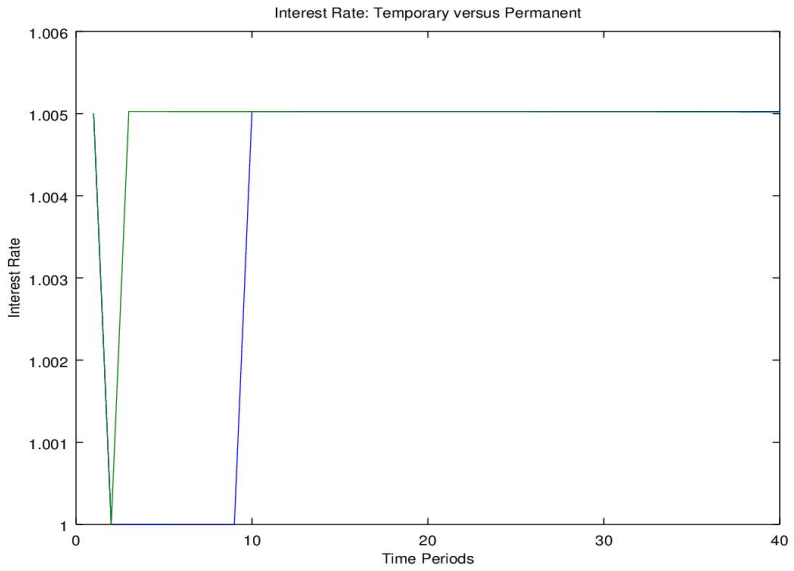
It is relatively straightforward to show this in a simple theoretical model. Ambler (2017) uses a relatively vanilla New Keynesian model to illustrate the different impact of temporary increases in the monetary base from permanent increases. The model is similar to the basic three-equation New Keynesian

model as layed out in the third chapter of Woodford (2003) or the third chapter of Galí (2008). The only modifications are: (1) the addition of money in the utility to generate a standard money demand function; (2) the addition of capital with convex investment adjustment costs which affect the (non)-propagation of a temporary shock to the monetary base; (3) the replacement of the short-term interest rate by the monetary base as the central bank's main monetary policy instrument.

Figure 5 below shows the response of the nominal interest rate to two different policy experiments. The vertical axis shows the gross quarterly rate of return on a riskless one-period government bond. There is zero steady-state inflation. The long-run nominal and real interest rate are equal to 2% (annualized). The green path shows the interest rate response to a surprise permanent increase in the monetary base. The blue path shows the interest rate path in response to a temporary (eight-quarter) increase in the monetary base: the initial increase is a surprise, but the temporary nature of the policy is perfectly understood by individuals so that the decrease of the monetary base to its initial level after eight quarters is perfectly anticipated.

The differences between the effects of the two types of policy are striking. In response to the permanent shock, the interest rate is pushed to the zero lower bound for one period. It then increases to a level that is virtually indistinguishable from its steady-state value from the second quarter onwards. The money market clears at a positive rate of interest because aggregate demand increases substantially in response to the policy shock,

Figure 5: Lower for Longer is Less Expansionary



which increases the demand for real balances. In turn, aggregate demand picks up substantially because inflation increases sharply, driving down the ex ante real interest rate. In response to temporary QE, the interest rate is pushed to the zero lower bound and remains there for the full eight quarters, increasing only when the monetary base shrinks back to its initial level. The only way for the money market to clear is if the nominal interest rate falls enough for money demand to increase (given the model's specification of preferences, money demand is highly elastic at a low nominal rate of interest). Inflation barely moves at all, and the effects on aggregate demand (and therefore output) are very weak.

Two main mechanisms explain the weak impact of a temporary increase in the money supply on inflation.

The first mechanism operates in the presence of nominal price rigidities and follows from how firms optimally set their prices when they can do so. When QE is temporary, price-setting firms know that the price level must eventually revert to its path before QE. Firms do not raise their prices much during QE in order not to be stuck with relative prices that are too high when QE ends.

The second mechanism is in effect even in the absence of nominal price and wage rigidities. Significant inflation in response to temporary QE would entail significant deflation when QE ends. If the end of QE is anticipated this entails high ex ante real interest rates. Consumption smoothing and investment adjustment costs act as a brake on abrupt swings in the ex ante real interest rate. This is not a new theoretical result. The mechanism was first identified by Bernholz (1988), Calomiris (1988) and Sumner (1993) in the context of American colonial monetary history. Smith (1988), noting historical episodes of rapid money growth not accompanied by high inflation, had interpreted this as a rejection of monetarism. Bernholz, Calomiris and Sumner countered that since the rapid monetary growth was expected to be reversed, the lack of inflation could easily be explained within a monetarist framework.

As long as there is a well-defined money demand function, there is always a well-defined path for the interest rate that can replicate a monetary policy using the monetary base as the central bank's instrument. This would seem

to imply that forward guidance can be used as a substitute for QE.[13] However, in order to use forward guidance instead of QE the central bank would have to have a perfect knowledge of the form and parameters of the money demand function. As illustrated by the difference in response between a temporary and a permanent expansion of the monetary base, "lower for longer" does not necessarily mean a more expansionary monetary policy. In fact the simulation results show that in this case the nominal interest rate remains lower for longer in response to the monetary policy change that is by far less expansionary. If money demand is relatively elastic at low rates of interest, small errors in the interest rate could have large consequences in terms of the path of money balances. If money demand shocks are important, this would be even more difficult. Using QE requires only that money be approximately neutral in the long run: the exact parameters of the money demand function will have only second-order effects on the path of output and inflation.

4.1 The Equivalence of Helicopter Drops and Quantitative Easing

Some authors have proposed the use of "helicopter drops" to boost aggregate demand and inflation. In their view, helicopter drops are a policy that is distinct from QE because they require explicit coordination with the fiscal authorities and therefore somehow undermine central bank independence.

[13] With a model similar to the one studied here (but without money), Eggertsson and Woodford (2003) show how to use forward guidance to stimulate demand with a policy rate stuck at its zero lower bound.

This is certainly one way of achieving a permanent expansion of the monetary base. The treasury finances an increase in spending or a cut in taxes by borrowing from the central bank, and the corresponding increase in the central bank's liabilities constitute an increase in the monetary base.

However, no such coordination is necessary. If the central bank expands the monetary base via a conventional open market operation, it acquires interest-bearing government debt. The treasury must pay the interest on the debt, but as long as the central bank's operating costs are not affected, the interest payments increase the central bank's profits, which are returned to the treasury. As noted by De Grauwe and Ji (2015), "Of course, typically the central bank keeps the government bonds on its balance sheet, thereby creating the fiction that these bonds still exist. These bonds, however, are just a claim of one branch of the public sector (the central bank) against another branch of the public sector (the government). These two branches should be consolidated into the public sector, and then it turns out that these claims and liabilities cancel out."

A permanent open market operation does relax the government's intertemporal budget constraint, as noted and demonstrated formally by Buiter (2014).[14] This means that the present value of government spending minus taxation must necessarily increase. However, the exact form of the change in fiscal policy does not have to be agreed to in advance: the central bank can

[14]He gives the precise technical conditions under which permanent open market operations expand the wealth of the private sector and relax the government's budget constraint.

act unilaterally.[15]

4.2 Implications

The idea that effective QE necessarily means permanent changes in the level or path of the central bank's balance sheet has several important implications for the conduct of monetary policy.

1. In the simple numerical exercise considered in the previous subsection, the simulations assume perfect foresight. In the presence of uncertainty, expectations are crucial. QE must be expected to lead to a permanent increase in the money supply in order to be effective in stimulating demand and output.[16]

2. The end point or final level of the central bank's balance sheet must be clearly communicated to the public, and this must be credible, in order to create the expectation of a permanent increase in the monetary base. The promise of a permanent increase in its balance sheet is subject to the same time inconsistency problems as forward guidance. Once

[15] Cohen-Setton (2015) also develops in greater detail the argument for the equivalence of QE and helicopter money, less technically than Buiter's (2014) article. For a critical view of helicopter money, see Borio, Disyatat and Zabai (2016).

[16] Woodford (in Reichlin, Turner and Woodford 2013), discussing the difference between "traditional QE" and "helicopter money" noted, "Under quantitative easing, people might not expect the increase in the monetary base to be permanent – after all, it was not in the case of Japan's quantitative easing policy in the period 2001–2006, and US and UK policymakers insist that the expansions of those central banks' balance sheets won't be permanent, either – and in that case, there is no reason for demand to increase. Perhaps in the case of helicopter money, it would be more likely that the intention to maintain a permanently higher monetary base would be believed."

successful, if inflation is costly it is in the interest of the central bank to renege on it promise of a permanent increase in the balance sheet.

3. A natural way of achieving credibility for the final level of the balance sheet would be to adopt some form of level targeting such as price-level-path targeting or nominal GDP path targeting.[17]

4. Because only a permanent increase in the monetary base is effective, it is necessary that QE lead to a rate of inflation that is temporarily higher than the target rate of inflation. Because inflation must overshoot the target rate in response to QE, there might be a danger of inflation expectations becoming unanchored. It has certainly been the case that inflation hawks both in the US and in Europe have been predicting rapid and even uncontrollable inflation in response to QE by the Fed and the European Central Bank. Some form of level target would help calm these fears and help keep medium-term inflation expectations anchored in addition to making the permanence of money supply increases more credible.

5. Temporary QE is very ineffective in boosting demand and output, but it has an unambiguously stronger impact on nominal interest rates. The short term interest rate decreases for longer in response to a temporary increase in the base. Under perfect foresight, longer-term interest rates are just averages of future short-term rates. This means that a

[17] Rowe (2009) develops this argument.

temporary QE policy must exert stronger downward pressure on the term structure than a permanent QE policy. A corollary of this point is that an econometrician looking for evidence of the effectiveness of QE by estimating the impact of changes in the central bank's balance sheet on the term structure could come to very misleading conclusions. Econometric estimates take it as given that the appropriate way to measure the impact of an increase in base money is as the response to an innovation to a given stochastic process. By construction such estimates cannot pick up a change in the degree of persistence of a given increase in base money.

6. The simulation results point to a corollary to Friedman's (1997) dictum that short-term nominal interest rates are generally a poor indicator of the stance of monetary policy. The simulation results show that low interest rates can also be sign that monetary policy is expected to be tight in the future.

5 Potential Objections to Effective QE

Several potential objections to QE (interpreted as permanent changes in the monetary base, which makes QE essentially equivalent to helicopter drops, as we have argued) have been raised in the literature. We consider some of these objections and how to meet them in this section.

5.1 Time Inconsistency

QE potentially suffers from the same problem of time inconsistency as forward guidance. Once the promise to permanently expand the central bank's balance has had its effect on output and inflation, the central bank will be tempted to renege on its promise to not reduce the size of its balance sheet. If it does renege, it loses credibility and future announcements of QE will have much weaker effects because inflation will be expected to be systematically **lower** than target in the medium-to-long run.

5.2 Unanchored expectations

A potential drawback related to time inconsistency is that inflation expectations could become unanchored. If, as in the previous subsection, the central bank reneges on its promise to permanently increase the size of its balance sheet, individuals may lose faith in its ability to attain its inflation target. There is another possibility. If the central bank can boost demand by permanently increasing the money supply once, it can do so again. If the central bank gives into this temptation, this would lead to an inflationary bias and inflation expectations could become unanchored in the upward direction. Dowd and Hutchinson (2017) write:

> These considerations lead to the third and biggest problem with helicopter money, namely, that it threatens to destroy altogether any last remaining constraints against the overissue of base money.

> If helicopter money is tried and is perceived to have been a success, there will be pressure to repeat the operation; if it fails, there will be calls to escalate the program because it wasn't tried on a big enough scale.

As noted above, one way of making the permanence of the increase in the money supply credible is to adopt some form of level targeting. In order to allay fears that QE will repeatedly by used to boost aggregate inflation and demand, the level target should be made **symmetric**. This means that a period of overshooting of the inflation target will be counterbalanced by a period of undershooting, just as a period of low inflation will be counterbalanced by a period of inflation higher than the target.

Level targeting has two other huge advantages. First, it is a substitute for credible commitment in the sense of Kydland and Prescott (1977). This was demonstrated by Vestin (2006): under certain conditions, a central bank that chooses its policy optimally under discretion to hit a price level target can achieve the same outcomes as a central bank that targets inflation and is able to precommit to its future policies. Second, level targeting avoids the problem of multiple steady-state equilibria that is an inherent problem associated with inflation-targeting regimes. This was demonstrated in the context of price-level targeting by Ambler and Lam (2016).

5.3 Choice of Target

We have suggested some form of symmetric level targeting. If this were to mean price-level targeting, it could imply that a spike in commodity and/or energy prices, which has an immediate impact on headline inflation, could lead the central bank to tighten monetary policy in response. This would put downward pressure on the prices of all goods other than the commodity or energy price that had spiked, and could lead to a suboptimal fall in demand and output. In other words, price-level path targeting may work well in response to demand shocks, but is suboptimal in response to supply shocks.

A remedy to this problem would be to target something other than a path for headline inflation. Beckworth (2017b) argues that targeting a path for nominal GDP avoids the "knowledge problem" of having to distinguish between supply and demand shocks. He shows how nominal GDP targeting leads monetary policy to respond in the right way to both supply and demand shocks, so that it becomes necessary only to observe or predict movements in nominal GDP (this could also mean relying on markets to forecast movements in nominal GDP).

Another alternative would be to target a different price index. The theoretical literature has shown that when nominal price rigidity differs across sectors, it is optimal to target an index of sticky prices only.[18] It would be possible and desirable to target an index of sticky prices that are more sticky. A sticky-price CPI is already being calculated and updated in the US

[18] See Aoki (2001).

by the Federal Reserve Bank of Atlanta: See Bryan and Meyer (2016) for more details.

5.4 Fiscal Consequences?

We have already noted that permanent QE does not necessarily require explicit cooperation with the fiscal authorities, even if QE does imply changes in the government's intertemporal budget constraint. As long as the central bank purchases government debt, either through transactions with the banking system or with non-banks, its assets holding are of the "traditional" type. QE can mean purchasing other types of assets. For example, subsequent to the financial crisis the Fed expanded its asset holdings to include such things as mortgage-backed securities. Purchasing some types of private securities and not others can and has been interpreted as taking an active role in credit allocation. The Fed took a fair amount of flak for going down this road.[19] Goodfriend (2014) argues that strong guidelines are needed to limit the Fed's (and by extension other central banks') ability to allocate credit in discretionary fashion. One simple possibility would be to limit central banks' assets to include only central government debt.[20]

[19] See for example Cochrane (2009), Hummel (2011), and White (2015).

[20] In the case of common currencies areas such as the eurozone this would not be sufficient since the central bank still has discretion over which countries' government debt to hold. De Grauwe and Ji (2015) suggest simple procedures to avoid the fiscal consequences of the ECB possibly assuming the risks of sovereign default, by withholding seignorage payments until the ECB recoups any losses due to sovereign debt default.

6 Conclusions

The implications of the paper for the conduct of monetary policy in an environmnet with a low natural rate of interest can be summarized succinctly as follows.

1. Make monetary policy effective by using permanent QE.
2. Make QE credible via some form of level targeting.
3. Use symmetric level targeting to remove the dangers (and fears) of high or out-of-control inflation.

QE can be effective, if properly implemented, can be effective in a low interest-rate environment. Effective QE will also help to boost nominal interest rates and

The analysis also leads to a corollary of Friedman's dictum concerning the unreliability of interest rates as an indicator of monetary policy. Friedman stressed that low interest rates can be an indicator that monetary policy has been tight in the recent past. The corollary stataes that interest rates can be low because monetary policy is **expected to be tight in the future**.

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