Nominal GDP Level Targeting*

Steve Ambler†

May 2020

Abstract

We consider the pros (and a few of the cons) of a monetary policy framework in which the principal goal is the targeting of a path for nominal GDP. We argue that it could lead to a significant improvement in economic performance over the current inflation targeting framework. It is more robust in the face of aggregate supply shocks and when it is difficult to identify the different shocks that are hitting the economy. It also provides a way of effectively providing economic stimulus in periods of recession or crisis.

*Prepared for *Choosing the Right Target: Real Options for the Bank of Canada's Mandate Renewal*, Max Bell School Monetary Policy Conference, September 2020

†École des sciences de la gestion, Université du Québec à Montréal and C.D. Howe Institute, steve.ambler@gmail.com. Preliminary and incomplete. Please do not quote without permission.

1 Introduction

The idea that central banks should adopt a monetary policy framework in which the principal goal is the stabilization of nominal GDP has a long history in academic and policy circles. (I will henceforth refer to targeting a path for nominal GDP as NGDPLT or nominal gross domestic product level targeting.) Selgin (2018) summarizes this long intellectual history starting with the book by Samuel Bailey (1837) and including Hayek (2008), Meade (1993) and Tobin (1980).

A number of modern luminaries of the academic and policy worlds have spoken in favour of NGDPLT: Nobel laureate Paul Krugman (2011), former chair of the Council of Economic Advisers Christina Romer (2011), former Federal Reserve Bank chair Janet Yellen (Bernanke and Yellen 2018), St. Louis Fed president James Bullard (Bullard and DiCecio 2019), Dallas Fed senior vice president Evan Koenig (2010), Chicago Fed president Charles Evans (2019), former Bank of Canada (and Bank of England) Governor Mark Carney (2012), Michael Woodford (John Bates Clark professor of political economy at Columbia University, 2012), Jeffrey Frankel (James W. Harpel Professor of Capital Formation and Growth at Harvard's Kennedy School, 2018), former Bank of England deputy governor Charles Bean (1983), and many others.

The goal of this chapter is to do a selective survey of the literature on NGDPLT. I will attempt more to synthesize than to innovate, while standing on the shoulders of many recent scholars. Many of these scholars belong to the so-called "market monetarist" school, perhaps the first school of economic thought to develop primarily on the web (Christensen 2011). The key publications of the market monetarist school include Sumner (2011, 2012, 2013, 2019), Beckworth (2010, 2017, 2019, 2019b), Hendrickson (2012, 2012b), Beckworth and Hendrickson (2019), Hetzel (2009, 2012, 2015), Christensen (2011), Nunes and Cole (2013), and Rowe (2011).

After a brief discussion of what NGDPLT entails, I summarize (in the third section)

the main arguments in favour of NGDPLT. In the fourth section I consider the possible objections to NGDPLT and whether or not they are well founded. The fifth section offers conclusions.

2 What Does NGDPLT Entail?

Nominal gross domestic product is a measure of the monetary value (dollars in Canada) of total spending on final goods and services in the economy. NGDPLT entails specifying a growth path for total spending and tailoring monetary policy in order to hit that target. If current nominal GDP were below the growth path, monetary policy would become more expansionary. If were above the growth path, it monetary policy would be tightened.

NGDPLT is compatible with different choices for the central bank's main policy instrument. This could mean using a monetary aggregate as an intermediate target or controlling a short-term nominal interest rate, as is currently the case of most central banks with explicit inflation targets. We will have more to say about this below in the context of the zero lower bound on central banks' policy rates.

In the case where the central bank's instrument is a short-term interest rate (currently, the Bank of Canada's main policy instrument is the target overnight rate),[1] the central bank would follow a feedback rule of the following form.

$$i_t = i^* + \alpha \times \ln\left(GDP_t - GDP_t^*\right). \tag{1}$$

Here, i_t is the value of the central bank's policy interest rate, i^* is the neutral policy rate compatible with nominal GDP being on its target path, and $\ln\left(GDP_t - GDP_t^*\right)$ is the proportional (in logs) gap between the current level of nominal GDP (GDP_t) and the target (GDP_t^*). The α parameter The target level of nominal GDP would

[1] The overnight rate is the interest rate at which banks lend to each other in the overnight market.

normally follow an exponential growth path, so that

$$\ln\left(GDP_t^*\right) = \ln\left(GDP_0^*\right) + \beta \times t,$$

where β is the predetermined growth rate of nominal GDP along the target path. This would normally be constant, and could be chosen to equal the sum of the estimated growth rate of (real) potential output and a targeted average rate of inflation.

With NGDPLT we can express the central bank's feedback rule very simply (more on this below) and it has the advantage of depending on only one variable, the current level of nominal GDP.

Data on nominal GDP are typically published with a lag, so that GDP_t is not directly observable by the central bank when it makes its decision concerning i_t. In practice, the central bank will have to estimate the current level of nominal GDP (more on this below) so that its feedback rule can be written as

$$i_t = i^* + \alpha \times \ln\left(\mathrm{E}_t\left(GDP_t\right) - GDP_t^*\right), \tag{2}$$

where $\mathrm{E}_t\left(GDP_t\right)$ is the central bank's best estimate of current nominal GDP based on available information at time t.

NGDPLT allows the central bank to achieve (on average) a targeted rate of inflation as long as it can forecast the rate of growth of potential (real) GDP. For example, if potential GDP grows at a rate of 2 percent, then a targeted growth rate of nominal GDP of 4 percent will lead, on average, to an inflation rate of 2 percent. Note also that if nominal GDP grows at a constant rate, inflation will be counter-cyclical. If real GDP grows faster than potential, which it does during the expansion phase of the cycle, inflation will be lower to maintain a constant rate of growth of nominal spending.

3 The Advantages of NGDPLT

3.1 NGDPLT is a History-Dependent Rule

The ”L” in NGDPLT is important. Targeting a path for nominal GDP means that the central bank must correct for past deviations of nominal GDP from its targeted path. If an unexpected negative shock pushes nominal GDP below its target path (the analysis of a positive shock is completely symmetric), monetary policy must become more expansionary, sufficiently so for nominal GDP growth to become greater than its average rate so that it can catch up to its growth path.

This has two important consequences. The first consequence is the impact of the NGPLT framework on expectations. If the framework is credible, individuals will come to expect a higher rate of real growth and a higher rate of total spending than they otherwise would. This will have a positive impact on both consumption and investment spending, and means that the central bank's policy will have to be less expansionary to achieve the same effect on demand. Monetary policy has to work less hard to achieve the same results.

The second consequence is that level targeting or level path targeting constitutes a form of credible commitment. Optimal monetary policy in the absence of an ability to pre-commit to future policies is referred to in the literature as optimal discretionary monetary policy. The distinction commitment and discretion is crucial. Plosser (2007) gives good working definitions:

> Commitment means delivering, in any particular situation, on past promises. In other words, the policymaker unequivocally will follow through on a promise made about future actions. Discretion, on the other hand, means that the policymaker is not bound by previous actions or plans and thus is free to make an independent decision every period.

A standard result from the literature on game theory and economic policy is that

optimal policy with pre-commitment can achieve a higher level of economic welfare than policy under discretion. Without commitment, in many cases it will be optimal (in terms of economic welfare) for the central bank to deviate from its announced policy path. However, if does so its announced policy path will no longer be credible and the beneficial effects on expectations alluded to above will be lost.

Adopting a level target can act as a substitute for commitment when optimizing. This has been shown in the context of price-level path targeting (henceforth PLT) versus inflation targeting (henceforth IT). Vestin (2006) showed a remarkable result: by assigning to a central bank the objective of targeting a path for the price level, it can (under certain assumptions) achieve under discretion the same level of economic welfare that it could under commitment with an inflation target.

The intuition for Vestin's result is straightforward. Assigning the central bank an objective function that depends on price-level deviations, rather than inflation, has the effect of conditioning the expectations of agents in the private sector. A positive inflation shock (due for example to an unexpected increase in production costs for firms) reduces expectations of future inflation, since lower inflation is necessary to get the price level back to its predetermined growth path. This has the same effect as if the central bank acted optimally and could commit to its future policy. Giving this objective function to the central bank is a substitute for commitment.

The Bank of Canada's current IT regime does not have this property of history dependence. If inflation falls below its 2 percent target, the level of the consumer price index falls below what it otherwise would have been. The Bank eases monetary policy in order to get inflation back up to target. The price level remains on a path below its previous trajectory. This is known as price-level drift, and means that the price level is harder to predict farther into the future, making contracts between parties that specify nominal payments subject to uncertainty. Clarida, Galí and Gertler (1999) first showed that optimal monetary policy under commitment implies price-level

stationarity (and perfect predictability in the absence of shocks) in the standard New Keynesian model.[2] This implies that current IT regimes in which past shocks to the price level are treated as bygones are suboptimal.

3.2 NGDPLT Avoids the Indeterminacy Problem

The current IT regime as practised by the Bank of Canada and by many other central banks around the world involves using a short-term interest rate to affect aggregate demand, thereby indirectly affecting the rate of inflation. The goal is to bring inflation to a target value within a planning horizon of a few quarters. Canada's targeted rate of inflation is 2 percent, and the Bank aims to keep inflation within a target band of 1 percent to 3 percent except in exceptional circumstances.

IT has a major theoretical drawback. Benhabib, Schmitt-Grohé and Uribe (2001) show that under IT and monetary policy that follows a Taylor rule, the economy **always** has two long-run equilibria once it is understood that the central bank's policy interest rate cannot fall below a minimum.[3] One of them involves inflation at target and output at potential. This is the **good** equilibrium. The other occurs when the policy rate is stuck at its lower bound and output is below potential: this is the **bad** equilibrium. This multiple equilibrium problem is illustrated in Figure 1 below. The green curve is the Taylor rule itself and shows how the central bank's policy rate responds to inflation. In the long run, the nominal policy rate has to equal the real interest rate (which is taken as given and constant) plus the rate of inflation — this is the so-called Fisher condition. There are two points where the blue (Fisher condition) and green curves intersect, and therefore two possible long-run equilibria.

The upward-sloping portion of the green Taylor rule curve has a slope greater than one: the central bank's policy rate increases more than one-for-one with inflation. In

[2] Amano, Ambler and Shukayev (2012) analyze when price-level stationarity is not optimal when the central bank must choose its monetary policy before observing all shocks.

[3] The lower bound on the policy rate is mildly negative once one accounts for the costs of holding cash. Several central banks such as Sweden's Riksbank, the European Central Bank, and the Swiss National Bank have had negative policy rates at different times since the financial crisis.

Figure 1:

this region, the so-called Taylor principle is satisfied.[4] The Taylor principle says the following. In order to be able to achieve a target inflation rate, the central bank must be able to increase the **real** interest rate by more than an unexpected increase in the rate of inflation (and vice versa) in order to decrease aggregate demand and bring inflation back down. Consequently, the central bank's nominal policy rate must be able to vary by more than the increase in inflation for the real interest rate to increase. At low interest rates and close to the bad equilibrium, the central bank cannot vary its policy interest rate by as much as the inflation rate varies. The result is dynamic indeterminacy in the region of the bad long-run equilibrium: many different dynamic equilibria are possible in such an environment, and starting from a situation with low inflation and high unemployment the economy may actually be drawn towards the bad steady state rather than gravitating towards the steady state with full employment and

[4] See Galí (2008, page 128).

inflation equal to its target.

This property of IT regimes might appear to be just a theoretical curiosity. However, Bullard (2010) argued that this explains why Japan went through its "lost decade." He also claimed that the U.S. was in danger at that time of falling into a similar low-output trap. Subsequent to the 2008 financial crisis and the Great Recession, many central banks had policy interest rates that were at or close to their effective lower bounds.

Because NGDPLT pins down the **level** of a nominal variable (total spending) it cannot suffer from the same indeterminacy problem as IT.[5]

3.3 NGDPLT is Superior to both IT and PLT in the Face of Supply Shocks

Both IT and PLT suffer from a major drawback. They lead the central bank to increase (decrease) its policy rate in response to an increase (decrease) in the rate of inflation, irrespective of the reason for the change in inflation. If the underlying cause of the change is a shock to aggregate demand, output and inflation tend to move in the same direction. With nominal frictions (sticky prices and wages), output moves away from full-employment output, and an active monetary policy can improve economic welfare.

A shock to aggregate supply has the effect of moving output and prices in opposite directions. If the shock is temporary, active monetary policy can improve economic welfare, but under IT and PLT monetary policy may in fact make things worse. Consider a temporary negative aggregate supply shock (the case of a positive shock is symmetric).[6] This pushes real output below its frictionless level, and also leads to an increase in the price level and inflation. Under strict IT or PLT, the central bank must

[5] Ambler and Lam (2016) demonstrate an analogous result that the PLT regime is not subject to the same indeterminacy as IT.

[6] For the sake of concreteness, assume a temporary positive shock to the markup of prices over marginal costs.

tighten monetary policy in order to reduce aggregate demand and inflation. This exacerbates the negative impact on output. Under NGDPLT, because inflation and real output growth move in opposite directions, the impact on the rate of growth of nominal GDP will be very small.[7]

In fact, central banks with inflation targets typically are not strict inflation targeters, but rather employ what is called **flexible** inflation targeting. This means that they can decide not to counteract a change in prices or inflation in the short run depending on the economic situation. They can respond to changes in unemployment and output as well as fluctuations in the inflation rate.

However, in order not to do the wrong thing in response to an aggregate supply shock, central banks have to be able to distinguish among the types of shocks hitting the economy when they formulate their monetary policy. Hetzel (2009, 2012) argues persuasively that poor monetary policy by the Fed and other central banks in 2008 exacerbated the severity of the Great Recession. They failed to recognize the importance of the rise in energy prices (a negative supply shock) on inflation. He states (2009, pages 211–212):

> With the energy price shock that began in the summer of 2004, central banks initially allowed headline inflation to rise. I argue in the next section that the world's major central banks, in the summer of 2008, despite deteriorating economic activity, became unwilling to lower their policy rates because of fear that headline inflation in excess of core inflation would raise inflationary expectations. The resulting monetary stringency turned a moderate recession into a major recession.

This means that IT and PLT are subject to what Beckworth (2017, page 2) refers to as a **knowledge problem**. "The knowledge problem in this context is that Fed officials are unlikely to know in real time what kind of shock is causing changes in inflation.

[7] If the price elasticity of the aggregate demand curve is equal to minus one, there will be no impact on NGDP growth, and the central bank will not have to react at all to the shock.

Knowing the difference, however, is crucial, because responding to supply-shock-driven movements in inflation could destabilize the economy."

NGDPLT is a robust regime that works without having to identify the underlying shocks affecting the economy.

The argument developed in this section can be illustrated with a simple aggregate supply/aggregate demand analysis of the kind found in many undergraduate textbooks such as Cowen and Tabarrok (2018) See Figure 2 below.[8]

The rate of change of real output is measured on the horizontal axis. Inflation is measured on the vertical axis. The long-run aggegate supply curve (LRAS) is vertical, and potential output is assumed to be growing at an annual rate of 3 percent. The aggregate demand curve (AD) traces the combinations of real growth and inflation that keep total spending growing at the same rate, in this case 5 percent. In the long run, aggregate demand is growing at 5 percent per year, so that inflation is equal to 2 percent. The short run aggregate supply curve (SRAS)

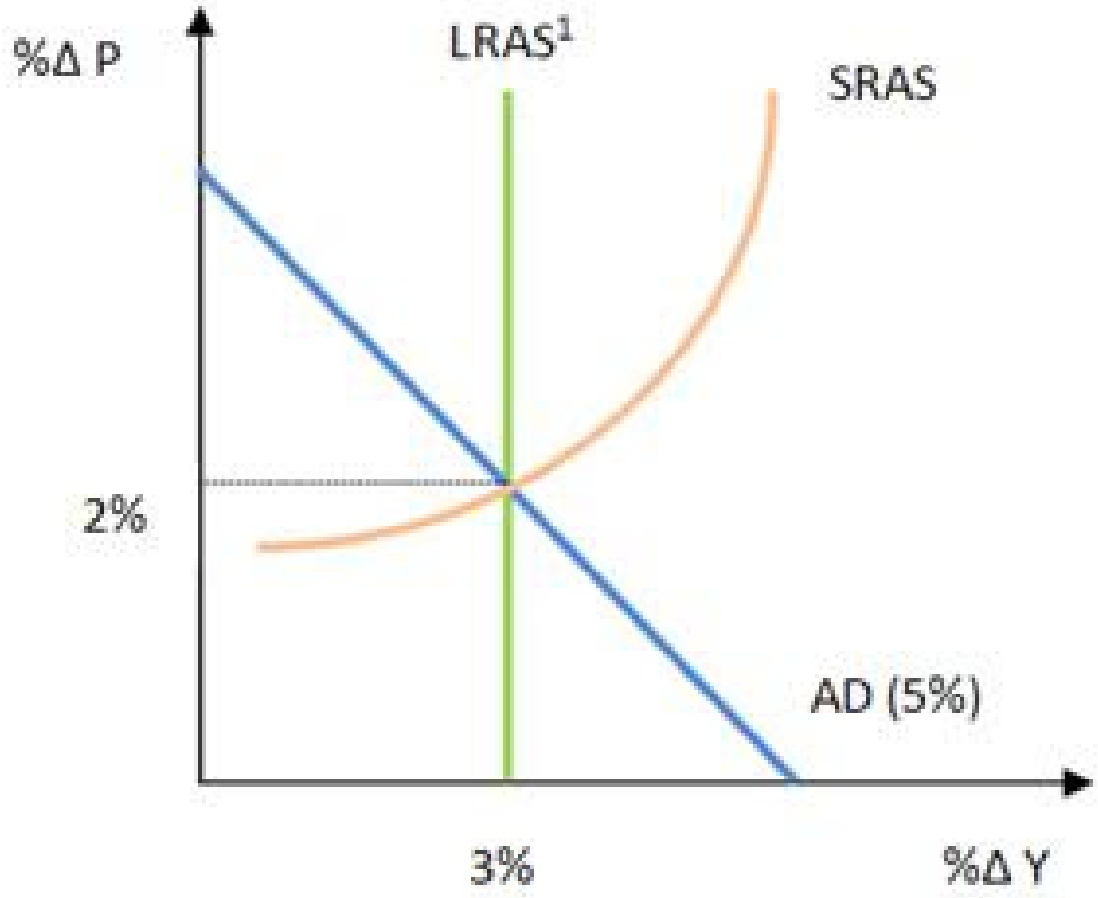
Consider now a positive shock to aggregate demand, which comes about for example from an increase in government spending. This is illustrated in Figure 3 below.

The right panel shows what would happen if the central bank could perfectly control aggregate demand with its monetary policy. Under an IT regime, the central bank would raise its policy rate in order to reduce both aggregate demand and inflation, thereby offsetting the initial increase in demand. This is exactly the same at what the central bank would do under NGDPLT. Under the two regimes, the response to an aggregate demand shock would be identical and furthermore would be optimal.

Figure 4 below illustrates the case of a temporary (negative) aggregate supply shock. The shock leads to an increase in inflation and a drop in output below its full-employment level, as shown in the left-hand panel of the figure. The response of the central bank under IT is illustrated in the right-hand panel. Since inflation has increased, the central bank must tighten monetary policy enough that inflation falls

[8]The graphs are from Beckworth (2010).

Figure 2: Aggregate Demand and Supply



back to 2 percent. This exacerbates the drop in real output, pushing it further away from its full-employment level. Under NGDPLT, the central bank would not respond. Output remains below its full-employment level, but at least the central bank does not exacerbate the negative impact of the shock on output.

Selgin (2018) notes that money prices may be more responsive to supply shocks than demand shocks. If this is the case, then the slope of the short-run aggregate supply

Figure 3: Positive Aggregate Demand Shock

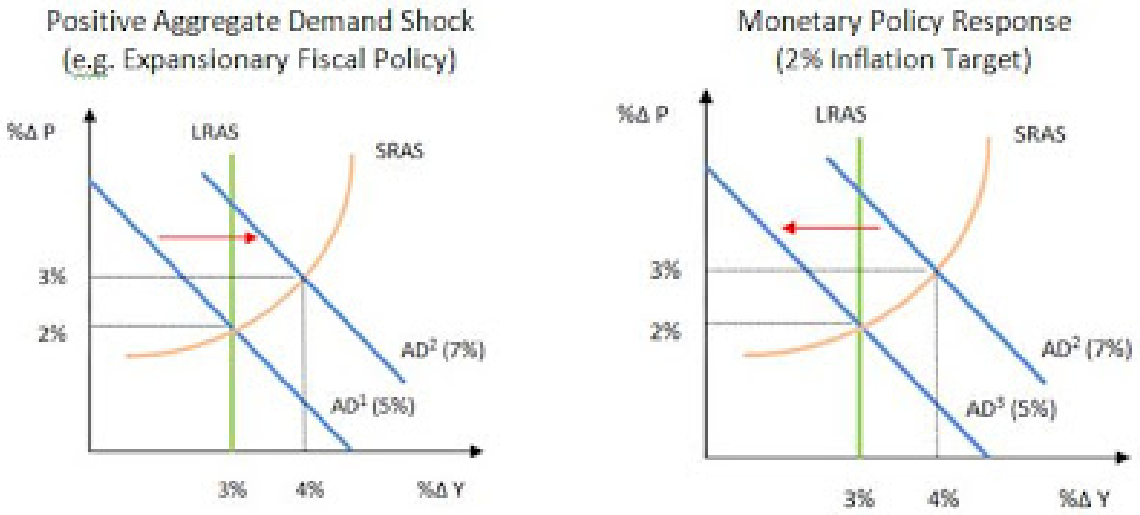
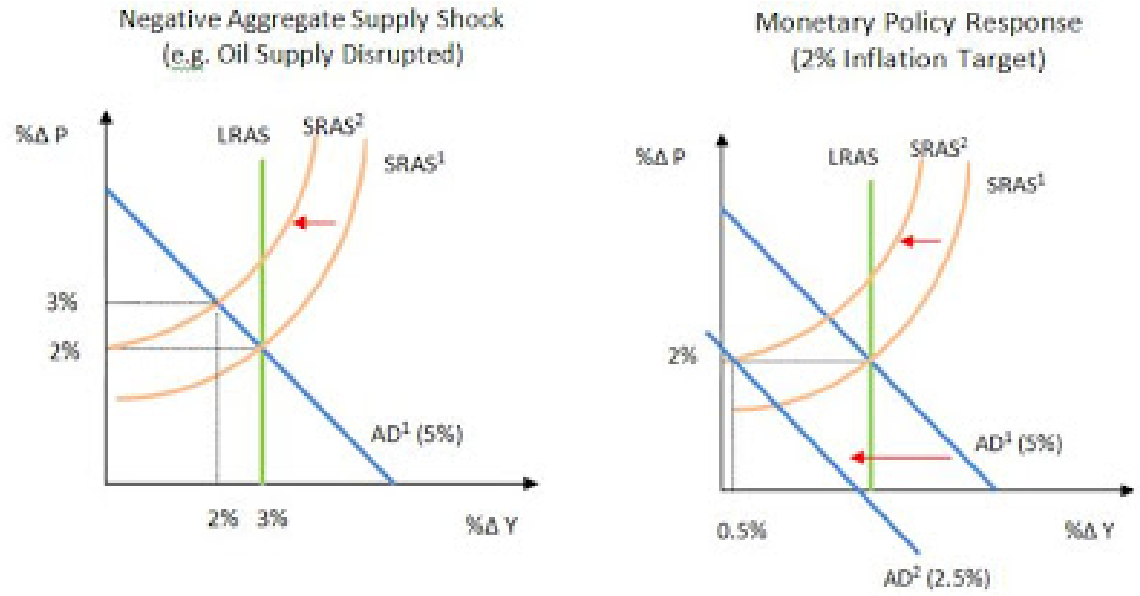


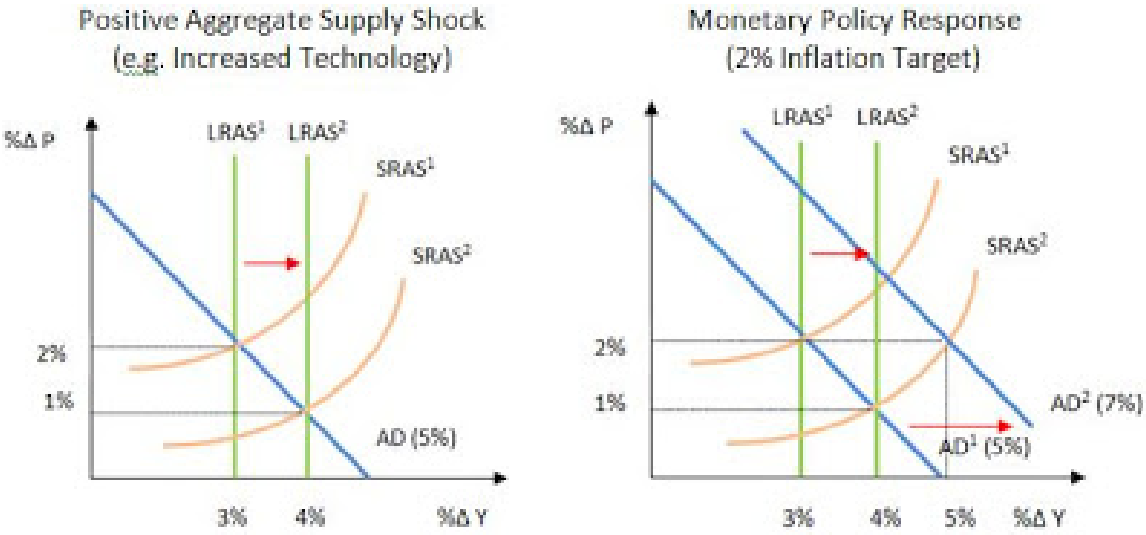
Figure 4: Temporary Aggregate Supply Shock



curve in response to temporary aggregate supply shocks would be steeper than in response to demand shocks. In this case, NGDPLT would be even more robust as a monetary policy strategy that does not force the central bank to identify the source of the shocks affecting the economy.

Figure 5 covers the case of a permanent aggregate supply shock.

Figure 5: Permanent Aggregate Supply Shock



The left-hand panel illustrates the impact of a permanent, positive aggregate supply shock, in this case an increase in the rate of technological progress. If nominal spending growth remains constant, the economy's equilibrium remains on its (new) long-run aggregate supply curve. This is just the equilibrium that the economy would achieve without nominal frictions, and is the best outcome that monetary policy could achieve. This is exactly what happens under NGDPLT.

Under IT, the response of the central bank is once again inappropriate. The drop in inflation leads the central bank to ease monetary policy. Aggregate demand increases until inflation returns to 2 percent. The new equilibrium of the economy is at a point

where output is above its full-employment level.

3.4 NGDPLT is Based on Observable Variables

As noted in the previous subsection, in order for IT to work well, the central bank must be able to distinguish among the different possible sources of shocks that affect the economy.

Central bank behaviour under IT can be well approximated by a Taylor rule[9] of the following form.

$$i_t = i^* + \alpha_1 (\pi_t - \pi^*) + \alpha_2 (y_t - y_t^*) . \tag{3}$$

Here, as in the feedback rule in equation (1) above, i_t is the central bank's policy rate, i^* is the long-run or neutral value of that rate, and π_t is the inflation rate, p^* is the inflation target, y_t is current **real** GDP, and y_t^* is potential output, so that $(y_t - y_t^*)$ is a measure of the output gap.

This is a more complicated feedback rule than under NGDPLT. It involves knowing the current levels of both inflation and real output, and it also depends on knowing the value of potential output. The latter variable is not observable and must be estimated using a full-blown structural model of the economy or sophisticated statistical techniques. Even if most central banks do not explicitly follow Taylor rules, the output gap is an important input into their decision making processes. One reason for this is that inflation is related to the output gap in their forecasting models via the New Keynesian Phillips curve (see Roberts 1995), which is a critical component of the forecasting and policy-analysis models of all inflation-targeting central banks.

This means that NGDPLT is simpler than IT and is based completely on observable variables (even if these variables are only observed with a lag and subject to some measurement error — we return to the measurement of nominal GDP in the next section dealing with critiques of NGDPLT).

[9] See Orphanides (2007) and Woodford (2001).

3.5 NGDPLT is Better in a Low-Inflation Environment

Equilibrium real interest rates have gradually been decreasing since the first central banks adopted official inflation targets in the early 1990s. The Bank of Canada (2020) now estimates that the long-run neutral interest rate in Canada lies somewhere between 2.25 percent and 3.25 percent. This is much lower than average short-term nominal interest rates before the Great Recession.

The main implication is that under IT central banks have less room to lower their policy rates before hitting their effective lower bound.

Kiley and Roberts (2017) estimate that for the U.S. economy the Fed's policy rate could be at its effective lower bound much more frequently than before the Great Recession, as often as 31.7 percent of the time if the neutral nominal interest rate is as low as 3 percent, which would be close to the upper end of the range of the Bank of Canada's latest estimate.

As noted above, inflation under NGDPLT is counter-cyclical if the rate of growth of nominal spending can be maintained. The short-term nominal interest rate is just equal to the short-term real interest rate plus the expected rate of inflation, following the well-known Fisher equation. If expected inflation is also counter-cyclical this means that under NGDPLT the short-term nominal interest rate should fall by less during slowdowns or contractions of real GDP as long as the growth rate of nominal spending can be maintained.

This raises the question of the feasibility of maintaining nominal spending growth in reaction to negative demand and/or supply shocks.

3.6 NGDPLT Provides a Superior Way of Providing Stimulus at the Lower Bound

Recessions are associated by definition with falls in real output. In practice, historical recessions have also been associated with falls in the level of nominal output.

Avoiding falls in nominal spending through the use of NGDPLT could reduce the likelihood of the economy falling into recession.

Since NGDPLT is a history-dependent monetary policy framework, as argued above the central bank has to work less hard to meet its nominal income growth target because of the way expectations work. A shortfall or drop in nominal spending growth sets up the expectation that in the medium run spending growth will be above average, which encourages spending and boosts aggregate demand. This means that for a central bank that uses a short-term nominal interest rate as its policy instrument, the lower bound should bind much less frequently under NGDPLT than under IT.[10]

On the rare occasions where the effective lower bound on the policy rate binds, NGDPLT could be implemented by switching to a non-conventional monetary policy instrument such as quantitative easing (henceforth QE). In this context, NGDPLT can be thought of as a velocity-adjusted money growth strategy. This is best understood in the context of the quantity theory equation in growth rates:

$$\dot{M}_t + \dot{v}_t = \pi_t + \dot{y}_t. \tag{4}$$

Here, dots on variables indicate rates of change. $\dot{M}_t$ is the rate of growth of a suitable monetary aggregate, $\dot{v}_t$ is the rate of change of the velocity of circulation of money, π_t is the rate of inflation, and $\dot{y}_t$ is the rate of growth of real GDP. The right-hand side of the equation is just the rate of growth of nominal GDP.

Figure 6 below[11] shows the long-run relationship between nominal income and money growth over the period 1981-2018 for a cross-section of countries.

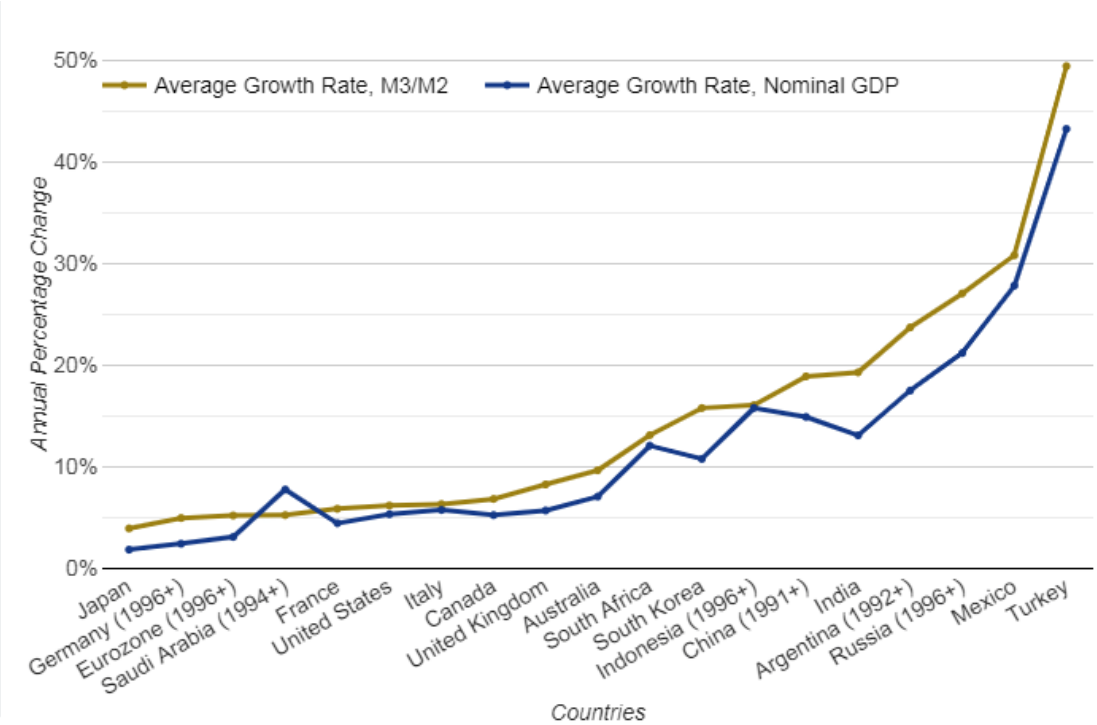
Velocity can fluctuate in the short term, but over the long haul it has historically been stable, except for a gradual downward trend.[12]. This means that total spending moves

[10]NGDPLT shares this property with PLT. Amano and Ambler (2014) show that the effective lower bound occurs much less frequently and for shorter periods of time under PLT than under IT.

[11]Institute for International Monetary Research (IIMR), `https://mv-pt.org/2019/01/24/our-research/`

[12]The long-run stability of velocity can depend on the monetary aggregate and is an empirical question. It is more stable in the case of broader aggregates such as M2 or M3, or even divisia aggregates which are not

Figure 6: Money and NGDP Growth



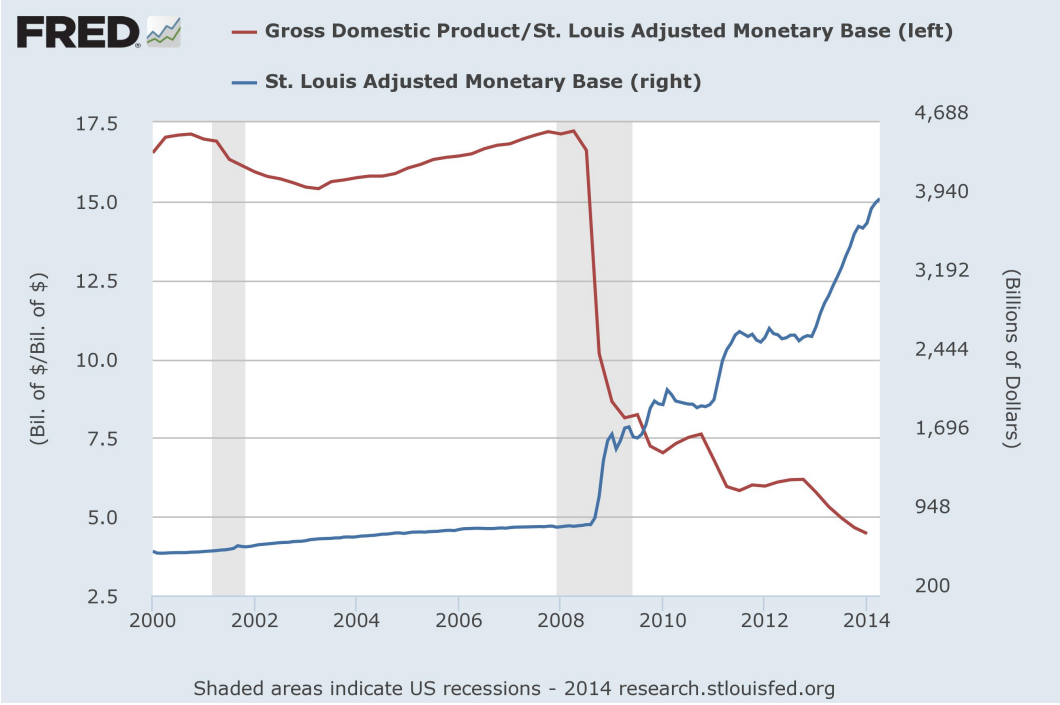
in lock step with the growth of the money supply, at least in the long run. Under QE, the central bank adjusts the size of its balance sheet through suitable open market operations. If it transacts only with banks, it can directly affect the size of the narrowest of monetary aggregates, the base money supply. However, if it can transact directly with households and firms (see Congdon 2010 for a detailed description of the mechanics of what he terms "credit market operations"), the central bank can directly affect the size of private sector deposits at banks, thereby affecting broader monetary aggregates.[13]

simple sums of their components. See Fisher, Hudson and Pradhan 2013.

[13]As outlined in Buiter (2014), this can be done either in coordination with the Treasury (Department of Finance) or completely independently. Such transactions affect the intertemporal budget constraint of the government: it would then be up to the government to adjust its fiscal policy by changing its tax receipts, its spending, or its borrowing. The central bank would not have to take a stance on fiscal policy.

Velocity is subject to fluctuations for exogenous reasons. This can include changes in transactions technology that affect the ability of individuals to shift their portfolios across different assets with differing degrees of liquidity. It can also include drastic decreases in velocity during financial crises that result from flights towards safe assets and sudden increases in the demand for liquidity. Such a decrease in velocity occurred during the financial crisis in 2008 in the US. The growth of broad monetary aggregates and velocity both decreased along with inflation and real growth heading into the Great Recession. As is well known, the monetary base increased rapidly during the Great Recession, but not fast enough to compensate for the dramatic drop in base velocity, as illustrated in Figure 7 below.

Figure 7: Base and Base Velocity



In addition to these exogenous changes, Ambler (2017) shows that velocity can be

very sensitive to shifts in monetary policy. In particular, an increase in the money supply (or money supply growth) that is expected to be temporary will typically lead to an endogenous decrease in velocity, little change in inflation or output, and a depressed nominal interest rate. Knowing that the money supply increase is temporary, firms will limit the amount by which they increase their prices when they reset them. Also, expectations of future real interest rate increases at the end of the temporary monetary expansion.

This means that in order for QE to boost inflation and output and to lift the nominal interest rate off its lower bound, it must be permanent and must be expected to be permanent.[14] For this reason, an NGDPLT regime is ideally suited to increase the effectiveness of QE. If money growth and velocity have decreased due to the type of financial crisis that brought on the Great Recession, a policy of QE will quite credibly be seen as permanent because of the history-dependent nature of the regime. Once total spending returns to its growth path, broad monetary aggregates will also return to their growth path (given the long-run stability of velocity).

3.7 NGDPLT Favours Central Bank Accountability

Central bank independence can be a good thing, but not without accountability (Hetzel 2012b). Central banks that are flexible inflation targeters try to stabilize real GDP along with stabilizing inflation around a target. The performance of central banks under IT has often been measured by looking at both inflation volatility and real GDP growth volatility.[15]

Focusing on a single target makes accountability much easier. Also, since NGDPLT is history-dependent, central banks targeting a path for total spending would be responsible for correcting or making up for past failures to hit its target. Under IT, many central banks have consistently undershot their targets since the end of the Great

[14] Beckworth (2017b) also forcefully makes this argument.
[15] See Cecchetti et al. (2006).

Recession. In some cases this has led to a softening of inflation expectations, which reflects a loss of credibility. In turn, the loss of credibility makes monetary policy less effective. A credible NGDPLT regime would anchor expectations of nominal spending growth.

3.8 NGDPLT Favours Financial Stability

Debt contracts are typically not state-contingent. In fact they stipulate payments in nominal terms. The reasons for this are not well understood, but presumably the complexity of state-contingent contracts and the difficulty of verifying their terms make them too expensive. This makes financial markets incomplete in a very important respect.

It turns out that NGDPLT can substitute to some extent for incomplete financial markets. Because inflation is counter-cyclical under NGDPLT, the real debt burden of borrowers is pro-cyclical. This improves the risk-sharing properties of non-contingent contracts. This has been shown in theoretical models by Koenig (2013), Sheedy (2014), and Bullard and DiCecio (2019).

Borrowers' ability to service their debt is highly dependent on their nominal incomes. Financial crises happen when individuals (households and firms) are unable to free up enough income to service their debts in a given month.[16] Beckworth (2019) shows that there is strong empirical cross-country evidence that stability in nominal income growth is associated with financial stability.

4 The Possible Disadvantages of NGDPLT

No monetary policy framework is perfect. The IT framework adopted by many central banks starting in 1991 performed well, indeed better than some pundits expected.

[16] Kronick and Ambler (2020) show that the debt service ratio (debt service payments as a fraction of disposable income) is an important predictor of financial fragility.

When it was first adopted in New Zealand and Canada it was almost a stopgap measure in response to the poor performance of monetary gradualism (reducing inflation by gradually reducing the growth rate of a suitable monetary aggregate). The theoretical underpinnings of IT were actually developed after it had been implemented by several central banks and had successfully reduced both average inflation and inflation volatility.[17] Its deficiencies became apparent during and in the wake of the Great Recession.

4.1 NGDPLT depends on Timely Information on GDP

IT has one major advantage over NGDPLT: information on the current rate of inflation is available with much less of a delay than on nominal GDP, and it is less subject to revision. However, as noted in the previous section, most central banks that target inflation are flexible inflation targeters. They use the output gap as part of their decision process. This means using a variable (real GDP) that is also observed with a substantial lag and is subject to revision, and a variable (potential output) that is not observable at all.

In Canada, Statistics Canada publishes information on the consumer price index and headline inflation for a given month approximately three weeks into the following month. In the case of GDP, it takes two full months for Statistics Canada to publish preliminary estimates of the industry-based estimates of monthly GDP, and two months to publish preliminary estimates of expenditure-based GDP for the preceding quarter.

This objection can be largely overcome in two possible ways. First, techniques for now-casting variables such as GDP have become relatively sophisticated. Using big data, now-casts of current GDP are quite accurate. See for example Chernis and Sekkel (2017).

[17] Laidler (2015) contains a detailed exposition of the interaction between the theory and practice of inflation targeting, with an emphasis on the Canadian experience.

Nominal GDP statistics are subject to revisions, typically several rounds of revisions over a period of several quarters, which is not the case with price indices such as the consumer price index. However, this does not pose a problem for NGPLT as long as preliminary estimates are not biased. In addition, the nominal value of total spending is a straightforward concept, much simpler in fact than the construction of a cost of living index, which must take substitution between goods and the effects of quality improvements into account.

Second, Sumner (2013) has suggested the possibility of creating a market in NGDP futures and having the central bank intervene in that market via purchases and sales of NGDP futures contracts to ensure that expected nominal GDP is on the target path. Since other participants in the market would stand to lose real money by being wrong in their predictions, this could lead to a situation where the NGDP future would be close to an unbiased predictor of future NGDP.

4.2 NGDPLT Would be Difficult for the Public to Understand

A shift from IT to NGDPLT would represent a challenge to central bank communications in the short term. Under NGDPLT, a central bank would have to frame its policy announcements in terms of nominal GDP falling short of or surpassing a predetermined growth path.

Few individuals can probably give an adequate definition of GDP. Without a clear understanding of nominal GDP, the public (households in particular) would have difficulty in formulating clear expectations about the future evolution of the economy, making the central bank's policy less effective.

However, households quite likely have a fairly firm grasp on their own nominal incomes and spending. Some proponents of NGDPLT have proposed a variant in which a growth path for total labour income would be the target. This would probably be easier for households to comprehend and would also stabilize total income growth

in the long run, although the effects over the cycle would be different since the labour share of total income fluctuates counter-cyclically.

If the goals and results of NGPLT were framed in terms that households could easily relate to, the communications problems for central banks should not be too onerous. It should be noted that IT presents its own communication problems. I have already noted above that total nominal spending is in many ways a concept that is simpler than a price index. Coibion and Gorodnichenko (2015) show that American households put inordinate weight on gasoline prices when forming their inflation expectations, weakening the link between headline inflation and the output gap.

4.3 Future Prices Will Not be Perfectly Predictable under NGDPLT

The growth rate of nominal GDP is by definition equal to the growth rate of real GDP plus the inflation rate. If the central bank wishes to target a given rate of inflation in the long run, in order to hit that rate exactly it must be able to forecast the average rate of growth of real GDP. It would then endeavour keep nominal GDP growing at a rate equal to targeted inflation plus the estimated real growth rate of potential output.

If the trend growth rate of potential output varies slowly over time for technological or demographic reasons, this just means that the slope of the growth path of targeted nominal GDP will have to be modified from time to time to cope with drift in the long run growth rate of real GDP. This would be another challenge for how the central bank communicates its policy decisions, but not an insurmountable one.

4.4 NGDPLT is Not an Instrumental Rule

We have already noted that NGDPLT is agnostic as to the exact choice of monetary policy instrument by the central bank.

Most analyses of nominal GDP targeting are vague on the exact implementation in

terms of a policy rule. Taylor (2013) emphasizes this point. Quoting himself from 1985, he writes "The actual instrument adjustments necessary to make a nominal GNP rule operational are not usually specified in the various proposals for nominal GNP targeting. This lack of specification makes the policies difficult to evaluate because the instrument adjustments affect the dynamics and thereby the influence of a nominal GNP rule on business-cycle fluctuations."

I have already argued above that NGDPLT is perfectly compatible with a feedback rule for a short-term policy interest rate, and that such a policy rate would be much less likely to hit its effective lower bound than a if the central bank followed a Taylor rule under IT. I have also argued that a switch to QE in situations where the policy rate hits its effective lower bound would be more effective under NGDPLT than under IT. Finally, targeting the price of NGDP futures represents a concrete if unorthodox alternative.

4.5 NGDPLT is Subject to a Time Inconsistency Problem

Consider a central bank which is fighting to bring nominal income back down to its target path after a positive shock to either inflation or real income or both. The central bank would have to tighten its monetary policy until nominal growth falls back to its target growth path. As noted above, the bank's job is made easier because its commitment affects expectations. If households and firms expect income growth and/or inflation to be lower they would have an incentive to reduce their spending, thus making the expectation self-fulfilling.

However, once the expectation of the reduced growth rate of nominal income reduced private spending, the central bank has an interest to renege on its tight monetary policy. By letting bygones be bygones and not getting nominal income back to its growth path, the costs in terms of lost output of bringing nominal spending back to its target growth path could be spared.

This is a classic time inconsistency problem. If the central bank gives into the temptation and reneges it will of lose its credibility and the advantages it gains in terms of influencing expectations.
A clear mandate to the central bank defining a growth path for total spending and with stipulations concerning how the central bank will be held accountable for meeting its the target over a reasonable time horizon would circumvent this time inconsistency problem.

4.6 NGDPLT Means Losing the Nominal Anchor

A consequence of the potential time inconsistency problem is that the public has to understand that NGDPLT is symmetric. It will not only be used to correct for past undershooting of the inflation target but also for overshooting.
This is why state-contingent NGDPLT as proposed by Evans (2010) and others may be undesirable. If mistakes are only corrected in one direction (to compensate for a period when inflation is lower than target) then, if successful, such a regime would guarantee an inflation rate higher on average than the target, leading to inflation expectations becoming unanchored. A clearly-defined, symmetrical target would avoid this problem.

5 Summarizing the Arguments

In Table 1 below, I summarize the main arguments in favour of NGDPLT.

The potential benefits of NGDPLT are numerous and important. The current economic environment, with lower real interest rates and lower growth than before the financial crisis and the Great Recession, practically guarantee that IT will not function as smoothly as before. The effective lower bound on policy rates will bite much more

Table 1: The Pros and Cons of NGDPLT

Major Arguments in Favour of NGDPLT	Explanations
History dependence	Mimicks the optimal policy under commitment
Determinacy of equilibrium	Unique long-run path for spending
Superior in the face of supply shocks	Obviates the need to identify different shocks
Targets a Single Variable	Obviates the need to estimate potential output
Better under low inflation	Less frequent lower bound episodes
Facilitates stimulus at lower bound	Makes QE more effective
Favours accountability	Bygones are not bygones
Favours financial stability	Debt burdens are pro-cyclical
Objections to NGDPLT	**Countering the Objections**
Requires timely information on GDP	Now-casting can get around this
Difficult for the public to understand	Framing in terms of total income would make it no more difficult to understand than IT
Future prices would not be perfectly predictable	Make adjustments in the slope of the growth path in response to changes in the trend of real growth
Not an instrumental rule	Would work with a short-term interest rate instrument and make QE more effective
Subject to a time-inconsistency problem	A clearly-defined level target substitutes for commitment
Danger of unhinged inflation expectations	Correction of errors must be symmetrical

quickly the next time there is a major worldwide shock or crisis. Central banks (including the Bank of Canada) have not articulated clear and detailed strategies for coping with the next crisis.

NGDPLT delivers a promising framework for developing a clear strategy before the next crisis hits. Its main advantages are the likely reduction in the probability that policy rates will hit their effective lower bound and the increased ability of central banks to provide stimulus when inflation, real growth, and interest rates are depressed. The table also summarizes some objections that have been put forward. An NGDPLT framework that is clearly articulated and explained would be able to overcome these drawbacks.

6 Conclusion

I have summarized the main arguments in favour of NGDPLT as a monetary policy framework. I believe that the most compelling of these arguments are its superior performance in the face of aggregate supply shocks, its robustness when it is difficult to distinguish among different types of macroeconomic shocks, and its superior ability to provide stimulus to the economy when short-term interest rates are at their effective lower bound.

I have also summarized some of the main objections to NGDPLT and tried to argue that they are not that important or that they can easily be met by tweaking the framework.

The question then becomes whether or not the advantages outweigh the costs involved in changing to a new monetary policy framework. These costs would include the challenges to central banks to adapt how they explain and communicate their monetary policy decisions, and the time needed for households and firms to learn how the new system works so that they will be able to form expectations about nominal income growth efficiently.

It is likely that inertia will prevent central banks from making major changes in their monetary policy frameworks in the absence of a new crisis. IT has not been a perfect regime but it has performed at least adequately, even if cracks have begun to appear in the . Most analysts believe it to be at least partly responsible for the so-called Great Moderation, the reduction in volatility of inflation and output that occurred when central banks adopted IT.[18]

It may take the next major crisis for central banks to envisage more than tinkering with their current monetary policy frameworks. However, by then it will be too late.

[18] See Cecchetti et al. (2006) for an analysis.

References

Amano, Robert and Steve Ambler (2014), "Inflation Targeting, Price-Level Targeting and the Zero Lower Bound." draft, ESG UQÀM

http://www.steveambler.uqam.ca/papers/lowerbound.2014.pdf

Amano, Robert, Steve Ambler and Malik Shukayev (2012), "Optimal Price-Level Drift under Commitment in the Canonical New Keynesian Model." *Canadian Journal of Economics* 45, 1023–1036

Ambler, Steve (2017), "A Tale of Two Velocities." unpublished draft, Université du Québec à Montréal

http://www.steveambler.uqam.ca/papers.html

Ambler, Steve (2017b), "How to Make Monetary Policy More Effective." unpublished draft, Université du Québec à Montréal

http://www.steveambler.uqam.ca/papers.html

Ambler, Steve and Jean-Paul Lam (2016), "Inflation Targeting, Price-Level Targeting, the Zero Lower Bound, and Indeterminacy." unpublished draft, Université du Québec à Montréal

http://www.steveambler.uqam.ca/papers.html

Aruoba, S. Borağan, Francis Diebold, Jeremy Nalewaik, Frank Schorfheide and Dongho Song (2016), "Improving GDP Measurement: A Measurement-Error Perspective." *Journal of Econometrics* 191, 384–397

Bailey, Samuel (1837), *Money and its Vicissitudes in Value; As They Affect National Industry and Pecuniary Contracts*. London, Effingham Wilson, Royal Exchange

Bank of Canada (2020), "Monetary Policy Report." Ottawa, Bank of Canada, January

https://www.bankofcanada.ca/2020/01/mpr-2020-01-22/

Bean, Charles (1983), "Targeting Nominal Income: An Appraisal." *Economic Journal* 93, 806–819

Bean, Charles (2013), "Nominal Income Targets: An Old Wine in a New Bottle." Speech by Mr Charles Bean, Deputy Governor for Monetary Policy of the Bank of England, at the Institute for Economic Affairs Conference on the State of the Economy, London, February 27

https://www.bis.org/review/r130228c.pdf

Beckworth, David (2010), "Target the Cause Not the Symptom." *Macro Musings Blog*, March 21

http://macromarketmusings.blogspot.com/2010/03/target-cause-not-symptom.html

Beckworth, David (2010b), "The Case for Nominal GDP Targeting." *Macro Musings Blog*, December 22

http://macromarketmusings.blogspot.com/2010/12/case-for-nominal-gdp-targeting.html

Beckworth, David (ed.) (2012), *Boom and Bust Banking: The Causes and Cures of the Great Recession*. Oakland, CA, The Independent Institute

Beckworth, David (2017), "The Knowledge Problem and Monetary Policy: The Case for Nominal GDP Targeting." Working Paper, Mercatus Center

https://www.mercatus.org/publications/monetary-policy/knowledge-problem-monetary-policy

Beckworth, David (2017b), "Permanent versus Temporary Monetary Base Injections: Implications for Past and Future Fed Policy." *Journal of Macroeconomics* 54, 208–216

Beckworth, David (2019), "The Financial Stability Case for a Nominal GDP Target." *Cato Journal* 39, 419–447

Beckworth, David (2019b), "Facts, Fears, and Functionality of NGDP Level Targeting: A Guide to a Popular Framework for Monetary Policy." Special Study, Mercatus Center

https://www.mercatus.org/publications/monetary-policy/facts-fears-and-functionality-ngdp-level-targeting-guide-popular

Beckworth, David and Joshua Hendrickson (2019), "Nominal GDP Targeting and the Taylor Rule on an Even Playing Field." *Journal of Money, Credit and Banking* 52, 269–286

Belongia, Michael and Peter Ireland (2015), "A Working Solution to the Question of Nominal GDP Targeting." *Macroeconomic Dynamics* 19, 508–534

Benhabib, Jess, Stephanie Schmitt-Grohé and Martín Uribe (2001), "Monetary Policy and Multiple Equilibria." *American Economic Review* 91, 167–186

Bernanke, Ben and Janet Yellen (2018), "A Fed Duet: Janet Yellen in Conversation with Ben Bernanke." video interview, Brookings Institution

https://www.brookings.edu/events/a-fed-duet-janet-yellen-in-conversation-with-ben-bernanke/

Billi, Roberto (2013), "Nominal GDP Targeting and the Zero Lower Bound: Should We Abandon Inflation Targeting?" Working Paper 270, Sveriges Riksbank

http://www.riksbank.se/Documents/Rapporter/Working_papers/2013/rap_wp270_130613.pdf

Bradley, Michael and Dennis Jansen (1989), "Understanding nominal GNP targeting." *Federal Reserve Bank of St. Louis Review* November/December, 31–40

Buiter, Willem (2014), "The Simple Analytics of Helicopter Money: Why it Works – Always." *Economics: The Open-Access, Open-Assessment E-Journal* 8, 2014–2028

Bullard, James (2010), "The Seven Faces of the Peril." *Federal Reserve Bank of St. Louis Review* 92, 339–352

Bullard, James and Riccardo DiCecio (2019), "Optimal Monetary Policy for the Masses." Working Paper 2019-009C, Federal Reserve Bank of St. Louis

Carney, Mark (2012), "Guidance." Remarks by Governor Mark Carney to the Toronto CFA Society, Bank of Canada, December 11

https://www.bankofcanada.ca/2012/12/guidance/

Cecchetti, Stephen, Alfonso Flores-Lagunes and Stefan Krause (2006), "Has Monetary Policy Become More Efficient: A Cross-Country Analysis." *Economic Journal* 116, 408–433

Chernis, Tony and Rodrigo Sekkel (2017), "A Dynamic Factor Model for Nowcasting Canadian GDP Growth." Staff Working Paper 2017–2, Ottawa, Bank of Canada

https://www.bankofcanada.ca/wp-content/uploads/2017/02/swp2017-2.pdf

Christensen, Lars (2011), "Market Monetarism: The Second Monetarist Counter-revolution." draft

https:
//thefaintofheart.files.wordpress.com/2011/09/market-monetarism-13092011.pdf
Clarida, Richard, Jordi Galí and Mark Gertler (1999), "The Science of Monetary Policy: A New Keynesian Perspective." *Journal of Economic Literature* 37, 1661–1707
Cohen-Setton, Jérémie (2015), "Permanent QE and Helicopter Money." *Bruegel Blog* January 5
http:
//www.bruegel.org/nc/blog/detail/article/1527-permanent-qe-and-helicopter-money/
Coibion, Olivier and Yuriy Gorodnichenko (2015), "Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation." *American Economic Journal: Macroeconomics* 7, 197–232
Cole, Benjamin and Marcus Nunes, (2013), *Market Monetarism: Roadmap to Economic Prosperity*. Amazon Digital Services
Congdon, Tim (2010), "Monetary Policy at the Zero Bound." *World Economics* 11, 11–47
Congdon, Tim (2011), *Money in a Free Society: Keynes, Friedman, and the new crisis in capitalism*. London, Encouter Books
Congdon, Tim (2011), "Dangerous Waffle about "the" Liquidity Trap." *Cato Unbound*
https://www.cato-unbound.org/2011/12/05/tim-congdon/
dangerous-waffle-about-liquidity-trap
Congdon, Tim (2014), "What Were the Causes of the Great Recession? The Mainstream Approach vs the Monetary Interpretation." *World Economics* 15, 1–32
Cowen, Tyler and Alex Tabarrok (2018), *Modern Principles: Macroeconomics*. fourth edition, New York, Macmillan
Cukierman, Alex and Francesco Lippi (2005), "Endogenous Monetary Policy with Unobserved Potential Output." *Journal of Economic Dynamics & Control* 29, 1951–1983
Delle-Chiaie, Simona (2009), ""A Survey on Monetary Policy and Potential Output Uncertainty." *Monetary Policy & the Economy*, Oesterreichische Nationalbank, issue 3, 53–61
Dorn, James (2020), "The Phillips Curve: A Poor Guide for Monetary Policy. *Cato Journal* 133–151
Ehrmann, Michael and Frank Smets (2003), "Uncertain Potential Output: Implications for Monetary Policy." *Journal of Economic Dynamics and Control* 27, 1611–1638
Evans, Charles (2010), "Monetary Policy: Tools for Non-Traditional Times." Annual Report, Federal Reserve Bank of Chicago, 7–13
https://www.chicagofed.org/publications/annual-report/2010-annual-report
Evans, Charles (2019), "On Risk and Credibility in Monetary Policy." speech at the National Association for Business Economics (NABE) and Sveriges Riksbank conference, *Global Economies at the Crossroads: Growing Together While Growing Apart?*, Stockholm, Sweden, May 3
https://www.chicagofed.org/publications/speeches/2019/
on-risk-and-credibility-in-monetary-policy

Fisher, Paul, Suzanne Hudson and Mahmood Pradhan (1993), "Divisia Indices for Money: An Appraisal of Theory and Practice." Working Paper 9, Bank of England

https://www.bankofengland.co.uk/working-paper/1993/divisia-indices-for-money-an-appraisal-of-theory-and-practice

Frankel, Jeffrey (2018), "The Case for (and Drawbacks of) Nominal GDP Targets." *Should the Fed stick with the 2 percent inflation target or rethink it?* Hutchins Center on Fiscal & Monetary Policy, Brookings Institution, January 8, 2018

https://scholar.harvard.edu/files/frankel/files/brookgsitngdpt.pptx

Galí, Jordi (2008), *Monetary Policy, Inflation and the Business Cycle*. Princeton, Princeton University Press

Garín, Julio, Robert Lester and Eric Sims (2016), "On the Desirability of Nominal GDP Targeting." *Journal of Economic Dynamics and Control* 69, 21–44

Gärtner, Manfred (2004), "Monetary Policy and Central Bank Behaviour." in Charles Rowley and Friedrich Schneider (eds.), *The Encyclopedia of Public Choice*. New York, Springer, 159–172

Hayek, Friedrich (2008), *Prices & Production and Other Works: F.A. Hayek on Money, the Business Cycle, and the Gold Standard*. Auburn, AL, Ludwig von Mises Institute

Hendrickson, Joshua (2012), "Nominal Income Targeting and Monetary Stability." in David Beckworth (ed.), *Boom and Bust Banking: The Causes and Cures of the Great Depression*. Oakland, CA, Independent Institute, 257–290

Hendrickson, Joshua (2012b), "An Overhaul of Federal Reserve Doctrine: Nominal Income and the Great Moderation." *Journal of Macroeconomics* 34, 304–317.

Hetzel, Robert (2006), "Making the Systematic Part of Monetary Policy Transparent." *Federal Reserve Bank of Richmond Economic Quarterly* 92, 255–290

Hetzel, Robert (2009), "Monetary Policy in the 2008–2009 Recession." *Richmond Federal Reserve Bank Economic Quarterly* 95, 201–233

Hetzel, Robert (2012), *The Great Recession: Market Failure or Policy Failure?*. Cambridge, Cambridge University Press

Hetzel, Robert (2012b), "Central Bank Accountability and Independence: Are They Inconsistent?" *Journal of Macroeconomics* 34, 616–625

Hetzel, Robert (2015), "Nominal GDP: Target or Benchmark?" Economic Brief EB15–04, Federal Reserve Bank of Richmond

https://www.richmondfed.org/-/media/richmondfedorg/publications/research/economic_brief/2015/pdf/eb_15-04.pdf

Ireland, Peter (2019), "Economic Conditions and Policy Strategies: A Monetarist View." *Cato Journal* 39, 51–63

Johnson, Clark (2011), "Monetary Policy and the Great Recession." *The Milken Institute Review* Fourth Quarter, 18–27

Kiley, Michael and John Roberts (2017), "Monetary Policy in a Low Interest Rate World." *Brookings Papers on Economic Activity*, 48, 317–396

Kim, Jinill and Dale Henderson (2005), "Inflation Targeting and Nominal-Income-Growth Targeting: When and Why are they Suboptimal?" *Journal of Monetary Economics* 52, 1463–1495

Koenig, Evan (2010), "The Case for Targeting the Level of Nominal Spending." Memo, Dallas, Federal Reserve Bank of Dallas
https://www.federalreserve.gov/monetarypolicy/files/FOMC20101013memo02.pdf
Koenig, Evan (2012), "All in the Family: The Close Connection Between Nominal-GDP Targeting and the Taylor Rule." *Staff Papers*, Federal Reserve Bank of Dallas, March
Koenig, Evan (2013), "Like a Good Neighbor: Monetary Policy, Financial Stability, and the Distribution of Risk." *International Journal of Central Banking* 9, 57–82
Kronick, Jeremy and Steve Ambler (2020), "Predicting Financial Crises: The Searchfor the Most Telling Red Flag in the Economy." Commentary 564, Toronto, C.D. Howe Institute
https://www.cdhowe.org/public-policy-research/predicting-financial-crises-search-most-telling-red-flag-economy
Krugman, Paul (1998) "It's Baaack: Japan's Slump and the Return of the Liquidity Trap." *Brookings Papers on Economic Activity* 2,137–205
Krugman, Paul (2011), "A Volcker Moment Indeed." New York Times, October 30
krugman.blogs.nytimes.com/2011/10/30/a-volcker-moment-indeed-slightly-wonkish
Laidler, David (2015), "The Interactive Evolution of Economic Ideas and Experience – The Case of Canadian Inflation Targeting." Economic Policy Research Institute Working Paper 20151, University of Western Ontario
https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1074&context=economicsepri_wp
McCallum, Bennett (2011), "Nominal GDP Targeting." Shadow Open Market Committee, October 21
https://www.shadowfed.org/wp-content/uploads/2011/10/McCallum-SOMCOct2011.pdf
McCallum, Bennett and Edward Nelson (1999) "Nominal Income Targeting in an Open-Economy Optimizing Model." *Journal of Monetary Economics* 43, 553–578
Meade, James (1993), "The Meaning of "Internal Balance"." *American Economic Review* 83, 1–9
Michel, Norbert (2019), "Give the Fed a Single Mandate: Monetary Neutrality." Backgrounder 3366, Heritage Foundation
https://www.heritage.org/monetary-policy/report/give-the-fed-single-mandate-monetary-neutrality
Niskanen, William (1992), "Political Guidance on Monetary Policy." *Cato Journal* 12, 281–286
Niskanen, William (2001), "A Test of the Demand Rule." *Cato Journal* 21, 205–209
x
Nunes, Marcus and Benjamin Cole (2013), *Market Monetarism: Roadmap to Economic Prosperity*. Marcus Nunes (Amazon Kindle)
Orphanides, Athanasios (2001), "Monetary Policy Rules Based on Real-Time Data." *American Economic Review* 91, 964–985
Orphanides, Athanasios (2003), "Monetary Policy Evaluation with Noisy Information." *Journal of Monetary Economics* 50, 605–631
Orphanides, Athanasios (2007), "Taylor Rules." Discussion Paper 2007–18, Finance and Economics Discussion Series, Board of Governors of the Federal Reserve System

https://ideas.repec.org/p/fip/fedgfe/2007-18.html

Plosser, Charles (2007), "Credibility and Commitment: A Speech Presented to the New York Association for Business Economics, March 6, 2007, and as the Hutchinson Lecture, University of Delaware, April 10, 2007." Philadelphia, Federal Reserve Bank of Philadelphia

https://www.philadelphiafed.org/publications/speeches/plosser/2007/03-06-07_ny-assoc-bus-econ

Reichlin, Lucrezia, Adair Turner and Michael Woodford (2013), "Helicopter Money as a Policy Option." *Vox EU*

https://voxeu.org/article/helicopter-money-policy-option

Roberts, John (1995), "New Keynesian Economics and the Phillips Curve." *Journal of Money, Credit and Banking* 27, 975–984

Romer, Christina (2011), "Dear Ben: It's Time for Your Volcker Moment." New York Times, October 30

www.nytimes.com/2011/10/30/business/economy/ben-bernanke-needs-a-volcker-moment.html

Rowe, Nicholas (2011), "E(NGDP) Level-Path Targeting for the People of the Concrete Steppes." *Worthwhile Canadian Initiative Blog* October 20

https://worthwhile.typepad.com/worthwhile_canadian_initi/2011/10/engdp-level-path-targeting-for-the-people-of-the-concrete-steppes-.html

Salter, Alexander (2013), "Not All NGDP Is Created Equal: A Critique of Market Monetarism." *Journal of Private Enterprise* 29, 41–52

Salter, Alexander and Thomas Hogan (2019), "Expectations and NGDP Targeting: Supply-Side Problems with Demand-Side Policy." *Journal of Private Enterprise* 34, 89–106

Selgin, George (2017), "Stable Prices or Stable Spending?" *Alt-M Blog* May 16

https://www.alt-m.org/2016/05/16/monetary-policy-primer-part-4-stable-prices-vs-stable-spending/

Selgin, George (2018), "Some "Serious" Theoretical Writings that Favor NGDP Targeting." *Alt-M Blog* June 19

https://www.alt-m.org/2018/06/19/some-serious-theoretical-writings-that-favor-ngdp-targeting/

Selgin, George (2019), "Lars Svensson on NGDP Targeting." *Alt-M Blog* October 15

https://www.alt-m.org/2019/10/15/lars-svensson-on-ngdp-targeting/

Sheedy, Kevin (2014), Debt and Incomplete Financial Markets: A Case for Nominal GDP Targeting." *Brookings Papers on Economic Activity* 45, 301–373

Sumner, Scott (2011), "The Case for NGDP Targeting: Lessons from the Great Recession." Adam Smith Institute

https://www.adamsmith.org/s/ASI_NGDP_WEB.pdf

Sumner, Scott (2012), "The Case for Nominal GDP Targeting." Mercatus Center

https://www.mercatus.org/publications/monetary-policy/case-nominal-gdp-targeting

Sumner, Scott (2013), "A Market-Driven Nominal GDP Targeting Regime." Mercatus Center https://www.mercatus.org/publications/monetary-policy/market-driven-nominal-gdp-targeting-regime

Sumner, Scott (2019), "Ten Lessons from the Economic Crisis of 2008." *Cato Journal* 39, 449–459

Svensson, Lars (2020), "Monetary Policy Strategies for the Federal Reserve." *International Journal of Central Banking* forthcoming

Taylor, John (2013), "More on Nominal GDP Targeting." *Economics One Blog*
http://johnbtaylorsblog.blogspot.ca/2011/11/more-on-nominal-gdp-targeting.html

Taylor, John and John Williams (2010), "Simple and Robust Rules for Monetary Policy." in John Williams, Benjamin Friedman and Michael Woodford (eds.), *Handbook of Monetary Economics, volume 3*. Amsterdam, Elsevier, 829–859

Tobin, James (1980), "Stabilization Policy Ten Years After." *Brookings Papers on Economic Activity* 11, 19–90

Vestin, David (2006), "Price-Level versus Inflation Targeting." *Journal of Monetary Economics* 53, 1361–1376

Woodford, Michael (2001), "The Taylor Rule and Optimal Monetary Policy." *American Economic Review* 91, 232–237

Woodford, Michael (2012) "Methods of Policy Accommodation at the Interest-Rate Lower Bound." *Proceedings – Economic Policy Symposium – Jackson Hole* Federal Reserve Bank of Kansas City, 185–288

Woolsey, Bill (2013), "NGDPLT and Central Bank Discretion."
http://monetaryfreedom-billwoolsey.blogspot.co.uk/2013/02/ngdplt-and-central-bank-discretion.html