

STEVE AMBLER

Nominal GDP Level Targeting

This text was written for and presented at *Choosing the Right Target: Real Options for the Bank of Canada's Mandate Renewal*, a conference held by the Max Bell School of Public Policy, September 22–25, 2020

Discussion
by Nicholas
Rowe
page 44



McGill



MAX BELL SCHOOL
of PUBLIC POLICY

SEPTEMBER 22-25, 2020

Choosing the Right Target: Real Options for the Bank of Canada's Mandate Renewal

A conference organized by
Christopher Ragan and Stephen Gordon

With the Bank of Canada's mandate up for renewal in 2021, McGill University's Max Bell School of Public Policy held a four-day online conference from September 22-25, 2020. The conference was attended by over one hundred policy professionals, students, academics, and monetary policy experts who had the chance to think about, exchange, and question what monetary policy in the post-pandemic era should look like. Recordings of the conference sessions can be accessed at:

<https://www.mcgill.ca/maxbellschool/choosingtherighttarget>

Authors and discussants

1. THE CASE FOR RAISING THE BANK OF CANADA'S INFLATION TARGET: LUBA PETERSEN
(Department of Economics, Simon Fraser University)
with Michael Devereux (Vancouver School of Economics)
2. WHY NOT TWO PERCENT OR BELOW?
AN EVALUATION OF A LOWER INFLATION TARGET FOR CANADA: THORSTEN KOEPPPL (Queen's University)
with Bill Robson (Chief Executive Officer, C.D. Howe Institute)
3. NOMINAL GDP LEVEL TARGETING: STEVE AMBLER
(Professor of Economics, Université du Québec à Montréal, David Dodge Chair in Monetary Policy at the C.D. Howe Institute)
with Nicholas Rowe (Formerly of Carleton University)

4. ADOPTING A DUAL MANDATE: DOUG LAXTON
(NOVA School of Business and Economics, Portugal)
*with Francisco Ruge-Murcia (Department of Economics,
McGill University)*
5. CLOUDED IN UNCERTAINTY: PURSUING FINANCIAL
STABILITY WITH MONETARY POLICY: SYLVAIN LEDUC
(Executive Vice President and Director of Research,
Federal Reserve Bank of San Francisco)
with Jean-François Rouillard (Université de Sherbrooke)
6. THE HISTORY OF INFLATION TARGETING IN CANADA
AND THE CASE FOR MAINTAINING THE STATUS-QUO:
MICHELLE ALEXOPOULOS (University of Toronto)
*with Edda Claus (Wilfrid Laurier University & Laurier Centre
for Economic Research and Policy Analysis)*

Panelists

1. DAVID ANDOLFATTO
Professor of Economics, Department of Economics, Simon
Fraser University and Vice President in the Research
division of the Federal Reserve Bank of St. Louis
2. DIANE BELLEMARE
Senator of Quebec
3. KEVIN CARMICHAEL
Journalist, Financial Post and Senior Fellow, Centre for
International Governance Innovation
4. DAVID DODGE
Economist & Former Governor of the Bank of Canada and
former Deputy Minister of Finance Canada
5. ANGELA REDISH
Professor of Economics, Vancouver School of Economics,
University of British Columbia

- 6 Introduction**
- 7 What does NGDPLT entail?**
- 8 The advantages of NGDPLT**
 - 9 NGDPLT is a history-dependent rule**
 - 11 NGDPLT avoids the indeterminacy problem**
 - 13 NGDPLT is superior to both IT and PLT in the face of supply shocks**
 - 19 NGDPLT is based on observable variables**
 - 20 NGDPLT is better in a low-inflation environment**
 - 21 NGDPLT provides a superior way of providing stimulus at the lower bound**
 - 24 NGDPLT fosters central bank accountability**
 - 25 NGDPLT fosters financial stability**
- 26 The possible disadvantages of NGDPLT**
 - 27 NGDPLT depends on timely information on GDP**
 - 28 NGDPLT would be difficult for the public to understand**
 - 29 Future prices will not be perfectly predictable under NGDPLT**
 - 30 NGDPLT is not an instrumental rule**
 - 30 NGDPLT is Subject to a time inconsistency problem**
 - 31 NGDPLT means losing the nominal anchor**
- 32 Summarizing the arguments**
- 33 A Pandemic Postscript**
- 35 Conclusion**
- 37 References**
- 44 Discussion by Nicholas Rowe**

STEVE AMBLER¹

Nominal GDP Level Targeting²

1 École des sciences de la gestion, Université du Québec à Montréal and C.D. Howe Institute, steve.ambler@gmail.com. The author is grateful to discussant Nicholas Rowe and to the participants in the *Choosing the Right Target* conference for comments and suggestions. The author retains responsibility for remaining errors and for the views expressed.

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

This chapter considers 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. 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.

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. (Henceforth NGDPLT will refer to targeting a path for nominal GDP.) 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 and/or written 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), Bennett McCallum (H.J. Heinz Professor of Economics, Carnegie Mellon University and member of the Shadow Open Market Committee, 2011), Michael Woodford (John Bates Clark Professor of Political Economy, 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), Peter Ireland (Murray and Monti Professor of Economics, Boston College and member of the Shadow Open Market Committee, 2020), and many others.

The goal of this chapter is to do a selective survey of the literature on NGDPLT. It 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, 2015, 2019), Beckworth (2010, 2017, 2019, 2019b, 2020, 2020b), Hendrickson (2012, 2012b), Beckworth and Hendrickson (2019), Hetzel (2009, 2012, 2015), Christensen (2011), Nunes and Cole (2013), and Rowe (2011).

What does NGDPLT entail?

Nominal GDP is a measure of the monetary value (in Canada, dollars) 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 falls below the growth path, monetary policy would become looser, and monetary policy would be tightened if nominal GDP were above the growth path. Because monetary policy operates with a lag, the goal would be to return nominal GDP to the specified growth path within a reasonable time frame.³

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, which is currently the case of most central banks with explicit inflation targets. This question will come up again in the context of the effective 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),⁴ the central bank would follow a feedback rule of the following form.

$$i_t = i^* + \alpha \times \ln(GDP_t - GDP_t^*).$$

³ Under its current inflation-targeting regime, the Bank of Canada aims to return inflation to its target within six to eight quarters.

⁴ The overnight rate is the interest rate at which banks lend to each other in the overnight market.

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 $\ln(GDP_t - GDP_t^*)$ is the proportional (in logs) gap between the current level of nominal GDP (GDP_t) and the target (GDP_t^*). The α parameter gives the sensitivity of the response of the policy rate to deviations of nominal GDP from the target path. A higher value of α implies a stronger response and a quicker return to the target path, but would also lead to more interest rate volatility. The target level of nominal GDP would normally follow an exponential growth path, so that $\ln(GDP_t^*) = \ln(GDP_0^*) + \beta \times t$, 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.

The central bank's feedback rule can be expressed very simply 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 $i_t = i^* + \alpha \times \ln(E_t(GDP_t) - GDP_t^*)$, where $E_t(GDP_t)$ is the central bank's best estimate of current nominal GDP based on information available 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 two per cent, then a targeted growth rate of nominal GDP of four per cent will lead, on average, to an inflation rate of two per cent. 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.

The advantages of NGDPLT

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 (and is well-understood by the public), 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 previously 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 two per cent 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 (which means that prices revert to their mean or their predetermined growth path) in the standard New Keynesian model.⁵ This implies that current IT regimes in which past shocks to the price level are treated as bygones are suboptimal.

⁵ 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.

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 two per cent, and the Bank aims to keep inflation within a target band of one per cent to three per cent 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 (see equation 3 below for a definition of the 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 value, called its effective lower bound.⁶ 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.⁷ This multiple equilibrium problem is illustrated in Figure 1 below, in which the effective lower bound on the policy rate is assumed to be zero. The green curve is the Taylor rule itself and shows how the central bank's policy rate responds to inflation. There is a kink in the curve: when the Taylor rule dictates a policy rate below the effective lower bound, it remains stuck at that lower bound. 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

⁶ 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. The Bank of Canada currently considers its current policy rate of 25 basis points to be the effective lower bound.

⁷ The illustrated equilibrium, with a zero nominal interest rate, implies that inflation must be negative and equal in absolute value to the long-run real interest rate. The only way for this to be sustainable in the New Keynesian framework used by Benhabib, Schmitt-Grohé and Uribe is for the output gap to be negative, with its size proportional to the sum of the long-term real rate and the targeted rate of inflation.

inflation—this is the so-called Fisher condition, and is illustrated by the purple line in the figure. There are two points where the purple and green curves intersect, and therefore two possible long-run equilibria.

Figure 1: Good vs Evil: Two 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 this region, the so-called Taylor principle is satisfied.⁸ The Taylor principle says that in order 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 close to the bad equilibrium, the central bank cannot vary its policy interest rate by as much as the inflation rate varies. This result is known as dynamic indeterminacy in the region of the bad long-run equilibrium. Many different dynamic equilibria are possible in

⁸ See Galí (2008, page 128).

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 inflation at 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 global financial crisis, 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.⁹

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 negative demand shock will depress both inflation and output, and an expansionary monetary policy will lead to increases in both. There is no trade-off between stabilizing output and stabilizing inflation. This property of IT in response to demand shocks is known as the “divine coincidence” and is usually attributed to the seminal article of Blanchard and Galí (2007).

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

⁹ Ambler and Lam (2016) demonstrate an analogous result that a PLT regime is not subject to the same indeterminacy as IT.

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).¹⁰ This pushes real output below its frictionless level (what it would be in the absence of nominal price and/or wage rigidities), and also leads to an increase in the price level and inflation. Under strict IT or PLT, the central bank must tighten monetary policy in order to reduce aggregate demand and inflation and combat the rise in 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.¹¹

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 to not 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 global financial crisis. 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 ... 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.

¹⁰ For the sake of concreteness, assume a temporary positive shock to the markup of prices over marginal costs.

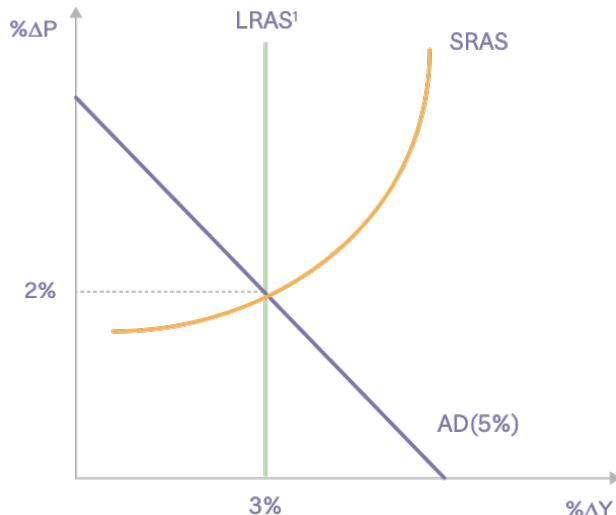
¹¹ If the price elasticity of the aggregate demand curve is equal to minus one, there will be no impact on NGDP growth, and the central bank will not have to react at all to the shock.

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. 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.¹²

Figure 2: Aggregate Demand and Aggregate Supply

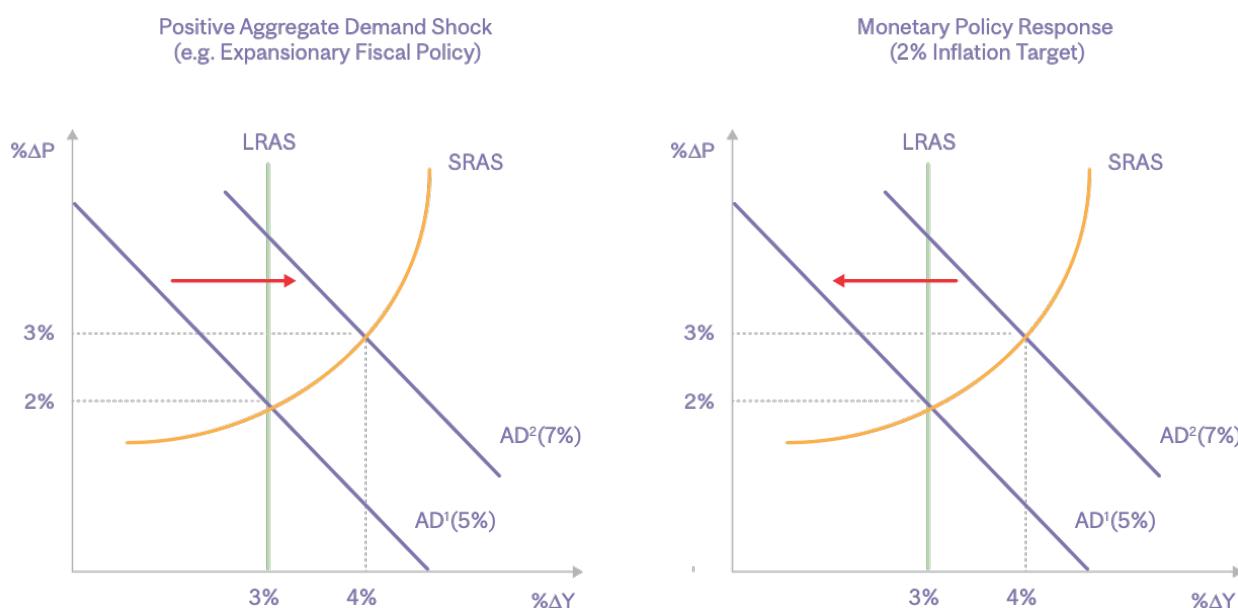


¹² The graphs are from Beckworth (2010).

The rate of change of real output is measured on the horizontal axis. Inflation is measured on the vertical axis. The long-run aggregate supply curve (LRAS) is vertical, and potential output is assumed to be growing at an annual rate of three per cent. 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 five per cent. In the long run, aggregate demand is growing at five per cent per year, so that inflation is equal to two per cent. The upward-sloping short run aggregate supply curve (SRAS) is based on the idea that nominal wages are predetermined, with wage increases depending on the expected rate of inflation when wage contracts were signed. Higher inflation means lower real wages, higher labour demand by firms (with workers agreeing to provide the labour services demanded by firms), and therefore higher hours worked and output.

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.

Figure 3: Positive Aggregate Demand Shock

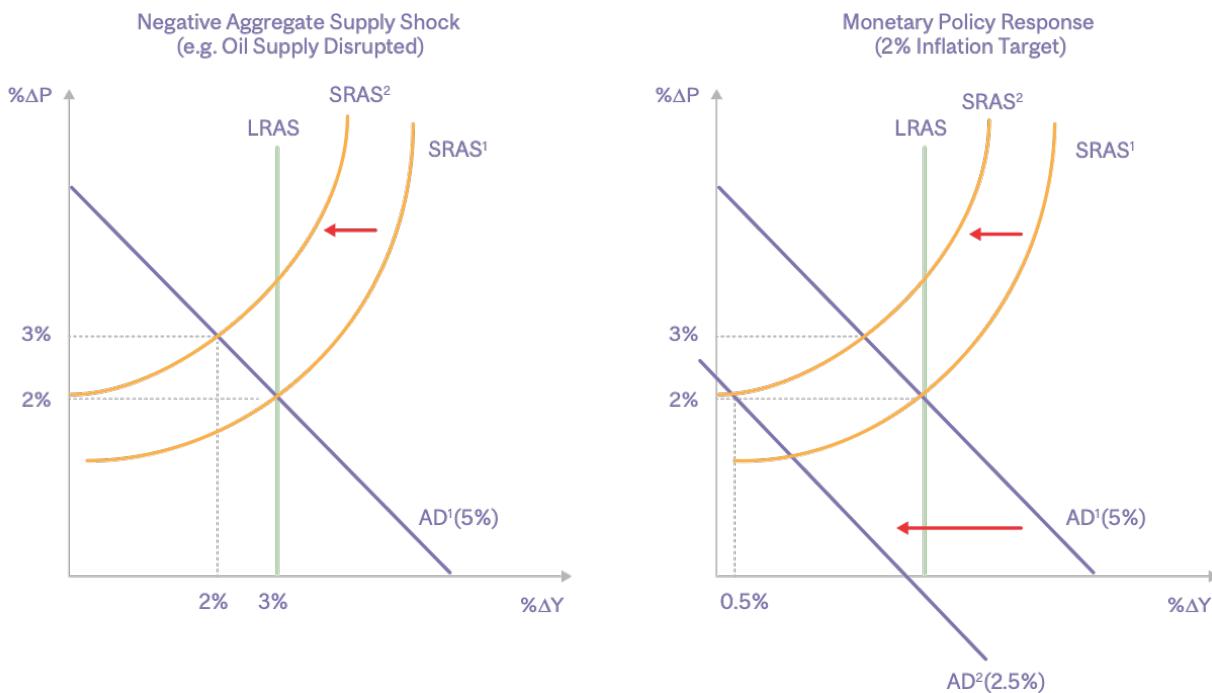


The right panel shows what would happen if the central bank could perfectly control aggregate demand with its monetary policy. Under an IT regime, the central bank would raise its policy rate in order to reduce both aggregate demand

and inflation, thereby offsetting the initial increase in demand. This is exactly the same as what the central bank would do under NGDPLT. Under the two regimes, the response to an aggregate demand shock would be identical (and optimal).

Figure 4 illustrates the case of a temporary (negative) aggregate supply shock.

Figure 4: Temporary Aggregate Supply Shock



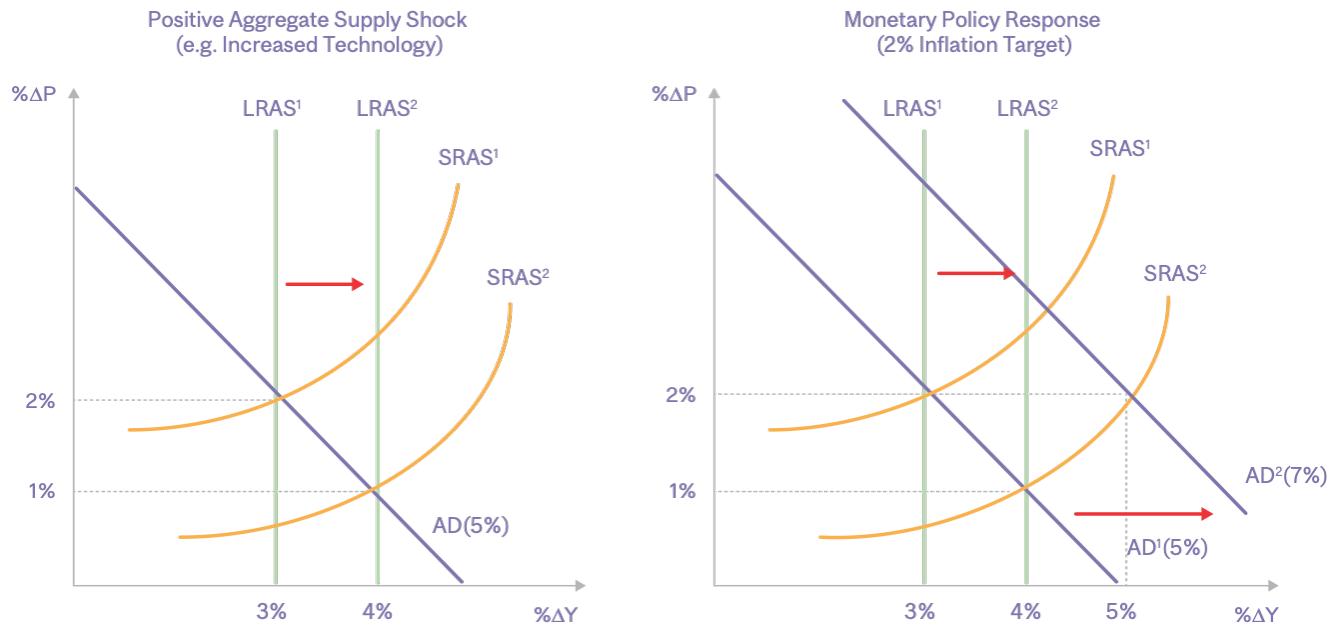
The shock leads to an increase in inflation and a drop in output below its full-employment level, as shown in the left-hand panel. The response of the central bank under IT is illustrated in the right-hand panel. Since inflation has increased, the central bank must tighten monetary policy enough that inflation falls back to two per cent. 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 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 two per cent. The new equilibrium of the economy is at a point where output is above its full-employment level.

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 rule¹³ of the following form.

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

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, π_t is the inflation rate, π^* 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. This 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—the section dealing with possible disadvantages of NGDPLT returns to this measurement issue).

13 See Orphanides (2007) and Woodford (2001).

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 nominal 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 global financial crisis.¹⁴

The main implication of a lower neutral rate 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 global financial crisis, as often as 31.7 per cent of the time if the neutral nominal interest rate is as low as three per cent—close to the upper end of the range of the Bank of Canada's latest estimate.

As noted earlier, 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.

14 The neutral rate of interest is the policy rate compatible with inflation equal to the target and production at full capacity, once the effects of economic shocks have dissipated. It is equal to the sum of the long-term riskless real rate of interest and the inflation target.

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, 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.¹⁵

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:

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

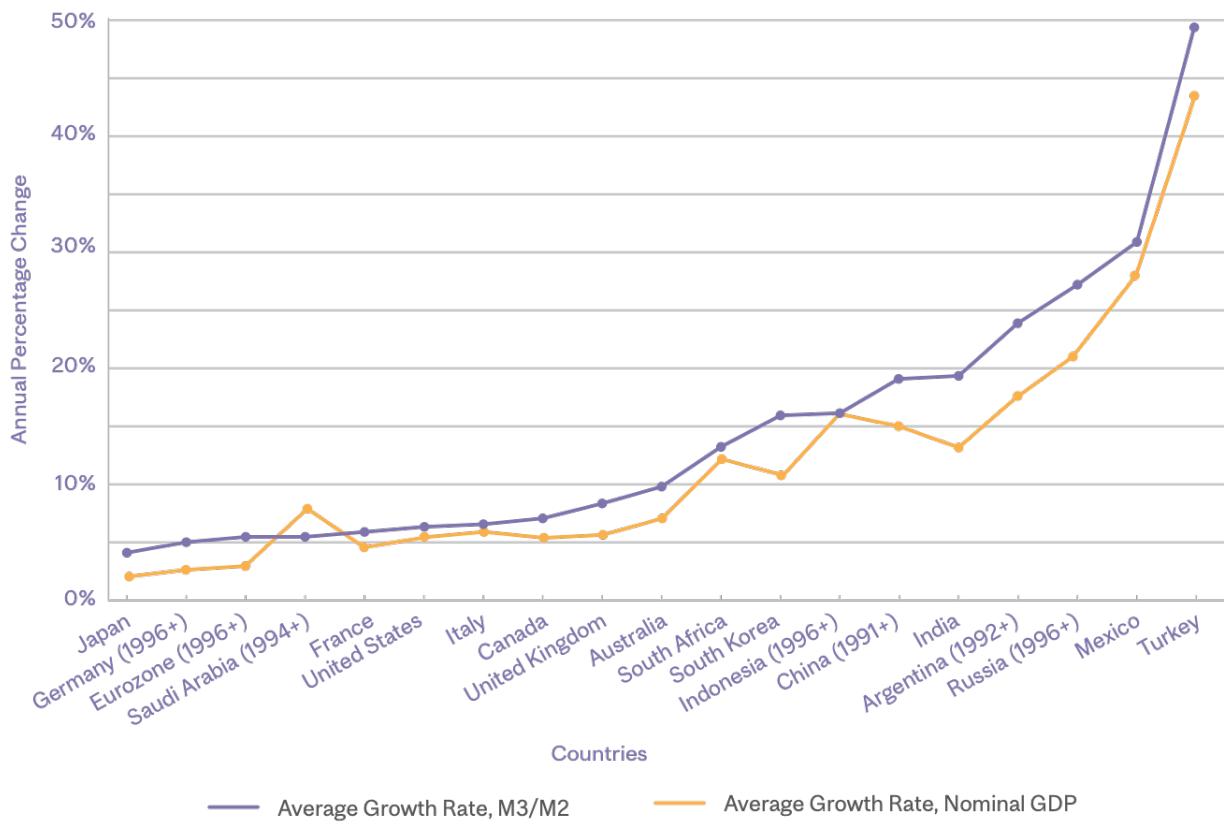
Here, dots on variables indicate growth rates. \dot{M}_t is the rate of growth of a suitable monetary aggregate, \dot{v}_t is the rate of change of the velocity of circulation of money, π_t is the rate of inflation, and \dot{y}_t is the rate of growth of real GDP. The right-hand side of the equation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

Figure 6¹⁶ shows the long-run relationship between nominal income and money growth over the period 1981-2018 for a cross-section of countries.

¹⁵ 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.

¹⁶ Institute for International Monetary Research (IIMR), <https://mv-pt.org/2019/01/24/our-research/>

Figure 6: Money and NGDP Growth



Velocity can fluctuate in the short term, but over the long haul it has historically been stable, except for a gradual downward trend.¹⁷ This means that total spending moves 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 supply of base money. However, if it can transact directly with households and firms, the central bank can directly affect the size of private sector deposits at banks, thereby affecting broader monetary aggregates.¹⁸ As outlined in Buiter (2014), this

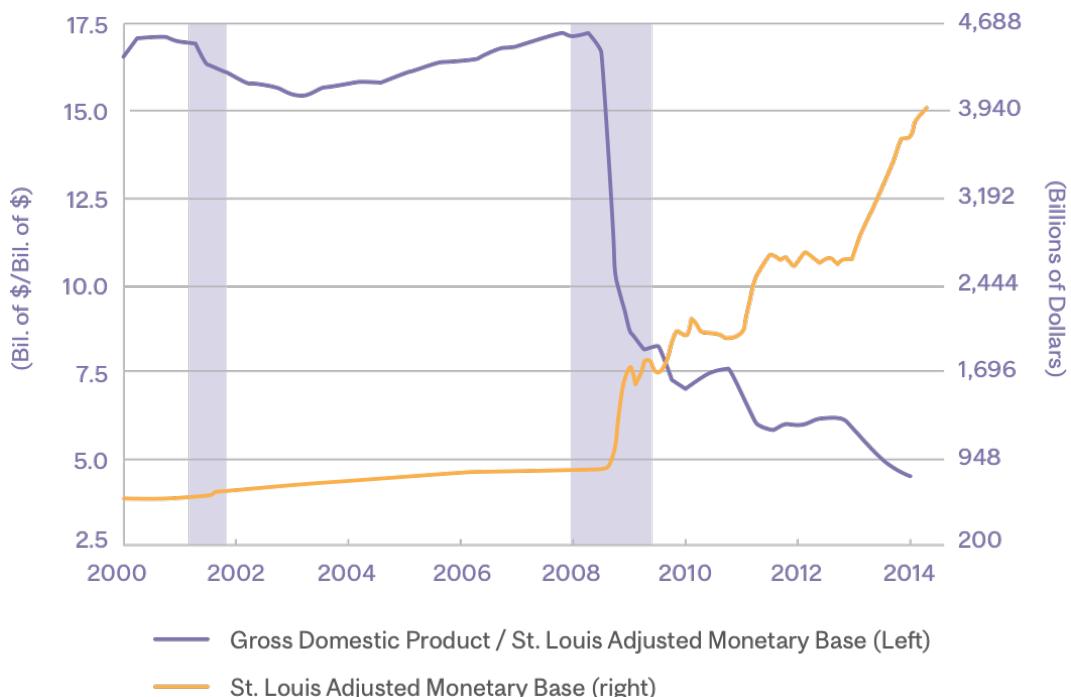
¹⁷ The long-run stability of velocity can depend on the monetary aggregate and is an empirical question. It is more stable in the case of broader aggregates such as M2 or M3, or even *divisia* aggregates which are not simple sums of their components. See Fisher, Hudson and Pradhan (2013).

¹⁸ See Congdon (2010) for a detailed description of the mechanics of what are often known as transactions in secondary markets and which he terms “credit market operations.”

can be done either in coordination with the Treasury (Department of Finance) or completely independently. Such transactions affect the 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 an explicit stance on fiscal policy.

Velocity is subject to fluctuations for several exogenous reasons. These can include changes in transactions technology that affect the ability of individuals to shift their portfolios across different assets with differing degrees of liquidity. They 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 global financial crisis. As is well known, the monetary base increased rapidly during the global financial crisis, but not fast enough to compensate for the dramatic drop in base velocity, as illustrated in Figure 7.

Figure 7: Base and Base Velocity



Source: 2014 research.stlouisfed.org

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. If prices increased substantially in response to a temporary money supply increase, they would have to decrease again quickly as the money supply fell back to its initial level or growth path. This deflation would be perfectly anticipated and would cause a sharp spike in the real interest rate. Both consumption smoothing and investment adjustment costs would put the brakes on such large anticipated swings in the real rate.

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.¹⁹ 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 global financial crisis, 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).

NGDPLT fosters central bank accountability

Central bank independence can be a good thing, but not without accountability (Hetzl 2012b). Central banks that are flexible inflation targeters try to stabilize real GDP along with stabilizing inflation around a target. The performance

19 Beckworth (2017b) also forcefully makes this argument.

of central banks under IT has often been measured by looking at both inflation volatility and real GDP growth volatility.²⁰

Focusing on a single target makes accountability much easier. Performance could be measured by the standard deviation of the gap between nominal GDP and its target path, which is not dependent on a particular model of how the economy works. 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 their target. Under IT, many central banks have consistently undershot their targets since the end of the global financial crisis. 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 and well-understood NGDPLT regime would anchor expectations of nominal spending growth.

NGDPLT fosters financial stability

Debt contracts are typically not state-contingent: that is, the size of payments does not depend explicitly on economic conditions. In fact, they most often stipulate payments in nominal terms, unadjusted for inflation. 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 to write and to enforce. 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: higher inflation in downturns reduces the real value of the amounts owed by borrowers more quickly. This improves the risk-sharing properties of non-contingent contracts, as seen in theoretical models by Koenig (2013), Sheedy (2014), and Bullard and DiCecio (2019).

²⁰ See Cecchetti et al. (2006). Historical inflation and output volatility are typically compared to the trade-off between the two that could be achieved with optimal monetary policy, the so-called Taylor curve. However, this optimal trade-off can only be derived in the context of a fully-fledged model of the economy.

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.²¹ Maintaining total nominal income on an even keel means that borrowers will be less likely to be unable to meet their debt burdens. Beckworth (2019) shows that there is strong empirical cross-country evidence that stability in nominal income growth is associated with financial stability.

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 many pundits expected. 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.²² Its deficiencies became apparent during and in the wake of the global financial crisis.

21 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.

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

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 industry-based 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, meaning that they are unbiased and have relatively small mean squared forecast errors. See for example Chernis and Sekkel (2017).

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 systematically biased. The central bank under an NGDPLT regime aims to return nominal GDP to its target path within a period of a few quarters, which is a fundamentally forward-looking strategy. A revision to the value of nominal GDP from, say, two quarters ago would affect how big the nominal GDP gap was at that time but would not impinge on the central bank's ability to get back to target in the future.

In addition, the nominal value (the dollar value in Canada) 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 both quality improvements and the introduction of new types of goods into account. The next subsection returns to this question.

Second, Sumner (2013, 2015) 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 price would be close to an unbiased predictor of future NGDP.

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.

It is almost certainly the case that few individuals other than professional economists can give an adequate definition of GDP. Without a clear understanding of nominal GDP, the public (households in particular) might have difficulty in formulating clear expectations about the future evolution of the economy, making the central bank's policy less effective.

Even so, the concept of the total dollar value of spending is quite straightforward. Central banks could develop a communication strategy to relate this concept to households' own nominal incomes and spending, over which they have a fairly firm grasp. Some proponents of NGDPLT have proposed a variant in which a growth path for total labour income would be the target (see for example Sumner 1995). 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.²³ Coibion and Gorodnichenko (2015) show that American households put inordinate weight on gasoline prices when forming their inflation expectations and their knowledge of the current price level, weakening the link between headline inflation and the output gap. Binder (2020) notes that in a survey of the knowledge of the Fed's policies "only a quarter of our respondents knew of the Fed's two per cent inflation target, and most respondents were unaware of recent inflation statistics."

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 a central bank wanted to target a given average rate of inflation in the long run, then in order to hit that rate exactly it would have to 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 would 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.

In fact, this would only be the case if the central bank gave high priority to achieving a given average rate of inflation. If the welfare costs of inflation are not highly sensitive to small variations in the average inflation rate (at least when average inflation is quite low), small errors in the predicted rate of real GDP growth leading to small differences in average inflation would not be very costly. Also, the

23 One of the alternative regimes considered in this volume, a dual mandate, would present even tougher communication problems. The central bank would have to communicate its changing weights, depending on the circumstances, on the inflation gap on the one hand and the output, unemployment, or employment gap on the other. The precise level of full-capacity output, employment, and unemployment would likely become a political football.

future price level would not be inherently more unpredictable under NGDPLT than under the current IT regimes in Canada and other countries, because of the price-level drift problem alluded to above.

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.”

As already noted, NGDPLT is perfectly compatible with a feedback rule for a short-term policy interest rate, and the policy rate would be much less likely to hit its effective lower bound than if the central bank followed a Taylor rule under IT. In addition, 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 via the purchase and sale of futures contracts by the central bank represents a concrete if unorthodox alternative.

NGDPLT is Subject to a time inconsistency problem

Consider a central bank that 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 we have already noted, 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 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.

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 or PLT as proposed by Evans (2010) and others may be undesirable. If mistakes are only corrected in one direction (to compensate for periods when inflation or nominal GDP is lower than target) then, if successful, such a regime would guarantee an inflation rate or a level of nominal GDP higher on average than the target. Inflation expectations could then become unanchored. A clearly-defined, symmetrical target would avoid this problem.

Summarizing the arguments

Tables 1 and 2 summarize the arguments developed in the preceding sections of this chapter. Table 1 summarizes the main arguments in favour of NGDPLT, while Table 2 lists the main objections to NGDPLT and how they can be countered.

Table 1: The reasons for 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

Table 2: The reasons against NGDPLT

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

The potential benefits of NGDPLT are numerous and important. With real interest rates and growth that are now lower than before the financial crisis, this practically guarantees that IT will not function as smoothly as before even

in normal times. The effective lower bound on policy rates will bite much more quickly in response to shocks of all types. Central banks (including the Bank of Canada) had not articulated clear and detailed strategies for coping with the next crisis when it actually hit in the form of the COVID pandemic.

A Pandemic Postscript

The pandemic that led to the postponement of the conference on which this volume is based presents an extreme form of a situation requiring economic stimulus at the effective lower bound. In Canada, the forced lockdowns to limit the spread of the pandemic led to the sharpest contraction in output since the Second World War. In response, in March 2020 the Bank of Canada cut its target overnight rate from 1.75 per cent to 0.25 per cent in three steps, only the first of which was on one of its scheduled fixed action dates. The rate reached what the Bank considers to be its effective lower bound of 25 basis points on March 27. The Bank also intervened heavily in various asset markets to ensure market liquidity and well-functioning financial markets. Its balance sheet and high-powered money liabilities (currency in circulation plus reserves held on deposit at the Bank of Canada) expanded at an unprecedented rate.

The pandemic had the characteristics of both a supply shock and a demand shock, with forced closures of businesses leading to lost jobs and incomes and from there to reduced spending by households and firms.

The Bank's initial reaction was credit policy more than monetary policy.²⁴ As the lockdowns came to an end, and with the Bank's policy rate at its lower bound for the foreseeable future, the expanded high-powered money stock began to play the role of QE, potentially driving down the yields on longer-term bonds. These measures provided large amounts of reserves (known technically as settlement balances in the Canadian context) that the financial system could use to expand

²⁴ This was the case of the Fed in the US as well. See Ireland (2020) on this distinction.

loans, and to put a floor on inflation expectations in order to keep real interest rates down. Coming out of the trough of the recession,²⁵ the Bank was faced with serious trade-offs among four interrelated and competing policy objectives.

1. Provide stimulus to aggregate demand in order to aid the recovery from the pandemic-induced recession and counteract the deflationary pressures coming from the initial collapse in demand, in order to hit its inflation target within a reasonable time frame, which will likely be extended beyond the usual six to eight quarters due to the severity of the recession.
2. Make clear that the massive expansion in the money supply (both high-powered money and broader measures of the money supply) would not eventually lead to a sustained increase in inflation.
3. Manage its holdings of debt (federal government debt, provincial government debt, and private-sector securities).
4. Resist pressures to keep interest rates artificially low in order to ease governments' debt servicing costs and reduce the real value of that debt through inflationary finance.

A switch to a target path for nominal GDP would make it easier to attain these goals. As previously noted, an expansionary monetary policy will lose most of its effectiveness if it is expected to be only temporary. A commitment to a growth path for nominal output would ensure that a component of the growth of the money supply aggregates would be permanent, boosting the impact of QE on demand and inflation.

We also noted above that the optimal monetary policy under commitment is history-dependent and means correcting past deviations of inflation from its target. This means that the optimal path back to long-run equilibrium involves inflation overshooting its target in the medium run. However, an extended period of higher inflation could destabilize expectations. A target growth path for nominal output puts both a lower and an upper bound on average inflation, which in turn depends on the upper and lower bounds on the average growth rate of potential output.

²⁵ At the time of writing (June 2020), it appeared that monthly (industry-based) real GDP would reach a minimum in April 2020.

A target path for nominal GDP would put natural bounds on the size of the Bank of Canada's balance sheet, on the stock of high-powered money, and on its holdings of government debt. These bounds would help to maintain its credibility and independence in the face of possible political pressure to lower the costs of financing the governments' (federal and provincial) debt through inflationary finance, low interest rates, or a combination of the two.

Conclusion

This chapter summarizes the main arguments in favour of NGDPLT as a monetary policy framework. 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.

The chapter also summarizes some of the main objections to NGDPLT from the literature. It contends that they are relatively unimportant 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.

Inertia will continue to be the main force preventing central banks from making major changes in their monetary policy frameworks. It has not been a perfect regime but it has performed at least adequately, even if cracks have begun to appear in the facade. 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.²⁶ However, it may also be partly responsible for the sluggish recovery of economies from the global financial crisis.²⁷ The pandemic crisis and the path to recovery present an opportunity for central banks to do more than just tinker with their current monetary policy frameworks. If they fail to take advantage of this opportunity, they may not get another chance before the next major crisis if IT continues to perform at least adequately.

26 See Cecchetti et al. (2006) for an analysis.

27 See Chapter 7 of Ambler and Kronick (2018).

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>
- Ambler, Steve and Jeremy Kronick (2018), *Navigating Turbulence: Canadian Monetary Policy since 2004*. Toronto, C.D. Howe Institute.
- 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 global financial crisis*. Oakland, CA, The Independent Institute

- Beckworth, David (2017), “The Knowledge Problem and Monetary Policy: The Case for Nominal GDP Targeting.” Working Paper, Mercatus Center at George Mason University
<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 at George Mason University
<https://www.mercatus.org/publications/monetary-policy/facts-fears-and-functionality-ngdp-level-targeting-guide-popular>
- Beckworth, David (2020), “An Operating Framework for the 21st Century.” Working Paper, Mercatus Center at George Mason University
<https://ssrn.com/abstract=3494567>
- Beckworth, David (2020b), “The Stance of Monetary Policy: The NGDP Gap.” Working Paper, Mercatus Center at George Mason University
https://www.mercatus.org/system/files/beckworth_-policy_brief_-ngdp_benchmark_paths_-policy_brief_-v2.pdf
- 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
- Binder, Carola (2020), “NGDP Targeting and the Public.” *Cato Journal* 40, 321–342
- Blanchard, Olivier and Jordi Galí (2007), “Real Wage Rigidities and the New Keynesian Model.” *Journal of Money, Credit and Banking* 39, 35–65
- 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 global financial crisis? 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 global financial crisis: 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 (2016), "Why Has Nominal Income Growth Been So Slow?." Shadow Open Market Committee Meeting
<https://www.shadowfed.org/wp-content/uploads/2016/04/IrelandSOMC-April2016.pdf>
- Ireland, Peter (2019), "Economic Conditions and Policy Strategies: A Monetarist View." *Cato Journal* 39, 51–63
- Ireland, Peter (2019b), "Interest on Reserves: History and Rationale, Complications and Risks." *Cato Journal* 39, 327–337
- Ireland, Peter (2020), "The Time is Right for Nominal GDP Level Targeting." draft, Boston College
<http://irelandp.com/papers/somc202006.pdf>
- Johnson, Clark (2011), "Monetary Policy and the global financial crisis." *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 Search for 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
<http://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
- 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.philadelphiahfed.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
- 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 (1989), "Using Futures Instrument Prices to Target Nominal Income." *Bulletin of Economic Research* 41, 157-162
- Sumner, Scott (1995), "Using Monetary Policy to Target a Nominal Wage Index." *Journal of Economics and Business* 47, 205-215
- Sumner, Scott (2011), "The Case for NGDP Targeting: Lessons from the global financial crisis." 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 (2015), "Nominal GDP Futures Targeting." *Journal of Financial Stability* 17, 65-75
- 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." *Monetary Freedom Blog* February 16
<http://monetaryfreedom-billwoolsey.blogspot.co.uk/2013/02/ngdplt-and-central-bank-discretion.html>

NICHOLAS ROWE

Discussion

Introduction

Steve Ambler has written a very good and very comprehensive survey of the pros (and cons) of replacing the Bank of Canada's current inflation target with a nominal GDP target. He leaves me with little to add (or subtract).

I will make two points:

My first point is about lags and leads, and rules vs discretion in monetary policy.

My second point is about "divine coincidence", and flat Phillips Curves.

Lags and leads, rules vs discretion

Practicing central bankers know that lags (recognition lag, decision lag, effect lag) are what make their jobs difficult. We talk about these lags in introductory macro to explain why monetary policy (or fiscal policy) cannot stabilize aggregate demand perfectly. It's like trying to drive at a constant speed on a hilly road, where the speedometer tells you what speed you were doing in the past, the gas and brake pedals take time to work, and you only see hills in the rearview mirror.

Lags make the central banker's job difficult. But lags alone tell us nothing about whether it's better for central banks to follow a rule vs discretion. You need leads, as well as lags, to explain why rules might do better than discretion. The car analogy breaks down, because cars don't respond to what they expect the driver to do in future.

Money is an asset. The current demand for any asset depends on expectations about future demand and supply of that asset. And the longer-lived an asset, and the lower its discount rate, the more 'the future' matters relative to 'the present' (an arbitrarily short period). Monetary policy is 99 per cent what people expect the central bank to do in future, and only one per cent what the central bank does today (except when current actions affect expected future actions).

It is leads that create a difference between rules and discretion, and create a time-consistency problem. We make promises about our future actions (like repaying a loan) in order to influence others' expectations about our future actions, in order to influence their current actions (like giving us a loan). But when the future arrives, bygones are bygones (they have already given us the loan), so our incentives to do what we had previously promised are very different. Without third-party enforcement, our only incentive for doing what we had promised is to maintain our reputation for keeping promises, so that we can benefit in future from being able to make credible promises. If there is no time consistency problem, there is no difference between rules and discretion.

A fiscal policy regime with progressive taxes, or employment insurance, will have stronger automatic stabilizer properties than a fiscal regime with lump sum taxes and no employment insurance. The same shock will have a smaller effect on aggregate demand, even before the fiscal authorities are aware of the shock and take deliberate actions to offset it. We should use the same language of automatic stabilizers to talk about monetary policy regimes as well.

A monetary policy regime is a monetary policy instrument plus a monetary policy target. Both instrument and target will affect the automatic stabilizer properties. The instrument is what stays constant until the central bank takes deliberate action to change it in response to shocks. The target is what stays constant despite shocks.

Suppose a shock hits aggregate demand. If there are no lags, the central bank can respond instantly, and instantly offset that shock, perfectly stabilizing aggregate demand. If there are lags, it cannot. But if there are leads as well as lags, the choice of monetary policy rule will make a difference, because different rules will have different implications for how the same shock affects people's beliefs about the future, and how they will respond to the same shock today.

An inflation target means changes in inflation are expected to be temporary. A price level target means changes in the price level are expected to be temporary. This will be a stronger automatic stabilizer than an inflation target, where changes in the price level are expected to be permanent. Because expected inflation will change, and so real interest rates will change (for a given nominal rate), so interest-sensitive expenditure will change to partly offset the shock.

A NGDP level path target means changes in the level of NGDP are expected to be temporary. If aggregate demand shocks caused changes in the price

level, but no changes in real GDP, the automatic stabilizer properties of a NGDP target would be exactly the same as a price level target. But if real GDP changes too, the automatic stabilizer mechanism of a NGDP target will be qualitatively different from that of a price level target. It won't just work through expected real interest rates, and their effect on firms' and households' spending decisions. It will work through expected future sales and incomes, and their effect on firms' and households' spending decisions. Two channels beat one: don't put both your automatic stabilizer eggs in one basket.

Could the Bank of Canada have prevented NGDP falling below target when the COVID-19 shock hit? Of course not - even if the Bank of Canada had perfect foresight, and could see the shock coming. For the same reason that the Bank of Canada cannot prevent NGDP falling on Sundays. What matters is whether it's better for people to expect that changes in NGDP are temporary, or that changes in inflation are temporary, or that changes in the price level are temporary.

‘Divine coincidence’ and flat Phillips Curves

It's the output gap (or the employment gap, or the unemployment gap) that we really care about. But the central bank can't target the output gap directly, because it doesn't observe it, and small consistent misses would add up to ever-accelerating inflation or deflation. But it could target the output gap indirectly, by targeting inflation. And if divine coincidence were true, minimizing deviations of inflation from target would also minimize the output gap.

‘Calvo’s fairy’ flies at random, so each firm has exactly the same chance of being touched by her wand and given permission to change its price. That randomness simplifies the math in a New Keynesian Phillips Curve. But that assumed randomness also stacks the deck in favour of inflation targeting. The subset of firms that do change prices is a perfectly representative sample of the population of firms. So if we see inflation fall below target, it means there must be an output gap for the average firm, which wants to cut its relative price but cannot, so the central

bank should loosen monetary policy. Deviations of inflation from target are a perfect signal of the output gap. So we get divine coincidence.

It's clear that divine coincidence can fail when there are supply shocks, which hit different firms differently. The firms that change their prices are unlikely to be a representative sample of firms.

What's less obvious is that divine coincidence can also fail with demand shocks, if some firms change prices more frequently than others. Suppose there's a negative demand shock, there's a lag in monetary policy response, and so the firms with more flexible prices cut their prices. The central bank targeting inflation now wants to loosen just enough to prevent *future* inflation falling below target. But the firms with stickier prices still have their relative prices too high; they still have an output gap even if inflation returns to target. It's firms with the most sticky prices that need the most help from the central bank; but it's firms with the most flexible prices that get the most attention with an inflation target.

Imagine a short-run Phillips Curve, with deviations of inflation from target on the vertical axis, and the output gap (or employment gap, or unemployment gap) on the horizontal. If that Phillips Curve were perfectly stable, deviations of inflation from target would be a perfect signal of the output gap; we get divine coincidence. A Phillips Curve that shifts up and down adds noise to the signal. And a flatter Phillips Curve would worsen the signal/noise ratio. (A perfectly flat Phillips Curve eliminates the signal, leaving only noise.)

The flattish look of observed Phillips Curves is in part just a statistical artefact of inflation targeting itself. A central bank that succeeds in keeping inflation at exactly two per cent will make every curve perfectly flat, if inflation is on the vertical axis. But it's hard to argue that is the whole story, given the depth and length of the global financial crisis in most inflation targeting countries. Maybe inflation targeting itself made inflation stickier, and less responsive to the output gap, by creating a 'two per cent norm'? And it is much easier to see that recession, and slow recovery, in the NGDP data than in the inflation data. Which suggests that deviations of NGDP from target would be a better signal of the output gap.

If you like, you could think of an NGDP target as an operational "dual mandate", with equal weights on the price level and real GDP.

About the Authors

Steve Ambler

**Professor of Economics, Université du Québec à Montréal
David Dodge Chair in Monetary Policy, C.D. Howe Institute**

Professor Ambler has taught at l'École des sciences de la gestion de l'Université du Québec à Montréal (ESG UQAM) since 1985, and has chaired the Department (2012-2015). Ambler has held visiting positions at the Université de Paris I (Panthéon-Sorbonne), the European University Institute, the Institut für Höhere Studien in Vienna, and the Oesterreichische Nationalbank (Austrian central bank). He is the author of numerous articles in journals such as the Journal of Monetary Economics, the Review of Economics and Statistics, and the Journal of Money, Credit and Banking.

He is a past president of the Société canadienne de science économique (1998-1999). He has been an Associate Editor of the Canadian Journal of Economics (1992-1995) and of Canadian Public Policy (1998-2003). He was on secondment to the Bank of Canada as Special Adviser from September 2006 to July 2007. He was Secretary-Treasurer of the Canadian Economics Association from 2007 to 2012.

Nicholas Rowe

Retired Professor, Carleton University

Nicholas Rowe taught economics at Carleton University for 37 years. He received his Ph.D. in economics from the University of Western Ontario, and was previously a member of the C.D. Howe Institute's Monetary Policy Council and the Centre for Monetary and Financial Economics. A contributor to numerous volumes, Professor Rowe's articles have appeared in such scholarly journals as the Journal of International Money and Finance and Canadian Journal of Economics.



MAX BELL SCHOOL
of PUBLIC POLICY

680 Sherbrooke St. West, 6th Floor
Montreal, QC H3A 2M7
www.mcgill.ca/maxbellschool/