

Inflation Targeting: A Victim of Its Own Success*

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Since the introduction of inflation targeting, inflation expectations have become firmly anchored at target and there has been a flattening of the Phillips curve. These changes mean that a “divine coincidence” between headline inflation and output-gap stabilization is less apparent than when inflation targeting was introduced. This has led some to call for a fundamental reengineering of inflation-targeting regimes: either adopting explicit dual mandates or replacing headline inflation with a target inflation measure more closely related to domestic output gaps. We argue instead for an evolution in the practice of CPI inflation targeting. In practice, many central banks have already moved in this direction with the adoption of flexible inflation-targeting frameworks.

JEL Codes: E31, E52, E58.

1. Introduction

Despite one of the largest global recessions in decades during the financial crisis, global inflation barely budged. In some respects, this could be seen as a triumph for inflation targeting—inflation remained close to target despite some of the largest economic shocks in living memory. In the eyes of some, however, the financial crisis has demonstrated the weaknesses of inflation targeting. It has been argued that, in the face of record levels of unemployment in

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many economies, central banks should weigh unemployment outcomes more heavily in their objectives. There have also been arguments that central banks, in responding to imported inflation shocks while domestic demand remains depressed, or focusing on low headline inflation while asset prices were accelerating, have focused on inappropriate or misleading inflation measures. This paper makes the argument that these two, seemingly contradictory, outcomes are a reflection of the general success of inflation targeting. Like a vaccination program, once the disease is effectively conquered, people begin to question the value of vaccination. This means that the communication challenges for central banks are magnified, but it doesn't necessarily mean that the vaccination program itself, inflation targeting, needs to be fundamentally reengineered.

To reach this conclusion, we first look at the behavior of inflation in Australia over the past twenty-five years or so since inflation targeting was introduced. While we look at data from Australia, reflecting our familiarity with the Australian experience, the findings are illustrative of a broader experience that is common across most inflation-targeting central banks, and our subsequent discussion is not specific to any one country (see International Monetary Fund 2013). We document significant changes in the behavior of inflation over that time period: long-term inflation expectations have become firmly anchored at target inflation rates; the simultaneous flattening of the Phillips curve has contributed to a substantial reduction in the variability of prices directly affected by domestic monetary policy; and imported inflation now accounts for a larger share of the variability in consumer price inflation than in the past, while also having less ongoing influence on inflation.

These changes in the inflation process have made CPI inflation a less reliable guide to the appropriate stance of monetary policy. Changes in CPI inflation are now more likely to reflect imported inflation than changes in domestic economic conditions. Furthermore, the flattening of the Phillips curve, whether caused by or coincident with the adoption of inflation targeting, has complicated the task of identifying deviations in output from potential and, thus, forecasting inflation. Inflationary pressures arising from imbalances between demand and supply are smaller and more difficult to separate from idiosyncratic variation in inflation.

We consider the implications of these changes in the inflation process for the conduct of inflation targeting over the next twenty-five years. We focus our discussion around the central bank objective of maintaining price stability rather than also exploring the other major responsibility of central banks—financial stability. This is not to say that financial stability is not important. Rather, it is a sufficiently large topic that it would be difficult to do it justice within the same paper. Notwithstanding this, we do touch on financial stability considerations to the extent that financial stability can affect price or output stability. Thus, reflecting our focus on the price stability mandate, we discuss two particularly prominent proposals for change: either adopting explicit dual unemployment-inflation mandates or changing the target to a measure more closely related to domestic economic conditions than CPI inflation. Our discussion emphasizes that a breakdown in the correspondence between output and inflation stabilization, caused in part by the success of inflation targeting, motivates these proposals for change and can help us understand the perceived “failings” of inflation targeting during the recent crisis. We conclude by suggesting some particular areas of the practice of central banking that will need to change and improve if inflation targeting is to celebrate its fiftieth anniversary twenty-five years from now. We do not recommend wholesale change, but there may be some scope for enhancements.

2. The Past Twenty-Five Years

When inflation targeting was first introduced in New Zealand twenty-five years ago, the world was a very different place from the one we know today. In New Zealand, inflation was hovering around 7 percent and interest rates, both monetary policy and mortgage, were in the high teens. The high interest rates were a reflection of the fact that, with limited inflation credibility, an aggressive policy response was required to reduce inflation. The situation was not so different in Australia: highly contractionary monetary policy in the early 1990s—mortgage interest rates were around 18 percent—preceded a large disinflation and the adoption of inflation targeting. Previous frameworks, such as fixed exchange rate regimes and money growth targeting, had broken down and the even higher inflation and

interest rates experienced in the 1970s were very much an ongoing concern rather than the distant memory they are today.

Since then the practice of inflation targeting has evolved substantially, as has the economic environment. This early evolution occurred in small open economies such as Australia, Canada, and New Zealand, and was driven by the practicalities of making monetary policy decisions in an uncertain world. There were large debates about how to implement inflation targeting, and the questions that were asked then are not so different from the ones being debated today. Policymakers and academics debated: Should the target be aggregate consumer prices or only non-traded consumer prices? Should asset prices be included in the objective function or not? And what was the appropriate horizon for achieving an inflation target?

From these debates, and the experience gained implementing inflation targeting, emerged the inflation-targeting frameworks we have today. These frameworks are commonly described as “flexible inflation targeting,” whereby central banks give priority to controlling inflation over the medium run but, where the opportunity exists, stabilize output or employment as well. Furthermore, while targets are invariably stated in terms of headline inflation, underlying inflation measures are routinely used as a guide for policy. These frameworks have proved to be remarkably successful in both reducing inflation and anchoring expectations. As we demonstrate in this section, the successful implementation of inflation targeting has dramatically altered the behavior of inflation.

A direct way of seeing one aspect of this change in behavior is to look at the way long-term inflation expectations respond to inflation surprises. If expectations are well anchored, they should not respond to surprises. On the other hand, if inflation expectations are adaptive or otherwise poorly anchored, one would expect to see revisions to longer-term expectations when a surprise occurs. To assess this we use Consensus Economics forecasts of inflation and look at the way expectations change between the March and September quarters.¹ The change in current-year inflation expectations between these two dates is a good indicator of the inflation surprise between

¹Official inflation data in Australia are published at a quarterly frequency.

those dates. Reflecting our comparative advantage, we conduct this exercise on Australian expectations—results for other countries are similar.²

Formally, for forecast horizons up to six years ahead, we estimate the regression

$$F_t^{Sep} \pi_{t+h} - F_t^{Mar} \pi_{t+h} = \alpha_h + \beta_t (F_t^{Sep} \pi_t - F_t^{Mar} \pi_t) + \varepsilon_{t+h},$$

where $F_t^{Sep} \pi_{t+h}$ is the September-quarter Consensus forecast in year t for inflation in year $t + h$, and similarly for the other forecast terms in the regression. The coefficient β_h is the estimated revision to inflation expectations at horizon h in response to a surprise in current-year inflation.

Data are available from 1991, so we split the sample approximately in half, with a sample from 1991 to 2000 that covers the initial years of inflation targeting in Australia and a sample from 2001 to 2013 reflecting more recent experience. We estimate regression coefficients β_h for each sample period, and show in figure 1 the response of inflation expectations to a one-standard-deviation surprise in current-year inflation: $F_t^{Sep} \pi_t - F_t^{Mar} \pi_t$. In the pre-2000 period for Australia, a one-standard-deviation surprise (March to September) in current-year inflation tended to raise professional forecasters' inflation expectations at a five-year horizon, but in the post-2000 period inflation surprises have had a negligible effect on expectations (abstracting from base effects). Inflation expectations are clearly better anchored today than they were when inflation targeting was first being established in Australia.

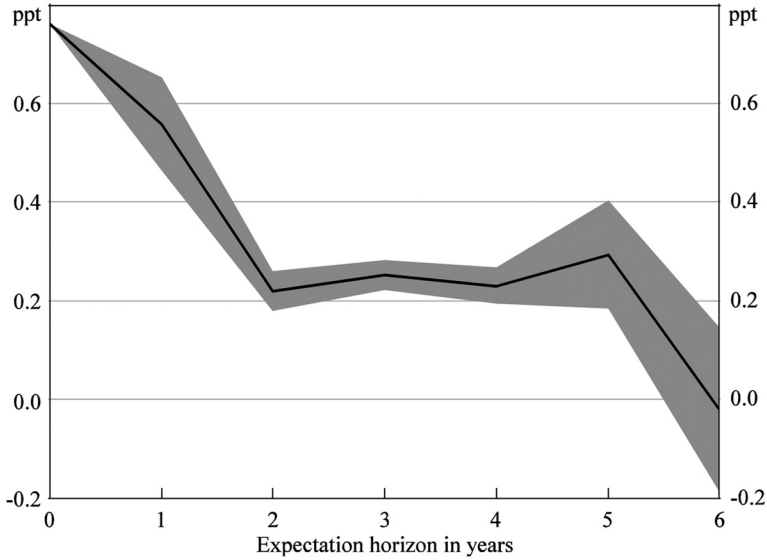
While this evidence is relatively direct and transparent, it is only partial. There are other ways in which inflation targeting may have affected the behavior of inflation. For example, there is ongoing debate about whether the relationship between economic slack and inflation has been changing or, conversely, whether more stable inflation has been a sign of small levels of economic slack despite heightened unemployment.³ Furthermore, particularly in small open economies, there has been a debate about the changing influence of imported goods and services prices on domestic inflation. To address

²See International Monetary Fund (2011).

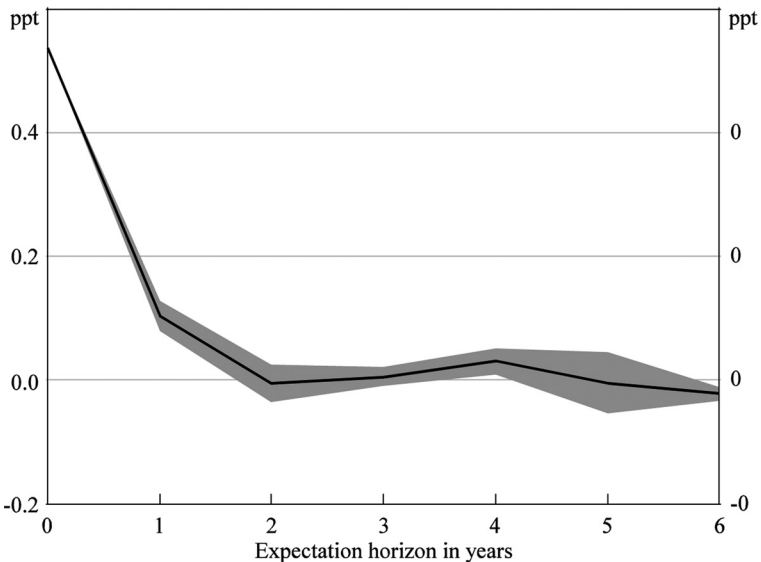
³See Debelle and Vickery (1997) and Kuttner and Robinson (2008).

Figure 1. Response of Inflation Expectations to a Surprise Change in Current-Year Inflation: By Horizon

A. 1991–2000



B. 2001–13



Notes: The figure shows the change in year-on-year Consensus inflation expectations between the March and September quarters for the current year and each year out to a six-year horizon, in response to a one-standard-deviation surprise change in current-year inflation.

these issues in a more comprehensive way, we estimate a relatively standard New Keynesian Phillips curve. To allow for the fact that the inflation process may have changed over time, we estimate a model with time-varying parameters using a non-linear Kalman filter developed by Matheson and Stavrev (2013). This framework allows us to simultaneously examine changes in the slope of the Phillips curve, the degree of anchoring in inflation expectations, and the natural rate of unemployment.

More technically, in our estimation annualized inflation π_t is described by a Phillips curve that depends on inflation expectations π_t^e , the deviation of unemployment from its natural rate ($u_t - u_t^*$), and import price inflation $\hat{\pi}_t^{4,m}$:

$$\pi_t = \pi_t^e - \kappa_t(u_t - u_t^*) + \gamma_t \hat{\pi}_t^{4,m} + \varepsilon_t^\pi.$$

The import price term $\hat{\pi}_t^{4,m}$ is demeaned tariff-adjusted import price inflation relative to CPI inflation, in year-ended terms. Inflation expectations is a weighted average of a forward-looking measure, long-term Consensus inflation expectations, and a backward-looking measure, lagged year-ended inflation:⁴

$$\pi_t^e = \theta_t \bar{\pi}_t + (1 - \theta_t) \pi_{t-1}^4.$$

The unemployment gap evolves according to the first-order autoregressive process

$$(u_t - u_t^*) = \rho(u_{t-1} - u_{t-1}^*) + \varepsilon_t^{(u-u^*)},$$

with the natural rate of unemployment evolving according to a random-walk process:

$$u_t^* = u_{t-1}^* + \varepsilon_t^{u^*}.$$

⁴After 1991, the long-term inflation expectations series is Consensus forecasts for CPI inflation six to ten years ahead; expectations are surveyed in the June and December quarters, and we linearly interpolate between observations. From 1986 to 1991, we use long-term inflation expectations implied by inflation-indexed bonds, and before 1986 expectations are proxied by the difference between ten-year nominal bonds and an estimate of the world real interest rate (see Debelle and Laxton 1997).

The shock $\varepsilon_t^{(u-u^*)}$ is interpreted to be a demand shock, and $\varepsilon_t^{u^*}$ a shock to the level of the natural rate of unemployment. The slope of the Phillips curve $\kappa_t \geq 0$, the weight on long-term inflation expectations $1 \geq \theta_t \geq 0$, and the coefficient on import prices $\gamma_t \geq 0$ are time varying, each evolving according to a constrained random walk. The coefficient ρ is constant throughout the sample period.

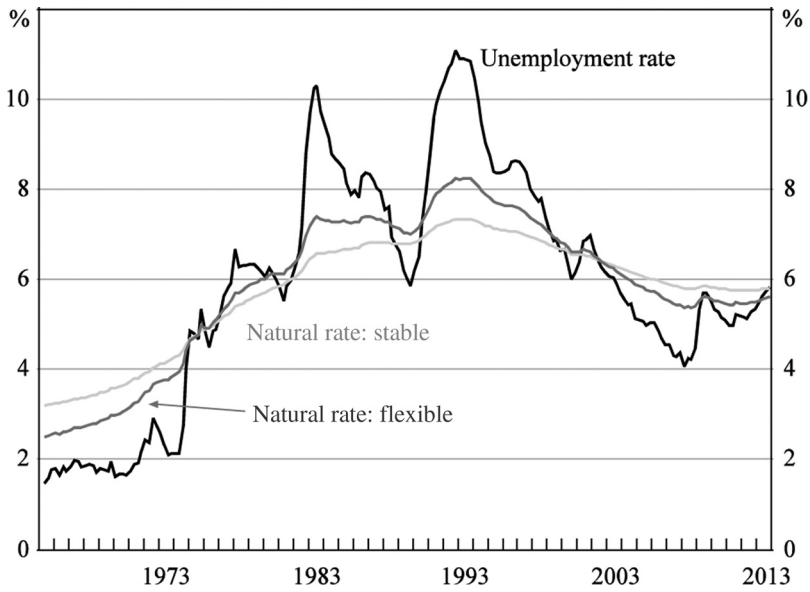
The natural rate of unemployment and time-varying parameters are treated as unobserved states and estimated using a constrained non-linear Kalman filter. A non-linear Kalman filter is required because the measurement equation is multiplicative in unknown state variables: the natural rate of unemployment and the coefficient on the unemployment gap are both allowed to be time varying.

Initial values for the shock variances are calculated using ten-year rolling non-linear least-squares regressions, with the parameters and the natural rate of unemployment assumed to be constant within each ten-year window. Constrained maximum likelihood is used to estimate the parameter ρ and the shock variances, subject to the constraint that the estimated shock variances are no larger than across the ten-year rolling windows. Because there is a potential identification problem for the unemployment-gap demand shock $\varepsilon_t^{(u-u^*)}$ and the natural rate shock $\varepsilon_t^{u^*}$, the relative variance of these two shocks is imposed. We follow Matheson and Stavrev (2013) in choosing $S \equiv \text{var}(\varepsilon_t^{(u-u^*)}) / \text{var}(\varepsilon_t^{u^*})$ equal to 15, resulting in relatively stable estimates for the natural rate of unemployment; for robustness we also estimate the model assuming $S = 5$, which results in a relatively flexible natural rate of unemployment (shown in figure 2, but the corresponding parameter estimates are omitted in figures 3–5 for clarity—they are qualitatively similar to those shown).⁵ We estimate the system at a quarterly frequency for the period 1965–2013, using CPI inflation excluding interest charges and health and tax policy changes.⁶

⁵To avoid convergence on unrealistic variances for the shock processes when $S = 5$, we restrict the estimated variances of the shocks to the parameters κ_t , θ_t , and γ_t to be no less than one-quarter of their estimated magnitude in ten-year rolling regressions; at an optimum, these constraints do not bind.

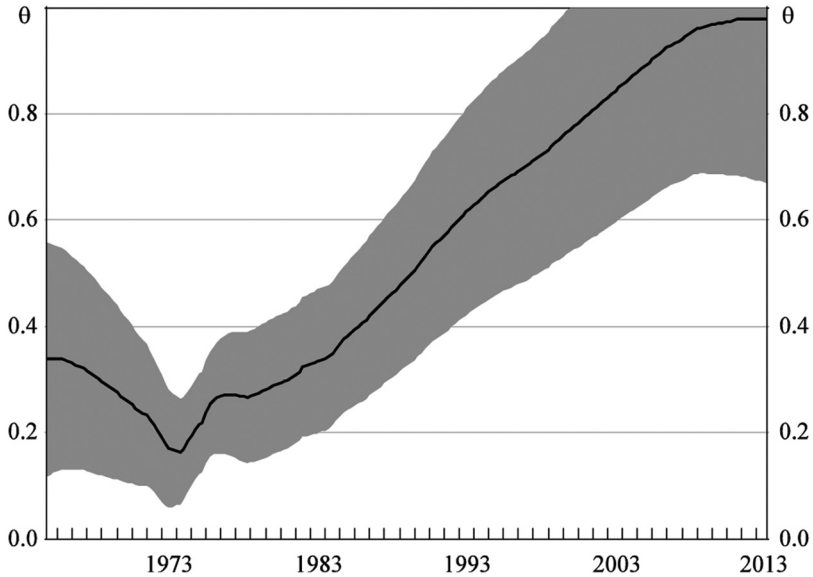
⁶The official target measure for Australia used Treasury underlying inflation between 1993 and 1998; the econometric results are similar using Treasury underlying inflation in place of CPI inflation for this period.

Figure 2. Unemployment and the Natural Rate of Unemployment



Figures 2–5 report the two-sided smoothed estimates of the natural rate of unemployment and the slope parameters. The estimated natural rate of unemployment depends on the imposed degree of stability, and so the size of the unemployment gap at any point in time is quite uncertain, the more so at the endpoints. To give a sense of the uncertainty inherent in these estimates, we present two such estimates in figure 2. Furthermore, as we discuss later, changes in the inflation process have made it more difficult to estimate the natural rate of unemployment precisely. As such, little weight should be placed on the particular estimates of the natural rate of unemployment shown here. For our purposes, the important aspect of these estimates is that we use a natural rate of unemployment that is internally consistent; the estimates of the other parameters are not particularly affected by the degree of smoothness we impose on the natural rate of unemployment.

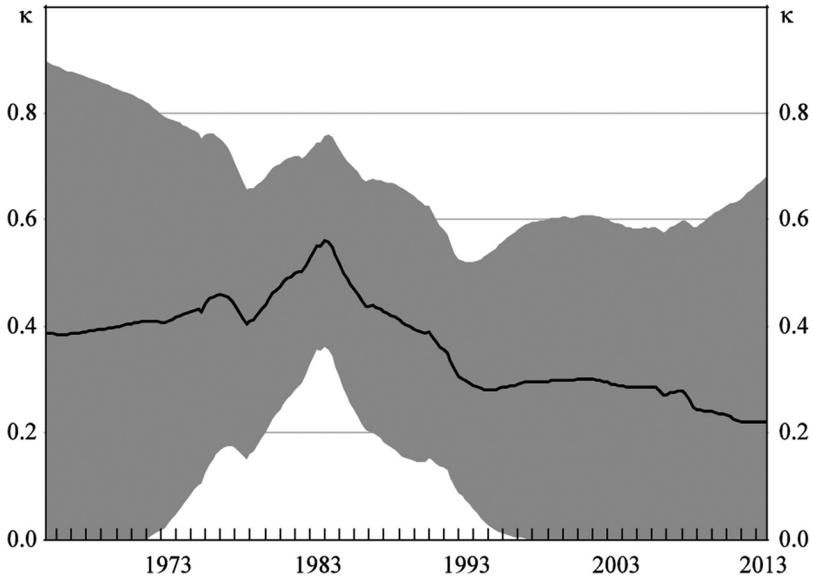
Turning to the parameters of most interest, we see that, following the introduction of inflation targeting (IT), inflation has become

Figure 3. Anchoring of Expectations: Θ 

Notes: +/- one-standard-deviation confidence interval is shown.

more firmly anchored on long-term expectations, and less on the previous year's inflation rate: the coefficient θ_t on long-term bond market inflation expectations has risen toward unity over the inflation-targeting period. Furthermore, since the introduction of inflation targeting, long-term inflation expectations have themselves become better anchored: since 1998, long-term inflation expectations have never deviated from the midpoint of the Reserve Bank of Australia's inflation target by more than 0.2 percentage points, unlike in earlier years when co-movement between long-term expectations and current inflation was clearly evident. At the same time, the coefficient k_t on the unemployment gap has become smaller, indicating a flattening of the Phillips curve. The speed with which import price changes pass through to consumer price changes also appears to have slowed. In particular, figure 5 shows that the effect on consumer price inflation of a one-standard-deviation increase in year-ended import price inflation is estimated to have declined over the inflation-targeting period.

Figure 4. Slope of Phillips Curve: κ

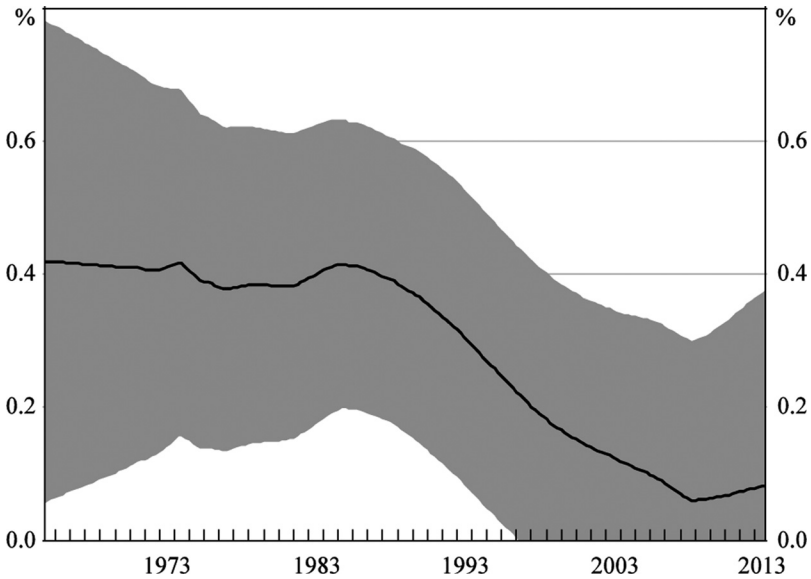


Notes: +/- one-standard-deviation confidence interval is shown.

Our econometric results suggest that shocks have less of an effect on inflation now than prior to the introduction of IT. The wage-price spirals that economists of the 1970s worried about seem to be less of a concern today, reflecting better-anchored inflation expectations but also decentralization of the wage-bargaining process. The transitory nature of inflation surprises in an IT world is confirmed by a trend-cycle decomposition of inflation. For the United States, Stock and Watson (2007) show that the variance of the trend component of inflation declined sharply in the mid-1980s, following the Volcker disinflation, and declined further after 1990, falling to a level of volatility not seen since the mid-1950s. Variability in the transitory component is largely beyond the control of central banks and has remained unchanged. Thus, the share of inflation variability accounted for by transitory shocks has risen sharply.

For Australia, a simple way to see this change in the inflation process is to compare tradable and non-tradable inflation between

Figure 5. Response of CPI Inflation to a One-Standard-Deviation Increase in Real Import Prices



Notes: +/- one-standard-deviation confidence interval is shown. Import prices have been adjusted to include tariff changes.

the 1980s and 1990s, when inflation targeting was in its infancy, and today. Although tradable inflation includes a domestic retailing component, a large portion of the variation in tradable goods and services prices reflects external influences. Consistent with the results of Stock and Watson (2007) for the United States, the first panel in table 1 indicates that there has been a negligible change in the variance of tradable inflation in the pre- and post-IT periods. (We exclude the disinflationary period from these calculations to guard against attributing the mean shift in inflation to variability in the pre-IT period.) In contrast, the variance of non-tradable inflation—the set of prices most influenced by Australian monetary policy—has fallen by more than half. Compounding the increase in the relative importance of imported inflation, the covariance between tradable and non-tradable inflation has declined between the pre- and post-IT periods. The persistence of non-tradable inflation has

Table 1. CPI Inflation Variance Decomposition: Australia

	Pre-Inflation Targeting: 1982:Q2–1990:Q4	Post-Inflation Targeting: 1993:Q1–2013:Q4
Original Series	Variance: Non-Tradables Variance: Tradables Covariance	0.15 0.58 -0.02
AR(p) Model: Non-Tradables AR(p) Model: Tradables	Sum of Coefficients Variance of Residuals Sum of Coefficients Variance of Residuals Covariance of Residuals	AR(4): 0.21 0.12 AR(2): -0.16 0.49 -0.03

Notes: Data are in percentage points, at a quarterly frequency, excluding tax changes and interest charges. Lag lengths were selected using the AIC criterion.

fallen together with its variance between the pre- and post-IT periods: the sum of the autoregressive coefficients for non-tradable inflation falls from 0.44 in the pre-IT period to 0.21 in the post-IT period (see the second panel in table 1). Consistent with our earlier results, the variance of shocks to non-tradable inflation, estimated by the residuals of the autoregressive models for the pre- and post-IT periods, has fallen substantially. There is little evidence of persistence in tradable inflation in the pre- or post-IT periods. An implication of the decline in the covariance between tradable and non-tradable inflation is greater relative price variation. As a consequence of more stable non-tradable prices, nominal and real prices of tradable goods now move more closely together.⁷

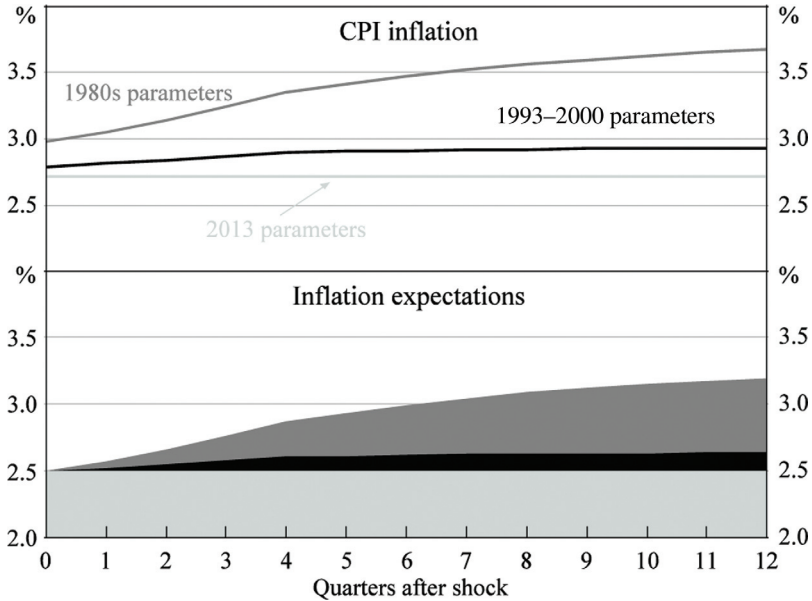
Associated with these changes, the relationship between unemployment and inflation has become substantially weaker. To illustrate the flattening of the Phillips curve, we forecast the response of inflation under old and current parameter values to a sustained 1-percentage-point deviation in unemployment below its natural rate. Figure 6 indicates that the predicted response of inflation to an unemployment gap is now smaller than under parameter values estimated prior to and in the early years of IT. Inflation is less sensitive to an unemployment gap than in the past for two reasons: first, the slope of the Phillips curve has declined, and second, because inflation expectations are now firmly anchored on the inflation target, the increase in inflation caused by the unemployment gap has a negligible effect on inflation expectations.⁸ The contribution of inflation expectations to predicted CPI inflation for each scenario is indicated by the area in the lower panel of figure 6. The sensitivity of inflation to import prices is also estimated to have declined, although our scenario assumes unchanged import prices.

With a flatter Phillips curve, a relatively large share of the variability in inflation is now dominated by transitory changes, and deviations in unemployment from its natural rate are more difficult to detect in inflation data than in the past. Excess demand pressures

⁷Thanks to Alex Wolman for bringing this point to our attention.

⁸We assume long-term inflation expectations remain anchored at target for the purposes of this illustration. Given the slow rate at which the degree of anchoring has changed in response to regime changes in the past, this seems reasonable for an illustration of an unchanging regime.

Figure 6. Predicted CPI Inflation



Notes: Inflation is at an annualized rate. Prior to the shock, the unemployment gap is assumed to be equal to zero and inflation expectations to be 2.5 percent per annum. “1980s parameters” uses the average of the estimated model parameters for the 1980s, and analogously for “1993–2000 parameters”; “2013 parameters” uses the estimated model parameter values at end-2013.

are more likely to be swamped by noise than in previous decades. Conversely, changes in unemployment and output are less useful for forecasting inflation than in the past. In a particularly stark demonstration of this point, Atkeson and Ohanian (2001) found NAIRU-based inflation forecasts to now be little better than naive inflation forecasts of U.S. inflation. For Australia, this was demonstrated by Heath, Roberts, and Bullman (2004).

3. The Next Twenty-Five Years

As we have seen, there is evidence that twenty-five years of inflation targeting have delivered inflation processes that are better anchored and less affected by the business cycle than they were before the

advent of inflation targeting. Although we focused on Australia above, its experience is illustrative of the experience of many countries around the world.⁹ These changes mean that the challenges facing central banks are likely to be of a quite different character than the challenges dealt with over the past twenty-five years. Moreover, the financial crisis has stimulated a renewed debate about whether inflation targeting is the most appropriate way to conduct monetary policy. We suggest that it is—subject to some evolutionary changes. But, before we get there, it is useful to review some of the criticisms that have been directed at inflation targeting since the financial crisis. We discuss the alternative monetary policy frameworks that have been suggested in light of these criticisms and how these criticisms are a natural consequence of the changed behavior of inflation over the past twenty-five years. It is, ultimately, the fact that the changed behavior is a reflection of successful inflation targeting that argues against wholesale change.

3.1 *A Flavor of the Debate*

The financial crisis has been the catalyst for criticism of inflation targeting. Wren-Lewis (2013) states, “Whatever the causes, there is now a clear conflict between what a sensible UK monetary policy would be doing and what is actually happening. Monetary policy is not providing enough stimulus to the UK economy, because it is focusing on the inflation target, and not the output gap. Inflation targeting in the UK is not working, and something needs to change.” Joe Stiglitz (2011) put it thus: “The idea that targeting inflation will lead to financial stability or that focusing on only price and financial stability is sufficient for maintaining a low output gap and stable and robust growth is fundamentally flawed.”¹⁰ Jeffrey Frankel (2012b) has already prepared an obituary for IT, writing that “the monetary

⁹See International Monetary Fund (2013).

¹⁰Notably, however, he acknowledges the following in a parenthetical comment immediately after his criticism: “(In extreme cases, of course, where the issue is not 3, 4, or 5 percent inflation but more like 10 percent inflation, central banks must focus on inflation as well. But in places like the United States and Europe, *where inflation has been controlled*, this is not the issue.)” (emphasis added). We believe this really is the issue and discuss it further below.

regime, known affectionately as ‘IT’ to its friends, evidently passed away in September 2009.”

These criticisms stem from a view that, given depressed economic conditions, central banks should be running very stimulatory monetary policy, pretty much regardless of the rate of headline inflation. While central banks have generally been running stimulatory policy, the criticism is that they have not been aggressive enough because of fears of breaching their inflation targets. For example, it is suggested that the European Central Bank delayed lowering interest rates because it was overly concerned about headline inflation rates that were being boosted by temporary oil and commodity price increases. In the United Kingdom, as alluded to by the quote from Wren-Lewis above, the suggestion is that persistently high inflation outcomes and rising inflation expectations constrained the stimulus that the Bank of England provided.

In short, in the view of many critics, current monetary policy frameworks place too much weight on CPI inflation. The solutions that have been proposed address the perceived shortcomings in two main ways. One strand of suggestions has been to focus on inflation measures other than the consumer price index—in particular, to focus on measures that respond more closely to domestic cyclical conditions. For example, targets could be defined in terms of the rate of increase in labor earnings net of productivity gains (unit labor costs). Another suggestion is to give asset price inflation more prominence in monetary policymaking. Asset price developments may signal changes in financial stability and, thus, inform judgments on the risks to output. While both labor earnings net of productivity gains and asset price changes are still measures of inflationary pressure, the ideas have at their heart the goal of choosing targets that are more in line with output fluctuations. If the economy is booming, it is argued, it is more likely to be showing up in wage measures or asset price rises than in headline inflation.

The other main strand of suggestions is to target output fluctuations more directly. In some, this would be an explicit mandate to stabilize output—similar to the Federal Reserve’s so-called dual mandate. In this dual-mandate framework, central banks’ decisions would be based not only on their views about inflation but also on direct measures of output and unemployment gaps. Central banks would thus have more discretion to allow inflation fluctuations if

addressing them would exacerbate cyclical downturns. Alternative approaches would incorporate output into the framework by making nominal GDP the target of policy.

3.2 The Options

As discussed above, there are two broad suggestions for how to “fix” inflation targeting given the tensions revealed in the aftermath of the financial crisis: (i) modify the particular definition of inflation that is being used or (ii) incorporate output into the target more explicitly. There is, also, a third option to maintain the current framework. We discuss these general suggestions next.

3.2.1 Modify the Target Definition

During the Great Moderation there was an unusual correspondence between stabilization of CPI inflation and output: cost-push shocks were short lived and typically small. But as the Bank of England’s experience illustrates, this correspondence broke down. Confronted with persistent imported inflationary pressures, it has been argued that the CPI inflation target restricted its ability to react to domestic weakness and accommodate non-domestically generated inflation. Similarly, although with the opposite effect, the rise of China and other emerging-market economies as low-cost producers of manufactured goods in the 1990s and early 2000s restrained tradable inflation and led to central banks tolerating relatively high rates of nontradable inflation that became uncomfortable once the effect on tradable inflation waned. Given the way CPI inflation muddied the waters, it seems natural to consider adjusting the target inflation measure to better reflect underlying inflationary forces.

Adopting an inflation measure that corresponds more closely to domestic economic conditions reduces the potential conflict between output and inflation stabilization while maintaining a credible nominal anchor for monetary policy and, given the transitory nature of imported inflation shocks, focusing on a measure that is likely a better indicator of medium-run inflationary trends. A target inflation measure that abstracts from idiosyncratic variation is also attractive because doing so holds the central bank responsible only for the prices under its influence.

Replacing CPI inflation with non-tradable inflation as the target measure, for example, would largely abstract from commodity price and exchange rate movements. As Bharucha and Kent (1998) explain, targeting non-tradable rather than CPI inflation allows the central bank to tolerate relatively large movements in the exchange rate. They consider the exchange rate channel of monetary policy transmission and show that it is optimal for a central bank with a non-tradable inflation target to respond relatively aggressively to supply and demand shocks, at the expense of exchange rate and CPI inflation variability. Furthermore, because tradable prices (e.g., petrol prices) are typically more flexible than non-tradable prices, targeting non-tradable prices puts more weight on sticky-price goods, which is optimal from a welfare perspective in New Keynesian models (Aoki 2001, Eusepi, Hobijn, and Tambalotti 2011). Targeting a non-tradable inflation measure does not hold central banks responsible for cross-country spillover effects of export price inflation, but neither does current practice: IT central banks use consumer rather than producer price target measures.

A complication associated with adopting non-tradable inflation as the target measure is that, reflecting the Balassa-Samuelson effect, non-tradable inflation has consistently exceeded tradable inflation. Because non-tradable inflation is a biased measure of average CPI inflation, consumer inflation expectations might, irrationally, become anchored at this higher level because it was the target of policy. If so, the disconnect between inflation expectations and the inflation target would lead to either a ratcheting up of average inflation, if these higher inflation expectations were allowed to become embedded in prices and wages, or consistently contractionary monetary policy with higher unemployment and output gaps as these pressures were resisted.

As mentioned earlier, another alternative is to adopt a measure of labor earnings net of productivity as the target measure, potentially providing a better indication of the trend pace of inflation than a consumer price measure. A drawback is the notorious difficulty in estimating productivity growth: reliable productivity estimates are only available for the market sector, and the data are often substantially revised. Changes in the composition of employment over the

business cycle would also complicate the use of a labor cost target measure to guide monetary policy.¹¹ Furthermore, such a measure would abstract from the important role that changes in margins play in the inflation process.

3.2.2 Target Output More Explicitly

Rather than change the target inflation measure, central banks could adopt an explicit output stabilization objective, to complement the inflation target. A dual mandate would provide flexibility to accommodate persistent commodity price or exchange rate shocks that push inflation above target during times of economic slack. In contrast, a strict CPI inflation objective requires monetary policy tightening, exacerbating the fall in output. To the extent that there has been a flattening of the structural Phillips curve, a reevaluation of the trade-off between inflation and output would be in order, as offsetting even relatively minor cost-push shocks requires a larger fall in output than in the past.

One mechanism to increase the importance of output relative to inflation is to replace IT with nominal GDP growth targeting, an old idea that has gained prominence since the financial crisis. A nominal GDP growth target implicitly places equal weight on output and inflation stabilization, which to its proponents achieves a better balance of objectives than IT. But targeting nominal GDP growth does more than reweight the inflation and output stabilization objectives: it changes the target inflation measure. The consumer price inflation measure used by IT central banks includes the price of imports and excludes the price of exports, while the GDP price measure does the reverse. Excluding import prices automatically accommodates imported inflation, such as oil price shocks, as would adopting non-tradable inflation as the target inflation measure. However, the desirability of adopting a target measure that includes export prices is less clear. Frankel (2012a) argues that producer price targeting has the beneficial effect of stabilizing export prices in local currency terms. But for a small open economy such as Australia, the inclusion

¹¹Notwithstanding this, measurement error in labor earnings and productivity estimates could be offsetting, so the error in the net measure might be smaller.

of export prices in the target inflation measure would expose the non-resources economy to large, and mostly exogenous, monetary policy changes. This is potentially problematic when there are level shifts in the terms of trade that the central bank must seek to identify in real time.

A more radical proposal is the adoption of nominal GDP as a level rather than growth target. Like price-level targeting, a nominal GDP target does not let “bygones be bygones”: past deviations from target must be corrected in the future. During his time as Governor of the Bank of Canada, Mark Carney (2012) argued that nominal GDP targeting has particularly attractive properties at the zero lower bound. In an economic slump nominal GDP falls, and inflation expectations must rise for the central bank to maintain its nominal GDP target; any rise in inflation expectations lowers the real interest rate and stimulates demand. In essence, a nominal GDP target might endogenously generate countercyclical inflation expectations. The success of nominal GDP targeting crucially depends on the speed with which consumers’ and firms’ inflation expectations adjust. Following the adoption of IT, inflation expectations remained substantially above target for several years. Imperfect inflation credibility is likely to have been important, but so was sluggish adjustment of inflation expectations. Supporting this, a growing literature argues that information frictions are an important source of inertia in the monetary policy transmission mechanism (see, for example, Mankiw and Reis 2002). If inflation expectations adjust sluggishly, a nominal GDP target may only raise inflation expectations marginally in an economic slump, undermining one of its key features.

With the exception of the United Kingdom, the potential relevance of a dual-mandate policy is clearest in the lead-up to the crisis, during the sustained rise in oil prices. Jeffrey Frankel (2012b) argues that “it is widely suspected that the reason for the otherwise-puzzling decision of the European Central Bank to raise interest rates in July 2008, as the world was sliding into the worst recession since the 1930s, was that oil prices were just then reaching an all-time high.” Regardless of whether Frankel’s assessment is correct, it is this type of conflict between output and inflation stabilization that a dual-mandate policy is designed to avoid.

3.2.3 *Maintain Current Targets and Lengthen the Target Horizon*

As discussed above, alternative proposals are not without their own problems. Thus, one needs to give serious consideration to retaining CPI inflation as the target. CPI inflation is perhaps the simplest and most relevant inflation target to consumers: it measures consumers' average inflation experience, is a key input to wage negotiations, and is used for indexation purposes in contracts. It is used as a target by the vast majority of central banks for a reason. But, importantly, CPI inflation targeting can be implemented in a variety of ways. This can be seen most easily by noting that inflation targeting has evolved since its first implementation and generally takes account of activity in practice. Thus, further evolution of the framework seems feasible. Indeed, given the significant issues identified in some of the critiques, we argue that changes in the practice of inflation targeting may be warranted.

Amending frameworks to lengthen the inflation target horizon provides the most obvious evolution and is a natural middle ground between the wholesale change envisaged by the sharpest critics of IT and no change. Lengthening the target horizon provides central banks with more freedom to practice "flexible inflation targeting." Indeed, this is the direction that IT has been tending since its inception. A long horizon, such as the Reserve Bank of Australia's "over-the-cycle" criterion, maintains CPI inflation as a clear, transparent, medium-term nominal anchor, but minimizes the likelihood of conflict between output and inflation objectives over shorter horizons when transitory influences are more dominant.

A lengthening of the target horizon is also a natural consequence of changes in the inflation process we have documented. Slower pass-through of imported inflation shocks, more anchored expectations, and a flatter Phillips curve mean that inflation is likely to be much slower moving in response to any shocks and policy responses than in the past. Furthermore, with inflation credibility firmly established, there is greater scope than in the early years of inflation targeting to tolerate deviations from target: consumers and firms are less likely to interpret deviations from target as revisions to the implicit inflation target than when inflation targeting was in its infancy. How *much* central banks can leverage their credibility to tolerate

persistent deviations in inflation from target is an unknown empirical question. Clearly, there is a limit: expectations adjust, even if only sluggishly. Nevertheless, the potential for inflation expectations to become “unanchored” should not be over-emphasized: a defining feature of the past decade has been the constancy of long-term inflation expectations through large swings in commodity prices and a deep economic slump.

Lengthening of the target horizon provides increased flexibility but also brings new challenges. First, the communication of the central bank may need to become more nuanced. Some inflation shocks, those that reflect fluctuations in domestic economic activity, may have to be addressed aggressively, while it may be better to look through others, such as exchange rate shocks. Of course, not all exchange rate shocks are alike, and the appropriate degree of monetary policy accommodation depends on the source of the shock. The challenge for central banks’ communication strategies is to explain why certain shocks are being ignored, while others are being addressed.

Second, central banks’ internal analysis may need to improve. While the flattening of the Phillips curve and anchoring of inflation expectations might seem like good news, it has an important drawback. Inference about the state of the economy based upon the behavior of inflation is now more difficult. Previously, capacity constraints would show up in inflation relatively clearly and induce an appropriate tightening of policy. Now, with the effect muted, it can be hard to identify a structural tightness in the economy, which can lead to persistence of that tightness that may have undesired effects. A prime example would be the experience of many euro-area countries that saw property booms in the lead-up to the financial crisis. Contained inflation was taken as evidence that output gaps were smaller than they actually were and allowed stimulatory policy to go on for longer than it otherwise would have. Compounding these analytical challenges are the difficulties of forecasting the highly non-linear effects of financial instability. In short, the flattening of the slope of the Phillips curve and greater anchoring of expectations means that the separation of systematic movements in inflation from random noise is now harder—NAIRU-based forecasts of inflation are now less reliable and new techniques will need to

be developed.¹² And changes in the processes governing inflation identified above mean that the Lucas critique applies with great force. Models which fail to take this into account are likely to make systematic errors.

3.3 Discussion of the Options

In thinking through the options, it is worth emphasizing that the effects of inflation targeting evident in the data are twofold. First, there has been a flattening of the Phillips curve, whereby the linkages between current inflation rates and output gaps have weakened. Second, there has been an increase in the anchoring of inflation around long-run expectations, which are invariably the same as the stated targets. These effects, along with slowing pass-through from imported inflation, mean that current inflation is now more affected by shocks where the inflation and output stabilization objectives appear to be in conflict than in the past. But that is mostly because current CPI inflation is now a poor indicator of future inflation. And, in such an environment, a pure CPI inflation target, particularly one focused on shorter-term outcomes, risks destabilizing output to offset idiosyncratic shocks. In this light, all three options discussed above can be seen as ways of reducing the emphasis on current or short-term CPI inflation and increasing that on output—especially to the extent that output is an indicator of future inflation.

The strongest critics of IT argue that wholesale change is required: either adopt explicit dual mandates or change target inflation measures. Both these proposals share the common objective of minimizing the chance of conflict between output and inflation stabilization. But, as we have argued, these arguments for change are, in part, a consequence of the success of IT. With inflation expectations now firmly anchored at target and the Phillips curve flatter, the non-tradable component of inflation has been stabilized, and the relative importance of the idiosyncratic and uncontrollable component of CPI inflation has risen.

The adoption of a dual mandate minimizes the possibility of conflict by permitting inflation to be above target when output is

¹²A corollary is that it is harder to pin down the level of the natural rate of unemployment precisely.

depressed, as does changing the target to an inflation measure more closely associated with economic activity. A difficulty, however, with proposals to down-weight the inflation target is that, even if it does not affect the slope of the Phillips-curve relationship, it risks undermining the anchoring of expectations. And it is only because expectations are now anchored that idiosyncratic shocks appear to be so important.

Additionally, conflict between output and inflation stabilization in the post-financial crisis period should not be over-emphasized. Inflation has remained close to its target for most IT central banks, despite substantial economic slack and highly accommodative monetary policy. The characterization of IT central banks as caring exclusively about CPI inflation is also something of a strawman argument. The practice of inflation targeting has evolved. For example, the Reserve Bank of New Zealand's inflation target band was widened from 0–2 percent to 0–3 percent in December 1996 to provide additional flexibility. More generally, underlying inflation measures are now routinely used as a guide for policy, abstracting from sharp idiosyncratic variation in inflation that is unrelated to domestic economic conditions. Central banks have also become more forward looking, setting monetary policy based on forecasts of inflation, and output and unemployment, rather than contemporaneous estimates. Svensson (1997) argues that making central banks' inflation forecasts an explicit intermediate target simplifies the implementation and monitoring of monetary policy. Because central banks' inflation forecasts are typically guided by a Phillips-curve relationship, and idiosyncratic changes in inflation more than a couple of quarters ahead are essentially unforecastable, inflation forecast targeting implicitly sets monetary policy based on a measure of inflation that reflects domestic economic activity. (Although, as the simulation above showed, if those forecasts are premised on an unchanged Phillips curve, they may prove to be misleading.)

Our suggestion to lengthen the target horizon provides central banks with the flexibility required to tolerate persistent idiosyncratic shocks to inflation, in the same way as the other general proposals do, but without some of the negative consequences for the anchoring of expectations. Notwithstanding this, our recommendation to maintain CPI inflation as the target measure should not be mistaken for complacency. Indeed, we cannot forget that the benign

inflationary outcomes during the 2000s masked the buildup of imbalances that contributed to the financial crisis. Rather, central banks must be increasingly vigilant in identifying changes in the trend pace of inflation and, at the same time, willing to tolerate commodity price or exchange rate shocks that push CPI inflation away from target for a time. Clear communication will be required to explain changes in the stance of policy. Policy tightening may be required when the trend pace of inflation is forecast to rise even if CPI inflation remains close to the target. Conversely, in the presence of idiosyncratic shocks, monetary policy may often remain accommodative. Because the appropriate policy response to an inflation surprise crucially depends on its cause, structural models that can identify the source of shocks are needed. Furthermore, the breakdown in the forecasting performance of the Phillips curve suggests that near-term forecasting will need to make use of a broad range of economic indicators.

Thus, we conclude, a lengthened target horizon for CPI inflation targeting provides the necessary additional flexibility to implement “flexible inflation targeting” in a world where ultimately idiosyncratic shocks are more persistent—without some of the downsides more radical proposals suffer from.¹³

4. Conclusion

The practice of inflation targeting over the past twenty-five years has fundamentally changed the character of target inflation measures. Unlike in the early years of inflation targeting, before credibility had been established, long-term inflation expectations are firmly anchored at target, moving little in response to inflation surprises. Variability of the domestic component of inflation has declined substantially, and much of the variation in CPI inflation is now caused by imported shocks, such as commodity price and exchange rate changes. Stabilization of the domestic component of inflation has weakened the relationship between inflation and domestic economic conditions—the Phillips curve has become flatter.

¹³For example, the benefit from adopting a non-tradable inflation target is unclear when monetary policy is guided by inflation forecasts that abstract from exchange rate shocks anyway (Ryan and Thompson 2000).

These changes in the inflation process have resulted in a breakdown in the correspondence between output and inflation stabilization in the short run. Changes in CPI inflation are now more likely to reflect idiosyncratic shocks than signal deviations in output from potential. Some critics argue that this calls for inflation-targeting frameworks to be fundamentally reengineered, placing more weight on output than inflation stabilization. It is argued by some that weighting output more heavily in central banks' objective function would avoid the stability of inflation blinding central banks to spare capacity, and reduce the likelihood of inappropriate monetary policy tightening in response to imported price shocks.

We argue that while the character of target inflation measures has changed, the fundamental relationships are much the same even if the time frames for them to operate have lengthened. Sound monetary policy still requires the stabilization of output about potential, and the accommodation of idiosyncratic inflation shocks. Inflation targeting need not be abandoned or fundamentally reengineered, but its practice must reflect the changing nature of target inflation measures. With inflation credibility now firmly established, central banks can afford to accommodate persistent commodity price and exchange rate swings. Similarly, policymakers need not induce large upfront contractions in activity to avoid any unanchoring of inflation expectations. But stabilization of output about potential is now a more complicated task, as the relationship between domestic output and inflation is weaker and more drawn out than in the past and domestic inflationary pressures are likely to be hidden in noise. Identifying deviations in output from potential is as important as ever, but the task has become harder.

This creates a problem for central bank communications and analysis. First, because the analysis required to differentiate domestically generated demand shocks from imported shocks is tricky, the communication challenges for the central bank are likely to be similarly difficult. While some inflation shocks will be accommodated, others will merit a response. Second, because the potential for shocks to be hidden in noise is magnified now that the effect of any given shock is smaller, there is an increased possibility that mistakes might be made.

Notwithstanding this, the solution is not to declare victory over inflation and switch the primary focus to output. While widespread

vaccination has dulled the memory of how dangerous measles and other infectious diseases can be, that does not mean they have become any less dangerous. Both inflation targeting and vaccination programs are victims of their own success. The inflation process has changed over the past twenty-five years, and the practice of IT must evolve accordingly. But the same issues that led to the choice of inflation targeting over the alternatives in the past continue to apply with the same force.

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