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ABSTRACT

The pre-crisis monetary policy consensus has been challenged on a number of fronts. Even the nominal target, around which the modern consensus developed, has been called into question, with a vigorous recent debate ensuing about nominal income targeting as an alternative. This paper contributes to the controversy by arguing that one important reform of inflation-targeting regimes that deserves more attention is reformulating their targets explicitly in terms of core inflation. Core inflation targeting has a better theoretical grounding from both welfare economics and business cycle perspectives, holds practical advantages for inflation-targeting central banks, and has the promising feature of improving the frankness and accountability of monetary policy.

Keywords: Inflation, Core inflation, Inflation-targeting, Monetary policy
JEL codes: E31, E52, E58

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1. Introduction

The pre-North-Atlantic crisis monetary policy consensus² has been challenged on a number of fronts. Financial stability has risen to the top of the monetary policy debate, and macro-prudential regulation has risen with it. Meanwhile, central banks have experimented with new policy tools, such as a range of balance sheet policies, and new strategies, such as forward-guidance. More fundamentally, the nominal target variable around which the modern consensus developed has also been called into question, with a vigorous debate ensuing about nominal income targeting as an alternative to inflation targeting.

It is to this last controversy that this paper responds, by returning to the pre-crisis consensus. Here I will identify one important, but currently neglected, reform of inflation-targeting regimes, that is, to reformulate their targets explicitly in terms of core inflation. Economic theory supports this change: it will bring the targeting regime closer to what is practically achievable – and indeed what is practically done – and will avoid some of the worst political economy problems for emerging market central banks.

2. Inflation targeting in 2014

Inflation targeting has proved to be the most robust monetary policy since the gold standard.³ But the successes of monetary policy since the 1980s have not been the work of inflation-targeting central banks alone, with similar successes in terms of low and stable inflation and a macro-stability achieved by central banks without an explicit inflation target (Woodford 2005). Or, as Alan Greenspan observed a decade ago:

...the actual practice of monetary policy by inflation-targeting central banks now closely resembles the practice of those central banks, such as the European Central Bank, the Bank of Japan, and the Federal Reserve, that have not chosen to adopt the paradigm (Greenspan 2004).

It is the explicit announcement of a target for inflation, to be attained over a certain (medium- to long-term) horizon and the use of this explicit target in a strategic approach to monetary policy (which implies hitherto unprecedented openness) that separates the inflation targeters from the successful non-inflation-targeting central banks.

² Goodfriend (2007) is a widely read summary of the pre-crisis consensus, but see also Mishkin (2007) and Woodford (2003).

³ Rose (2007) provides the data and analysis to support this claim.

But the nominal target assigned to most inflation-targeting central banks is one of the small deviations from the pre-crisis theoretical policy consensus that requires closer scrutiny in the general revision of monetary policy now under way. With the exception of the central banks of Norway and Thailand, the nominal target for inflation-targeting regimes is set in terms of the headline inflation rate, almost universally associated with the annual growth in the consumer price index (Roger 2009).⁴

That is the current picture, but there were some earlier experiments with core inflation targeting. New Zealand's pioneering inflation target was specified in terms of core inflation until 1997. One year later the Reserve Bank of Australia also abandoned a core inflation target in favour of a headline target. Meanwhile, the Bank of Korea started with a headline inflation target, moved to a core target in 2000 and returned to a headline inflation target in 2006 (Wynne 2008: 2). By contrast, the pre-crisis theoretical consensus was that monetary authorities would do best to target (whether implicitly or explicitly) core inflation (Goodfriend 2007: 62).

This is not to say that core inflation was (or is) ignored by inflation-targeting central banks. On the contrary, most of these central banks claim to use core inflation as an important part of the information used in their policy deliberations. It is to the extent that there is a conceptual difference between a variable that is included in the objectives of monetary policy and one in the information used to inform monetary policy that the practice of inflation targeting has departed from the theoretical consensus.

The South African Reserve Bank's practice is typical of the general inflation-targeting experience. Core inflation is not the objective of monetary policy, but the recent trajectory of core inflation and the South African Reserve Bank's (SARB) forecast for core inflation are evidently part of the information used by the Monetary Policy Committee in their deliberations (for example, Monetary Policy Committee 2014: 2-3).

To understand this disagreement between an academic consensus and the practice of central banks on the appropriate role for core inflation, I start with a theoretical discussion followed by the practical considerations that have had considerable influence at central banks.

⁴ The author confirmed the accuracy of this claim for the inflation-targeting central banks of the following 28 countries: Albania, Armenia, Australia, Brazil, Canada, Chile, Colombia, Czech Republic, Ghana, Guatemala, Hungary, Iceland, Indonesia, Israel, Korea, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Romania, Serbia, South Africa, Sweden, Thailand, Turkey, United Kingdom.

3. Core inflation

The effects of inflation have been observed for thousands of years, and though the term “inflation”, in its original usage, referred to an expansion in the supply of money (Hazlitt 1964), by the middle of the 19th century, Jevons (1863) linked it in the now familiar manner with an “inflation of prices”. But Jevons knew that while price changes are observed, inflation is not. To measure inflation, we need to impose additional identifying assumptions, and economists have shown great ingenuity with such identifying assumptions over time.

Jevons (1865), for example, showed that inflation would be a simple average of individual price changes if relative price changes were uncorrelated and had a zero mean (Wynne 2008: 6). But his identifying assumptions were too extreme. Many alternatives have since been suggested, and the measurement of inflation has caused much controversy, including one of the fiercest debates in the South African Journal of Economics.⁵ By the sixties the master of precise language in economics Fritz Machlup (1960) found no consensus amongst economists about the concept or the measurement of inflation. But he did observe – and it is still true – that the common usage of inflation as defined by annual changes in a consumer price index had become the *de facto* definition of inflation.

These consumer price indices are typically cost-of-living indices with weights determined by the observed pattern of household expenditure, providing some grounding in welfare economics (Cecchetti and Wynne 2003). In South Africa headline inflation is derived from the consumer price index, which “... aims to measure the effects of price changes on the cost of achieving a constant standard of living” (Statistics South Africa 2009: 1). An index of this kind, so argues Statistics South Africa, serves two equally important objectives: (i) to measure inflation and (ii) “to measure changes in the cost of living of South African households, to ensure equity in the measures taken to adjust wages, grants, service agreements and contracts” (Statistics South Africa 2009: 1).

As a matter of construction the consumer price index (CPI) is designed to do the second of these, but has by common usage assumed the first task as well. That there are particular technical problems with consumer price indices as an accurate measure of inflation are well known, including biases due to substitution effects, quality improvements and new goods (Cecchetti and Wynne 2003). Central bankers are well aware of these biases, and this is one of the reasons why the goal of price stability is not typically thought of as a zero change in the CPI index. Statistical agencies also work diligently to diminish the impact of these biases through regular rebalancing of the indices.

⁵ Lewin (1977; 1978a; 1978b; 1978c), Botha (1977; 1978) and Mittermaier (1978).

These biases are not at stake in this paper though. Instead, I am concerned with what Quah and Vahey (Quah and Vahey 1995: 1130) called the “conceptual mismatch” between changes in a cost of living index and the process of inflation. The measurement of headline inflation with a CPI index does not impose adequate identifying assumptions to reveal the process of inflation. A concept of “core inflation” has often been suggested to provide the required identifying assumptions, though core inflation is itself a concept that is “often used but rarely defined” (Smith 2005: 1019).

There are a large number of alternative measures of core inflation and a rich South African literature that considers their merits and problems. In the local literature, important contributions have been made by Logan Rangasamy (2009; 2011), Franz Ruch and Dirk Bester (2013); new work has been done by Kevin Kotze (2014); as well as joint work by Zelda Blignaut, Greg Farrell, Victor Munyama and Logan Rangasamy (2009). These papers investigate many of the alternatives to the widely used measure of core inflation derived by excluding some volatile components from the price index, often food and fuel prices. I am not going to discuss here the many alternatives to such exclusion indices of core inflation⁶.

⁶ There are a number of different strategies for identifying core inflation empirically: Brischetto and Richards (2007) suggested a useful two-dimensional classification of the alternative approaches, which uses the smoothing and reweighting entailed by the various measures as the two dimensions of their classification.

The reference point in this classification is the headline measure of inflation, which is calculated from the consumer price index without either smoothing or reweighting. One approach to measuring core inflation proceeds by smoothing either the headline inflation rate itself or the underlying components thereof. The smoothing can be done in a variety of ways, with Gillitzer and Simon (2006), for example, proposing a time varying strategy for the smoothing, where the components of inflation that are already smooth are not smoothed to the same extent as the more variable components.

Reweighting is, however, a more widely used approach to identifying core inflation, with a number of different reweighting schemes in common usage. One very widely used approach is to exclude from the CPI basket certain components that are believed to be notably subject to large relative price shocks. In this tradition, Statistics South Africa publishes a core inflation rate that excludes food and energy from the headline inflation rate. But excluding particular components in every period is suboptimal if those components are not always the noisiest indicators of the underlying inflation rate.

A more efficient approach is to allow a time-varying reweighting, such as a trimmed means or median approach, whereby the most volatile price movements in every period are excluded (or down-weighted). Measures of persistence have also been used in combination with trimmed means or median reweighting strategies, to capture the idea of underlying inflation as being more stable and more persistent than relative price movements. A similar double-weighting strategy was recently proposed in the South African literature by Rangasamy (2009), who suggested a core measure of inflation based on a reweighting of the consumer price index, with weights giving greater importance to the more persistent components of the price index.

A final strategy for identifying the core inflation rate contains elements of both smoothing and reweighting, and uses a dynamic factor model to that end. The method is designed to operationalise two parts of a definition of inflation: first, inflation is a process of absolute price changes; hence, it affects all prices in the same way. The second part of the definition of inflation that needs to be incorporated is that pure inflation should not be correlated with relative price movements. This step can be achieved by means of a Kalman Smoother applied to a state space representation of the problem as suggested by Reis and Watson (2009).

While some of these approaches have a better theoretical grounding – notably Bryan and Cecchetti (1993), Quah and Vahey (1995), and Smith (2005) – the modern theory of monetary policy has provided a new basis for measuring core inflation.

Modern macroeconomic theory⁷ is dominated by the New Keynesian intertemporal approach, in which monopolistically competitive firms set prices in the economy. To set prices, these firms have to compare their actual mark-ups over marginal cost (affected by the evolution in productivity and production costs, notably labour) with the output price that would have been profit maximising in a flexible-price economy. Firms adjust their prices only when the gap between their own product price and the profit maximising price is large enough to justify the costs entailed by adjusting prices.

Marginal costs will rise above trend in this kind of model either when demand pressure on capacity pushes up wage and material costs or when labour productivity falls below trend. When this happens, firms will consider raising their product prices. Assuming that the monetary authority cares about delivering low and stable inflation as well as output stability relative to the economy's potential growth path, the policy challenge is to encourage aggregate demand growth that corresponds with the target inflation rate, so encouraging firms to adjust their prices consistent with the inflation target.

The crucial theoretical step is to assume that in this model economy there are some goods and services with highly flexible prices, which would intuitively correspond to prices such as those of fuel and food in the real world. A price shock to one of these flexible prices would raise a cost-of-living-based index in the economy, and if the central bank responded to this pressure on headline inflation, they would have to depress aggregate demand to lower the prices of the less flexibly priced goods and services. But this response does not serve society's welfare. Instead, Woodford describes the appropriate policy response as follows:

The prices that monetary policy should aim to stabilise are the ones that are infrequently adjusted and that consequently can be expected to become misaligned in an environment that requires these prices to move in either direction. Large movements in frequently adjusted prices ... can instead be allowed without raising such concerns, and if allowing them to move makes possible greater stability of the sticky prices, such instability of the flexible prices is desirable ... Central banks should target a measure of “core” inflation that places greater weight on those prices that are stickier (Woodford 2003: 13-14).

⁷ Rigorous expositions of the theory are available in Woodford (2003), Walsh (2003), and Clarida, Galí and Gertler (1999), with Galí (2008) providing a more accessible introduction. The heuristic explanation in the text draws on Goodfriend (2007).

Society is served best by allowing the economy to adjust to flexible price shocks, while keeping core inflation anchored on the inflation target (Goodfriend 2007). This is the pre-crisis theoretical result referred to in the introduction.

The result reported in Woodford (2003) was first derived by Aoki (2001), who showed that optimal monetary policy required targeting the correct inflation measure, i.e. core inflation measured as inflation in the sticky price sector. Clarida, Galí and Gertler (2002) showed that it is not headline CPI, but domestic CPI that should be targeted to maximise welfare in a model where the international prices are analogous to the flexible prices described above. Bodenstein, Erceg and Guerrieri (2008) subsequently used a dynamic stochastic general equilibrium (DSGE) model to show that optimal monetary policy responds to core, not headline, inflation. Indeed, responding to a forecast of headline inflation leads to very different, and worse, welfare outcomes compared with core forecast targeting.

In emerging market economies where relative price shocks may be more important in the inflationary process than in the large developed economies, this welfare economics argument for targeting core inflation is even stronger. This result also follows from Guangling Liu's (2013) recent DSGE model for the South African economy, with which he investigated the optimal monetary policy responses to different kinds of price shocks.

While the theoretical results reported above may be specific to New Keynesian models of recent vintage, a more general theoretical result reported by Carl Walsh (2009) is based on the literature on the cost of inflation. An important result in this literature relevant to the case at hand is that inflation brings the largest welfare losses in those sectors of the economy with the stickiest prices (where price shocks are most persistent). Relative price shocks that dissipate quickly impose few welfare costs, and from this perspective, should be excluded from the nominal target of the monetary authority.

In the inflation-targeting literature, the appropriate response to such a flexible price (or relative price) shock is called “flexibility”, to indicate that the policy maker will not try to generate the desired inflation outcome regardless of the source of the price disturbance. All inflation-targeting central banks act flexibly in the face of relative price shocks (Svensson 2010), and they do so in one of the following four ways (Mishkin 2007).

Firstly, the central bank might use a formal escape clause to buy time in the wake of the relative price shock, so allowing the economy to adjust and the price shock to dissipate without requiring a perverse policy response. Escape clauses were widely used amongst the inflation-targeting pioneers but have

fallen out of favour, and only a minority of inflation-targeting regimes still use them (Roger 2009: Table 3).

The relative decline of escape clauses saw the rise of longer target horizons as the preferred route to flexible inflation targeting (Roger 2009: 10). In South Africa the inflation target evolved along the same lines, from an initial specification that included a formal escape clause to a regime with a longer-term horizon and a forward-looking “explanation clause” (Kahn 2008: 8). This has become the “industry standard”, with central banks targeting headline inflation but avoiding perverse policy responses by adopting a long-term target horizon.

In this form of inflation forecast targeting, it is the inflation rate at the forecast horizon that has to be kept consistent with the target range for headline inflation (Svensson 1996). It is important to note that the long forecast horizon is chosen precisely to help the central bank “look through” any relative price shocks that are expected to dissipate over that horizon. And core inflation has an important role in this strategy as part of the forecasting technology used in forecast targeting. While the target is not defined in terms of core inflation under this strategy, it is part of the information set. To the extent that core inflation is an accurate forecast of future headline inflation – which is how Julie Smith (2005) defines “core” – inflation forecast targeting becomes core forecast targeting.

A third route to flexible inflation targeting lies along a wide target range for the inflation rate, thus allowing for expected inflation instability. Wider target ranges have not been popular amongst inflation-targeting central banks, though, as they risk undermining the central bank’s commitment to its target (Mishkin 2007). In practice central banks have not been alarmed when inflation moved beyond their target ranges, and have instead used such opportunities to explain the nature of the price shocks and their appropriate policy response to the public (Walsh 2009).

Finally, an inflation-targeting central bank might ensure appropriate flexibility by targeting core, instead of headline inflation. Despite the theoretical support for this choice, I have already noted that few have taken this step. And I should add that the kind of core inflation measure consistent with the theoretical argument is not the widely used exclusion index (CPI less food and energy components), but a measure of core where the frequency of price changes in the underlying data determine the weights in the core index, as proposed by Mark Wynne (2008). In the South African context, a core index of this kind can be built around the microeconomic price data collected by Creamer, Farrell and Rankin (2012), which shows precisely the kind of heterogeneity in price adjustments that should encourage the SARB to consider a theoretically grounded core measure.

4. Flexible, but non-core, inflation targeting

In practice, the flexibility of inflation-targeting regimes has been achieved through escape clauses (to a lesser and diminishing extent over time) and long forward-looking target specifications, instead of specifying explicit core inflation targets. The arguments against a wider adoption of core inflation targeting are both conceptual and practical.

The conceptual argument is that monetary policy should concern itself with the variable that matters to people's lives, i.e. the cost of living, or as James Bullard argued recently:

Since headline inflation is the goal for monetary policy, the introduction of the core inflation concept as an intermediate target introduces some slippage between the variable the Committee is reacting to and the ultimate value of the goal variable (Bullard 2011: 225).

However, the conceptual claim that headline inflation is the “ultimate value of the goal variable” cannot be evaluated outside a welfare theoretic framework. In such a framework, the consequences of alternative policy regimes can be evaluated in a model where the policy effect is restricted by the structure of the model economy and the instruments available to the policy maker. Using such a framework, *inter alia*, Clarida et al. (2002), Aoki (2001) and Bodenstein et al. (2008) found that society's welfare is best served by targeting versions of core, not headline inflation.

While the public indisputably cares about changes in the cost of living, models of monetary policy provide the discipline that helps us to restrict the goals of monetary policy to the outcomes that fall within the ambit of policy instruments.

The practical argument against core inflation revolves around the supposed communications advantage of headline CPI. Svensson (1999: 8) argued, for example, that CPI “has the advantage of being easily understood, frequently published, published by authorities separate from central banks, and very rarely revised”. Along similar lines Roger (2009: 12) emphasised the “... familiarity of the public with the headline CPI, the importance of the CPI in the formation of inflation expectations and wage determination, and the fact that it is calculated by the statistics agency and is typically the best quality of the price measures available”.

Meanwhile, the public does not understand core inflation, or so argued Mishkin (2007), which risks undermining the success of the monetary authority's communication strategy. It is not easy to judge these claims either way, and the evidence is not overwhelming. Using the South African literature as an

example, there is little evidence from the surveys of Rossouw and Padayachee (2009) and Rossouw and Joubert (2005) that the South African population understands the headline measure of inflation, or at least accepts it as a credible proxy.

A more positive argument can be constructed from the Bureau for Economic Research (BER)'s inflation expectations survey. Aron and Muellbauer (2007) are amongst those who observed that financial analysts were the one group surveyed by the BER whose expectations not only converged in a forward-looking manner on the SARB's target but also led the expectations of households, trade-unions and businesses. Since these analysts are – by virtue of their professions – able to understand communication about core inflation, there is little evidence in South Africa that targeting an appropriately explained core index explicitly would undermine the current success of the SARB's communication strategy.

5. The practical case for core inflation targeting

Having presented arguments against the two major reasons for not adopting core inflation targeting, I will now argue more positively that there are also practical reasons for adopting core inflation targeting. The first reason is the ability of core inflation to capture the underlying inflation trend.

Emerging market economies (as well as lower-income countries) are particularly exposed to the impact of large relative price shocks. In Roger's statistical summary of track records of inflation-targeting countries, he found that "... much of the difference seen in terms of headline inflation outcomes [between high- and low-income countries] is attributable to larger and more frequent supply shocks in low-income countries" (Roger 2009: 15). The SARB reported a very similar result for the specific case of South Africa, showing that that the non-core items in headline inflation "contribute most" to the volatility of headline inflation (South African Reserve Bank 2013: Box 2). The Bank of Thailand emphasised precisely this point to explain their preference for a core inflation target (Bank of Thailand 2014).

Meanwhile, opponents of inflation targeting in emerging market economies, such as Joseph Stiglitz, have used this fact to argue that:

Inflation in these countries is, for the most part, imported. Raising interest rates won't have much impact on the international price of grains or fuel. ... For example, even if global energy and food prices increase at a more moderate rate than now – for example, 20% per year – and

get reflected in domestic prices, bringing the overall inflation rate to, say, 3% would require markedly falling prices elsewhere (Stiglitz 2008).

This point has caused much public and even political controversy in South Africa. A long-standing criticism against inflation targeting in the South African debate is the argument that inflation targeting does not encourage an effective monetary policy response to the price shocks that have affected headline inflation. Interest rates are a “blunt tool” for combating supply side shocks, such as the oil price and food prices, runs this argument, and not only will the SARB’s attempts to combat such inflation with interest rate adjustments fail, but they will also cause pro-cyclical monetary policy.

A headline inflation target opens the SARB to continued criticism via the “blunt tool” argument, however mistaken the perception given the SARB’s practice. In any event, a reasonable response by the SARB to this criticism requires an explanation of the role of core inflation in the policy process and how this prevents the SARB from overreacting to supply shocks. In the June 2013 Monetary Policy Review the SARB formulated this point as follows:

The interpretation of inflation outcomes is at times complicated by temporary or idiosyncratic shocks. In such conditions, policy makers can look through temporary volatility by referencing various core measures of inflation that focus on underlying inflationary pressures (South African Reserve Bank 2013: Box 2).

The second practical reason for preferring core inflation targeting follows from the need for forecasts in an inflation-targeting system. Core inflation has the advantage of providing the most accurate information about the future direction of both core and headline inflation. There is some empirical evidence for this claim, including for example, Pétursson's (2002) demonstration for a small open economy, Iceland, where relative price shocks to food and fuel have little predictive power for subsequent inflation, while core inflation does. Federal Reserve Board Chairperson Janet Yellen made the same argument in a recent speech when she said, “... in light of the volatility of food and energy prices, core inflation has been a better forecaster of overall inflation in the medium term than overall inflation itself has been over the past 25 years” (Yellen 2011).

Bullard's (2011: 225-228) dispute on this point turns on the restrictive definition of core inflation as headline inflation less the impact of food and energy prices. He is able to report a number of results that cast doubt on the forecast superiority of such exclusion indices for US data. But there is no reason to restrict the definition of core inflation to an exclusion index either conceptually or practically (see footnote 5 above). Contra Bullard (2011) the bulk of the literature supports the forecast superiority of

core measures of inflation, whether they be trimmed means, dynamic factor models, structural VAR models, or even based on the recent application of wavelet econometrics. For example, using the US data that so concerned Bullard (2011), Smith (2004) showed that a bias-corrected weighted median measure of core inflation outperformed rival forecasts of inflation both in and out of sample.

The third and final reason for preferring a core inflation target is that there can be little argument for claiming to pursue one target, while in fact, the policy maker pursues another. Flexible inflation forecast targeting requires a forward-looking strategy that requires the central bank to implement a strategy built around a forecast for core inflation, whether implicitly or explicitly. Monetary policy would gain in frankness, with a positive impact on accountability, by targeting core inflation explicitly.

6. Conclusion

There is an apparently persistent gap between the practice of inflation-targeting central banks and the academic consensus on the need to target core rather than headline inflation in an inflation-targeting regime. In this paper I explained the theoretical case for core inflation targeting and disputed the usual criticisms of core targeting. I have argued that core inflation targeting has a better theoretical grounding in the recent literature, holds practical advantages for inflation-targeting central banks and has the promising feature of improving the frankness of monetary policy conduct. At the same time, the practical arguments against core inflation targeting are not nearly as compelling as often presented.

Inflation-targeting central banks, and the political authorities who assign their nominal targets, would do well to elevate theoretically grounded core inflation from the information set of monetary policy to the target.

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