Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate

South African Reserve Bank
Conference Series
2014

South African Reserve Bank

Enquiries relating to the papers in this publication should be addressed to the respective authors at the contact details provided.

ISSN (print):	1993-0895
ISSN (online):	2073-6770
ISBN (print):	978-1-920556-15-0
ISBN (online):	978-1-920556-16-7

To access this publication electronically, please go to: http://www.reservebank.co.za and follow these links: Research/Papers/Conference papers.

Produced by the Group Strategy and Communications Department, South African Reserve Bank

Contents

Foreword

The theme of the South African Reserve Bank's (the Bank) fifth biennial conference, 'Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate', remains as significant a challenge today as it was during the early phase of the global financial crisis. This conference volume provides various papers from several well-known international and local researchers. These papers were very timely and focus on core issues relevant to the Bank's current challenges.

The aim of the conference was to provide a platform for central bankers, the research community and other stakeholders to have a well-informed dialogue on important policy issues. These discussions will ultimately contribute to the evidence base for good monetary policy.

Both the presentations and discussions included various themes such as the interface between price stability and financial stability; global spillovers from global monetary policy, particularly from advanced countries; and the challenge of low economic growth and the need for structural reforms.

The conference concluded with a panel discussion that provided fruitful discussions and interactions between academics and practitioners. These kinds of discussions provide a unique opportunity to encourage cross-fertilisation between frontier academic thinking and the practical day-to-day challenges of policymaking.

Finally, I would like to express my gratitude and sincere appreciation to all the contributors who participated in this conference hosted by the Bank.

Lesetja Kganyago
Governor
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He received the Great Gold Medal of the Royal Swedish Academy of Engineering Sciences in 2012. He is a foreign honorary member of the American Economic Association, a member of the Royal Swedish Academy of Sciences, a member of Academia Europaea, a foreign member of the Finnish Academy of Science and Letters, a foreign honorary member of the American Academy of Arts and Sciences, an honorary member of the Latin American and Caribbean Economic Association, a fellow of the Econometric Society, a fellow of the European Economic Association, a research associate of the National Bureau of Economic Research, and a research fellow of the Centre for Economic Policy Research in London. He was Chair of the Prize Committee for the Alfred Nobel Memorial Prize in Economic Sciences from 1999 to 2001, a member from 1993 to 2002, and Secretary from 1988 to 1992.

He was active as an advisor to Sveriges Riksbank from 1990 to 2007 and was a member of the Monetary Policy Advisory Board and the Economic Advisory Panel of the Federal Reserve Bank of New York from 2004 until his appointment in 2007 as Deputy Governor of the Riksbank. He has regularly consulted for international and Swedish agencies and organisations. From 2000 to 2001 he undertook a review of monetary policy in New Zealand, commissioned by the New Zealand government, and in 2002 he chaired a committee reviewing monetary policy in Norway.

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John B Taylor is the Mary and Robert Raymond Professor of Economics at Stanford University and the George P Shultz Senior Fellow in Economics at Stanford's Hoover Institution. He is also the Director of Stanford's Introductory Economics Center. Taylor is known for his economic research on the foundations of monetary theory and policy, which has been applied by central banks and financial market analysts around the world. He also has an active interest in public policy and teaching. He served as Senior Economist on the President's Council of Economic Advisers (the Council) from 1976 to 1977, as a member of the Council from 1989 to 1991, as a member of the Congressional Budget Office's Panel of Economic Advisers from 1995 to 2001, and as Under Secretary of Treasury for International Affairs from 2001 to 2005. In addition, he also served as a senior economic adviser on four presidential campaigns. Among many awards, Prof. Taylor was awarded the Hoagland and the Rhodes prizes for excellence in undergraduate teaching. He received the Bradley Prize for his economic research and policy achievements, the Adam Smith Award from the National Association for Business Economics, the Alexander Hamilton Award and the Treasury Distinguished Service Award for his policy contributions at the US Treasury, and the Medal of the Republic of Uruguay for his work in resolving the 2002 financial crisis. Taylor received a BA in Economics (summa cum laude) from Princeton and a PhD in Economics from Stanford. He won the 2012 Hayek Prize for his latest book, *First principles: five keys to restoring America's prosperity*.

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Dr Williams currently serves as the Managing Editor of the *International Journal of Central Banking*. He was previously the Associate Editor of the *American Economic Review*. His research focuses on topics including monetary policy under uncertainty, innovation, productivity and business cycles.

Prior to completing his doctorate at Stanford, he earned a Master of Science with distinction in Economics from the London School of Economics in 1989, and a Bachelor of Arts with high distinction from the University of California at Berkeley in 1984.

Introduction

Conference Organising Committee

The global financial crisis introduced a period of sustained uncertainty and volatility in world economic conditions that remains a pressing challenge to governments and central banks. The recovery from the crisis has been incremental at best with numerous false starts and reversals, in part reflecting the 'trial and error' approach taken by policymakers.

Three fundamental difficulties presented themselves in the unfolding of the crisis and in its aftermath. The first was that while demand slumped and fiscal deficits expanded in response, government debt levels were already excessive in many countries from the outset. This implied that fiscal stimulus could only be maintained for a certain period and limited the extent to which public debt could help private deleveraging and be expanded as a substitute for private debt. Fiscal austerity had to start sooner than many would have preferred given the size of the slump in demand.

Second, while monetary policy needed to play an important role in assisting with demand management, inflation concerns and the risk of a further impetus to financial bubbles remained high. Over time, inflation concerns receded somewhat in advanced economies while fears of financial asset bubbles increased. More broadly, the impact of monetary policy on financial stability needed to be rethought in both sophisticated but encumbered advanced markets and in rapidly growing emerging financial markets, with potentially ambiguous implications for policy.

For emerging-market economies, a third difficulty was that the crisis generated waves of capital inflows that extended out from major financial centres. These helped to finance economic growth in most economies but also undermined the basis on which growth had started to accelerate before the crisis. Capital inflows appreciated exchange rates, which potentially limited growth in net exports and, more specifically, commodity exports. What to do about this has been less than clear, with emerging markets generally choosing approaches that suited their conditions and idiosyncrasies.

Each of these tensions raised questions about the suitability and effectiveness of the predominant policy framework – inflation targeting – employed by central banks around the world, including in South Africa.

While price stability remains a core objective of central banks, the persistence of low economic growth has raised expectations not only about what central banks can and should do, but also how financial stability should relate to their core objectives. The South African Reserve Bank's (the Bank) 2014 biennial conference focused on the framework and practice of inflation targeting in South Africa over the past fourteen years as well as the frameworks and practises abroad to contribute to our collective understanding of those challenges.

As can be expected, tentative responses combine elements of the familiar and the unfamiliar – a recognition that some long-standing difficulties remain central to what monetary policy needs to do, alongside new thinking about how policy frameworks need to adjust to better address the financial and growth difficulties of the post-global financial-crisis world.

In the keynote address, John Taylor (Stanford University) reviews the experience of emerging-market countries that had adopted inflation targeting over the past two decades. Monetary policy in these countries became more rules-based and less discretionary, making it more credible and predictable, and helping to significantly improve macroeconomic outcomes. This progress has been interrupted by global developments, however. Advanced economies should have followed conventional policy rules more strictly in the years leading up to the crisis, which might have constrained the growth of financial bubbles. After the crisis hit, advanced economies implemented overly aggressive unconventional policies in an effort to rectify their earlier mistakes. The spillovers associated with these unconventional policies have, in turn, forced changes to emerging-market policies towards more discretionary responses. In his paper, Taylor argues that these have and would pose ongoing risks to the successes achieved by emerging markets. Taylor also calls for the normalisation of monetary policy and advises emerging-market countries to adhere to rules-based inflation targeting and use less industry specific but better defined macroprudential tools to address financial risks.

Lars Svensson (Stockholm School of Economics) reviews the recent shift in the Swedish monetary policy stance and identifies lessons for inflation targeters. In his paper, Svensson cautions against a policy of 'leaning against the wind' in current conditions, essentially using a tighter monetary policy stance to address housing prices and rising indebtedness than is justified for stabilising inflation. Swedish monetary policy transmission had a very small effect on the risks associated with household indebtedness. Compared to the large costs of too-high unemployment and too-low inflation, the

possible benefit of leaning against the wind is insignificant. Too-low inflation also worsened the real value of household debt, leading to even weaker economic conditions. Svensson concludes that macroprudential policies were more effective in influencing household debt and managing risks than monetary policy tools.

Vivek Arora (International Monetary Fund) gives a comprehensive overview of the developments in, and challenges faced by, emerging markets and focuses specifically on the rise in currency volatility. As growth in emerging markets slowed from 2011, market volatility caused by policy normalisation in the United States (the taper tantrum) and reversing capital flows complicated the policy responses. Arora concludes that policy challenges would remain, particularly to achieve multiple aims of supporting growth, managing inflation and building resilience to financial shocks.

In his paper, Stan du Plessis (Stellenbosch University) argues that core inflation rather than headline inflation may be more of an appropriate target for South Africa. Core inflation as a target would be less prone to exogenous shocks and provide a clearer signal to policymakers of the needed policy stance. Du Plessis recognises the communications problems that might be associated with using core rather than headline inflation, but is of the opinion that the practical arguments against core inflation targeting are not compelling.

Alain Kabundi (South African Reserve Bank), Eric Schaling (Wits Business School) and Modeste Some (University of Johannesburg) focus on a particular feature of the South African monetary landscape, namely the price and wage setting process and its impact on inflation expectations. Kabundi et al. demonstrate how their model showed the positive relationship between the expectations of price and wage setters and the upper end of the official inflation target range. By contrast, the expectations of analysts were more realistic and usually within the inflation target range, suggesting that the Bank's communication has a greater impact on the process of expectation formation in the markets.

John Williams (San Francisco Federal Reserve) addresses the successes and challenges of inflation-targeting countries during the crisis. In his paper, Williams shows that maintaining low and stable inflation and anchoring inflation expectations had been beneficial for economies during and after the global financial crisis. He emphasises that the main challenges were the zero lower bound on nominal interest rates, which had constrained conventional policy actions for most major central banks and made it more difficult to

identify the right role for monetary policy in maintaining financial stability. Micro- and macroprudential policies should therefore provide the first and second lines of defense for financial stability. Williams remains concerned that if financial stability and price stability goals conflict, there is a serious risk that price stability will be subordinated to the financial stability goal, with adverse long-run consequences for economic performance.

The role of the labour market in South African price setting is explored by Nicola Viegi (University of Pretoria). Because wages have empirically responded weakly to changes in employment, the central bank has been confronted by an unfavourable short-run unemployment-inflation trade-off that complicates the implementation of inflation targeting. Viegi suggests that a strategic framework in which the central bank consistently leads the price-setting process could improve coordination and reduce disinflation costs in the economy.

The final paper of the conference addresses the topic of exchange rate volatility in an inflation-targeting framework. Shakill Hassan (South African Reserve Bank) shows that while capital flows driven by carry trades could be destabilising and reduce the effectiveness of monetary policy, it is critical to distinguish between short- and long-term currency volatility. Because of its random nature, currency volatility in the short term can reduce long-run exchange rate misalignment, encouraging offsetting speculative positions. Moreover, by reducing nominal interest rates and reducing the return on rand assets, low and stable inflation can serve a counter-speculative role in the inflation-targeting policy framework.

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Opening address

Gill Marcus

It gives me great pleasure to welcome you all to the biennial conference of the South African Reserve Bank. The theme this year is 'Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate'. Lessons from history tell us that nothing is static, that societies and economies evolve, as do policies and policy frameworks. When things appear to be going well, it is often difficult to imagine that this will not continue or that the status quo will change, or how indeed it will or can change. During the so-called 'great moderation' of the mid-2000s when global inflation was low, the battle against business cycles was seemingly won, and inflation targeting, or some variant thereof, had gained widespread acceptability, it was hard to envisage what would come next, and what would cause us to reconsider the adequacy of the framework.

Little did we know that very soon, in the wake of the global financial crisis, we would be asking the question whether inflation targeting was enough and, if not, how the framework should be modified or augmented, and if central bank mandates should be expanded. The global financial crisis was a salutary reminder that nothing is static, that central banks largely deal with the unknown future, and that we have to adapt to changing and unexpected circumstances. However, there is still an intense debate about whether monetary policy should change, and how it should change. The aim of this conference is to provide a platform to debate these issues rigorously, and we are indeed privileged to have a high-level line-up of recognised authorities in the field, both international and local, to stimulate these discussions.

Although the focus of the conference is more about the future, the topic does imply some assessment of the framework, and I will attempt to provide brief reflections of the past 14 years of inflation targeting in South Africa. I will also reflect on global developments in monetary policy and, in particular, the expanding mandates of central banks and how these developments relate to our domestic circumstances.

Has inflation targeting been a success in South Africa? It is hard to say in the absence of the counterfactual, but there are a number of indicators that suggest it has been a positive experience. One way of looking at it is to compare the pre- and post-inflation-targeting period outcomes. While this

approach gives us some indications, the causal relationships may be unclear, and the different periods were subject to different shocks which may distort the picture. Nevertheless, the data does show that inflation targeting has been consistent with an average inflation rate lower than in the previous decade, and accompanied by lower volatility and lower nominal and real interest rates. Similarly, growth outcomes have been more favourable, which undercuts the argument that is sometimes made that inflation targeting is inimical to growth.

The South African Reserve Bank (the Bank) has adopted a flexible inflation-targeting approach, conscious of the trade-off between short-term inflation variability and output variability. This approach has been appropriate both in dealing with exogenous shocks as well as responding to periods of slow growth, as is currently the case. While growth does have a positive weight in the Monetary Policy Committee's objective function, and consideration is given to the real economy in making monetary policy decisions, the Bank believes that monetary policy, whatever the framework, does not impact significantly on long-term potential output growth.

Looking at some of the comparative data, we see that in the 10 years before inflation targeting was adopted, inflation averaged 9,7 per cent, and this declined to 6,3 per cent in the full inflation-targeting period, while average gross domestic product (GDP) growth improved from 1,6 per cent to 3,3 per cent. The average nominal policy rate declined from 15,5 per cent to 8,5 per cent, while the average real policy rate declined from 5,7 per cent to 2,2 per cent. If we simply look at the period from 2010, inflation has averaged 5,3 per cent, real GDP growth 2,6 per cent, the repurchase (repo) rate 5,5 per cent, and the real repo 0,3 per cent. The volatility of all these variables is also lower in the inflation-targeting period. Other positive indicators are the increased contra-cyclical nature of monetary policy (as noted, inter alia, in work by Ben Smit and Stan du Plessis) as well as the relative stability of inflation expectations, albeit, in the past three years, at the upper end of the target range. This topic will be explored further in the presentation by Alain Kabundi.

But it has not all been plain sailing and, as the averages suggest, inflation has not always been within the target range. Despite the improved outcomes during the inflation-targeting period, there have been significant divergences of inflation from the target range, particularly in 2002–03 and 2006–08. However, these deviations were primarily a result of exogenous shocks, and therefore 'justifiable' in a flexible inflation-targeting framework. Such deviations, if communicated and responded to appropriately, should

not undermine the credibility of the framework. These shocks have been primarily in the form of significant exchange rate changes, and global oil and food price increases. A criticism sometimes levelled at inflation targeting is that the response to such supply-side shocks could lead to procyclicality of monetary policy. The Bank's approach has been to try to 'see through' the first-round effects of such increases, and focus on the possible impact on inflation expectations and the emergence of second-round effects. Depending on the extent to which inflation expectations are anchored, the Bank could also take a more flexible approach by, for example, extending the policy time horizon. However, this is often easier said than done as a lot depends on the nature and duration of the shock, which is not always easy to discern ex ante.

For example, the oil price increases in January 2004 from around US$30 per barrel were initially expected to be temporary. Prices did not reverse, but then settled in the US$60–US$70 per barrel range for some time. From the beginning of 2007, oil prices began to increase almost persistently, but the Bank's own forecasts, based to a large extent on market forecasts at the time, kept underestimating these increases. Oil price increases continually surprised on the upside, resulting in almost continual upward adjustments in the Bank's inflation forecasts. Each forecast round produced a higher trajectory, and a higher oil price assumption. As these increases fed quickly through to headline inflation, coupled with accelerating global food prices and a depreciating currency, disentangling first- and second-round effects became increasingly difficult. It may be relatively easy to see through a temporary shock or a one-off permanent shock, but dealing with a continual or persistent one-sided shock is more challenging, particularly in the emerging-market context.

One approach to dealing with exogenous shocks would be to target core inflation, which would strip out volatile supply-side shocks. Most countries target headline inflation, but some use a measure of core inflation for operational purposes. While we have paid increasing attention over the years to a measure of core inflation, and the Bank publishes its forecast for this measure alongside its forecast for headline inflation, we have kept the main emphasis on headline inflation for ease of communication. We have, however, found core inflation to be a good indicator of the underlying inflation pressures excluding some exogenous and volatile components and exogenous shocks, and therefore a useful policy guide. Whether or not policy should focus primarily on core inflation is an issue that will be addressed by Stan du Plessis, and I am sure it will generate some interesting debate.

A related challenge to the inflation-targeting framework has been dealing with large exchange rate changes which were primarily responsible for the deviations from the target experienced in 2002–03 and, to some extent, in 2014. Although pass-through from the exchange rate to the consumer price index (CPI) has declined significantly over the period, it remains an important driver of inflation. The rand is prone to overshooting in both directions, at times for extended periods, and is vulnerable to terms-of-trade swings. In addition, because of the openness and depth of the South African foreign-exchange market, the exchange rate is sensitive to changes in risk perceptions in global financial markets and associated changes in capital flows – an issue highlighted in Shakill Hassan's paper.

Reacting to exchange rate movements has the potential to confuse the signals about the objectives of monetary policy and the commitment to the inflation target, particularly when a conflict between the objectives arises. However, while an inflation-targeting framework requires exchange rate flexibility, it is generally accepted that some intervention is not inconsistent with the framework, as long as the motives are fully communicated and understood, and that precedence is given to the inflation objective when a conflict between the objectives arises.

Changes in the exchange rate could have inflationary impacts, but reacting to them could pose a challenge for communication, particularly when a currency depreciation has been accompanied by a tightening of monetary policy. The Bank has tried to emphasise that such a reaction is to the potential inflationary impact of the exchange rate change, and not an attempt to target the exchange rate itself. The exchange rate is one of a number of determinants of inflation, so any response to an exchange rate change would have to be assessed in conjunction with the simultaneous impact of changes in other variables, some of which may be offsetting.

The response to exchange rate changes would depend on the nature of the shock, where monetary and portfolio type shocks would require different interest rate responses. The reaction of the exchange rate to interest rate changes has also been uncertain: during the mid-2000s, when equity capital flows dominated in South Africa, lower interest rates encouraged growth-sensitive inflows and currency appreciation. The impact of the exchange rate has become even more relevant, given increasing evidence of monetary policy spillover effects from advanced economies. In particular, low interest rates and quantitative easing in the United States (US) and associated capital flows (and reversals) have impacted on the rand, with attendant

consequences for inflation and inflation expectations. In this regard, domestic monetary policy has had to respond to both domestic factors and changes or potential changes in policy globally. The issue of spillover effects will be taken further by John Taylor, while Vivek Arora highlights the diverse response of emerging markets to shocks.

Inflation targeting, however, has not been without its domestic critics and political economy challenges. There has been a lot of resistance to the framework, from sections of the labour movement in particular, where the idea of a long-run trade-off between inflation and employment persists and, not surprisingly, opposition has tended to intensify during upward phases of the interest rate cycle. This animosity is problematic, as societal buy-in and public support are considered to be important prerequisites for the successful implementation of the framework. Nicola Viegi, for example, argues in his paper that a lack of a strong response of wages to labour market conditions is likely to undermine the efficiency of the framework. Initially, inflation targeting was introduced without much prior publicity, public education or consultation beyond the Bank and National Treasury. In retrospect, the Bank could have embarked on a more aggressive education campaign to underline the benefits of low inflation, the limits to what monetary policy can do with respect to growth, and why a flexible inflation-targeting framework is not necessarily inimical to growth. There was, and still is, a widely held view that monetary policy can do more for structural growth and employment than it can in reality.

To counter this, during the past few years the Bank has engaged in intensive stakeholder consultations and instituted an 'outreach programme' to facilitate meeting regularly with political parties, trade unions, business federations and civil society to discuss views on the economy in general and on monetary policy in particular.

Communication with the public has become an integral part of the Bank's overall strategy. It has taken time to develop a modus operandi for communicating with the public, and this remains an area of constant evolution and refinement.

Unfortunately, although the animosity towards inflation targeting has declined significantly almost 15 years after the implementation of the framework, and despite our communication initiatives, the views of some segments of society have not changed much. For example, following the 25-basis-point increase in the repo rate in July, the Cosatu response was one of 'bitter

disappointment', laying the blame for low growth at the door of 'conservative monetary and fiscal policies', despite a slightly negative real policy rate and a fiscal deficit of 4,5 per cent of GDP.

Communication has another dimension that relates to transparency of policy decision-making and forward guidance, which is more about future policy actions rather than communication about what monetary policy can and cannot do. Although transparency and communication, which are the corollary of accountability, are not unique to inflation targeting, there is no doubt that they are integral to the framework, and most countries, including South Africa, have made great strides in increasing these aspects over the past two decades. Alan Blinder has appropriately referred to this process as the 'quiet revolution in central banking'. But there are disagreements around the limits of transparency, particularly around the issue of forward guidance. Although forward guidance, in the form of setting the path for policy rates, predated the crisis (in New Zealand, Sweden and Norway), as monetary policy reached the zero lower bound in a number of the advanced economies, forward guidance of some form became more commonplace, although the nature of the guidance often differs across countries, and has been changing in the US and United Kingdom (UK) in particular.

The debate is now whether or not such guidance has been useful, and whether or not it should continue once interest rates normalise. Although the Bank has chosen not to give guidance in the form of an explicit path, it has moved in the direction of being more open, but prefers to provide a more generalised form of guidance, to act consistently and allow the market to deduce the appropriate policy path. Along with a number of other features of inflation targeting or monetary policy, central bank communication is likely to continue to evolve, particularly given the increased demand for greater public accountability.

Since the crisis there has been some questioning as to whether inflation targeting is enough to ensure price and financial stability and whether there should be any adjustments to the framework and policy mandates – an issue discussed by John Williams. In general, most conclusions are that some variant of inflation targeting is appropriate, and that long-run price stability should remain a key goal of monetary policy. But beyond that there are disagreements.

In particular, there are concerns that the low inflation environment and the narrow focus on inflation contributed to the financial crisis: that the period of low interest rate volatility lowered perceived risks, and encouraged

increased leverage and lending. Economists at the Bank for International Settlements (BIS), for example, were warning that credit cycles tend to be longer than business cycles, and that failure to focus on the former could lead to excessive leverage and the emergence of asset price bubbles. The conventional response at the time, as typified in Chairman Greenspan's Jackson Hole address in 2003, was that central banks could not recognise asset price bubbles, and therefore should not lean against them, but should rather clean up after the bubbles had popped (Bill White's so-called 'lean or clean' debate).

It is now generally accepted that a narrow focus on inflation to the exclusion of asset prices is not sufficient. However, a number of unresolved issues remain, one being whether or not monetary policy should lean against asset prices. For example, Claudio Borio at the BIS, proposes extending the time horizon for monetary policy to take the financial cycle into account. Alternatively, should interest rates remain focused on monetary policy, and macroprudential tools be used to deal with asset price excesses? And if macroprudential tools are used, should this be done by the central bank or by a separate agency? There are very different views still on this issue. A Brazilian proposal by da Silva and Minella is to integrate a focus on credit gaps into the monetary policy framework. By contrast, John Taylor argues for a return to a rules-based approach rather than trying to fine-tune sectors of the economy over the cycle, while Lars Svennson highlights the output costs of 'leaning against the asset price winds' with monetary policy.

The Bank's approach is one of separation of goals and instruments, that the repo rate will maintain its traditional role as the main monetary policy instrument, while macroprudential tools will be used for financial stability purposes. This toolkit is being developed, and the Bank closely observes how different instruments are being used in varied circumstances by other central banks. This does not mean, however, that interest rates could or should not be used in combination with macroprudential tools should the need arise.

The Bank's experience during the pre-crisis period, when it did not have a focused macroprudential approach, is instructive. During the period 2003–06, the economy was growing at rates above potential, with an average growth rate of around 5,5 per cent at a time when the potential growth rate was estimated to have been around 4 per cent. The exchange rate was appreciating, partly in response to the commodity price cycle; annual growth rates in credit extension were around 30 per cent; real household consumption expenditure growth was around 9 per cent; and house price growth was in excess of

30 per cent. Had we had a macroprudential focus, such a combination of settings would have been a cause for concern, and may have elicited a policy response through higher interest rates. However, over that period, inflation was steadily declining and threatening to fall below the lower end of the target range when it reached a low of 3,1 per cent, which could have required a further easing of monetary policy. There was perhaps a failure on our part to recognise this as a broader financial stability risk, and to react either with a tighter monetary policy stance or with macroprudential tools. Similar settings would probably result in a different response today, given the Bank's explicit financial stability mandate. How effective our macroprudential policies will be in solving financial stability issues and dealing with situations such as those described above is, however, still an open question.

The expansion of central bank mandates to include financial stability explicitly could have implications for central bank independence. Central bank independence is not absolute, however, and independence relates mostly to monetary policy at the operational level. The inflation-targeting framework lends itself well to the separation of instrument and goal independence, in that generally central banks do not have goal independence (as the target is usually, but not always, set by government) but, in order to prevent the so-called political interest rate cycle, central banks have independence to pursue the mandate given to them. But, as I have stressed on a number of occasions in the past, the Bank is not independent of the economy or the society in which we live, and therefore a number of factors have to be taken into consideration when making decisions. However, compared to financial stability, monetary policy decisions, while not easy, are more straightforward and better understood by the public. These decisions generally involve the use of one tool (the interest rate), although quantitative easing has complicated this argument, and there is a clear objective, even if there is some weight on output variability in the Bank's objective function.

However, a financial stability mandate is more complicated. It generally involves government, particularly when government funds are involved, in crisis resolution, and the policy tools are more directed at particular sectors, and therefore may be more politically sensitive as the distributional impacts are more apparent than in the case of monetary policy. Furthermore, challenges for communications are likely to arise if interest rates are used for both monetary policy and financial stability purposes. And, as a recent International Monetary Fund (IMF) paper has argued, financial stability is difficult to measure but crises are evident, so policy failures are observable, unlike successes. To quote from the paper, "central banks would find it difficult,

(even ex post) to defend potentially unpopular measures, precisely because they succeeded in maintaining financial stability." And any perceived failures on the financial stability front have the potential to undermine monetary policy independence through a general loss of credibility of the central bank.

A final issue is the debate around the optimal level of inflation. In particular, is the 2 per cent inflation target norm, in advanced economies in particular, too low? Olivier Blanchard at the IMF mooted this in 2010, but the idea persists, and was recently raised again by Paul Krugman. The argument relates to a fear of deflation, the dangers of a low inflation trap, and the economic costs of deflation. But it does not undermine the basic tenet that long-run price stability remains at the core of central bank mandates. Rather, it appears to be a call for a moderate upward adjustment to what would be regarded as the advanced economy norm for price stability.

This debate, however, is not really that relevant in South Africa or many emerging- market economies where structural features, price setting behaviour and vulnerability to exogenous shocks have generally required higher inflation targets. These structural features include factors such as the weight of administered prices in the inflation basket, the weight of volatile elements such as food, vulnerability to terms-of-trade changes, particularly in the case of commodity producers, and the impact of exchange rate volatility on the exchange rate.

Although the Bank's inflation target of between 3 and 6 per cent is higher than the advanced economy norm, this does not mean that there have not been times when there have been calls to raise the inflation target, even from the current high level, in order to bring about a looser monetary policy stance. The Bank's current level of inflation and its target are not close to the low inflation trap, and our view is that a higher inflation target would merely raise inflation expectations, and actual inflation would then likely increase. The end result would be higher nominal interest rates, and because of possible higher inflation variability and other risk premiums, we could end up with higher real interest rates as well.

In conclusion, inflation targeting is not as straightforward as its name suggests. There are many contentious issues, and the challenges facing emerging-market economies are different to those of the advanced economies. We are extremely fortunate to have a strong line-up of international and local experts on this topic to provide us with their thinking on this important policy question and to stimulate discussion. There is also keen interest and participation in the conference, with a wide range of delegates, and I am sure you will all

be active participants in the discussions. I am particularly grateful to our international visitors who have undertaken the long journey to be with us, and we hope that you will enjoy your stay with us and will have time to gain an appreciation of our country beyond the confines of the central bank and monetary policy.

Keynote address

Inflation targeting in emerging markets: the global experience

John B Taylor

Abstract

This keynote address reviews the experience of countries who adopted inflation targeting during the past two decades. It shows that monetary policy became more rule-like and less discretionary, and thereby more credible and predictable. The adoption of inflation targeting thereby resulted in improvements in domestic macroeconomic performance. Experience shows that these policies also tended to lead to smoother adjustments and less volatility internationally. They created forces that reduced exchange rate pass-through to inflation, moderated exchange rate volatility, and cut down on monetary-induced capital flows. The paper also examines the impacts and spillovers of a major departure from rules-based monetary policy in developed countries on emerging-market countries, and the recent threats to inflation targeting as more emphasis has been placed on the fine-tuning of macroprudential instruments and other expansions of central bank actions. The conclusion is that the entire international monetary system should endeavour to re-normalise and return to rules-based policy globally.

1. Introduction

In order to assess adequately the emerging-market experience with inflation targeting in recent years, it is necessary to place the experience in the broader context of global monetary policy in which emerging markets are playing a growing and increasingly important part.

During the past decade, the practice of monetary policy changed dramatically in many countries around the world. In some developed countries – the United States (US) and euro area countries in particular – this change in policy was apparent before the global financial crisis, and it showed up as a deviation from the more rules-based policy of the 1980s and 1990s. This policy shift continued after the crisis and spread to other countries in what has been called the Global Great Deviation.[1] It has been characterised by interest rate decisions that differed markedly from the 1980s and 1990s and by unconventional monetary policy actions, including quantitative easing in

the form of large-scale purchases of securities. In my view, this shift in policy has not been beneficial, but rather has been a factor in the deterioration of economic performance in the past decade.

As this shift away from rules-based policies was occurring in developed countries, the central banks of many emerging-market countries were moving towards more rules-based systems of inflation targeting. South Africa, as well as Brazil, Mexico and the Philippines all adopted inflation targeting around the turn of the century, and other countries, such as Colombia, began implementing monetary policy using the interest rate instrument in a rule-like manner similar to many other inflation-targeting countries. In my view, these changes were, for the most part, beneficial. They led to a more stable macroeconomic environment despite significant shocks from abroad – including the global financial crisis itself – and from other non-monetary policy shocks within the countries.

But the Global Great Deviation of the developed country central banks has affected the inflation-targeting movement of the emerging-market countries. First, it has created direct economic spillovers which have apparently adversely affected economic performance and have thus blurred the good effects of inflation targeting. Second, it has led to policy spillovers in which emerging-market central banks have been driven to deviate from their inflation-targeting rules.

There is now much discussion on the exit from the unconventional monetary policy of recent years, and the key question is where policy should be exiting to. Some are calling for a so-called new normal for monetary policy. The International Monetary Fund (IMF) recently devoted a conference, 'Monetary Policy in the New Normal', to this idea. For the developed countries, the new normal would mean the continuation of much of the unconventional monetary policy of recent years. For emerging-market countries, it would mean a change in, or even and end of, inflation targeting in which so-called macroprudential policy instruments would be manipulated in place of some formerly conventional monetary policy actions.

In my view, as I hope to show in these remarks, central banks around the world should re-normalise monetary policy rather than new-normalise it to some new normal. For the emerging-market countries such as South Africa, this means sticking to the type of inflation targeting they adopted a decade or more ago, with macroprudential policy simply focused on getting the overall risk environment right without also trying to fine-tune sectors of the economy over the business or credit cycle. For the developed countries such as the

US, this means ending the Global Great Deviation and returning to the rules-based monetary policy that worked well in the 1980s and 1990s and until recently.

Research and experience show that if such a policy framework were implemented by central banks in emerging-market and developed countries around the world, a more smoothly operating international monetary system would emerge. It would lead not only to a non-inflationary consistently expansionary (NICE) economy, but also to a near internationally cooperative equilibrium (NICE), which I have referred to as a TWICE NICE or NICE-squared outcome.[2]

I start with a simple empirically grounded theoretical framework to illustrate the interaction between monetary policy in emerging-market and developed country central banks. I then examine the empirical findings of spillovers based on multi-country model simulations, and finally I consider the historical experience.

2. Inflation targeting and rules-based policy in practice

To motivate the theoretical framework it is important to emphasise that as inflation targeting has been implemented in practice by most central banks – including the South African Reserve Bank (SARB) – it has been accompanied by a more rules-based approach to the settings of the instruments of policy. As the former governor of the Central Bank of Chile, Jose De Gregorio, (2014) puts it in his recent book, "The inflation target is an efficient framework to conduct monetary policy. The issue then is how to operationalise this framework. When should monetary policy be tightened or loosened? The most traditional answer is the Taylor rule …".

But whether it is a Taylor rule or some other rule for the monetary policy instruments, there is a remarkably close association between inflation targeting and such a rules-based policy. In the case of the SARB, Ellyne and Veller (2011) provide empirical evidence. They find that "monetary policy has become both more rules-based with the adoption of IT [inflation targeting] (or more precisely, that instrument reactions have more closely approximated a rule under IT), as well as simpler". They add that "[f]or the IT period, the basic Taylor Rule provides a good fit" but "a poor fit for the pre-IT period". Similarly, Klein (2012) shows that SARB policy is well described by a Taylor rule, noting that the implicit inflation target is at the upper part of the band with the inflation target gradually creeping up. Ortiz and Sturzenegger (2008)

also estimate a policy reaction function for the SARB, finding that the rule for the monetary policy instrument is similar to Canada, the United Kingdom (UK), Australia and New Zealand.

In its own explanation of its inflation-targeting policy on its web page, the SARB also emphasises the more systematic setting of the policy instrument, comparing it with the period prior to adopting the inflation-targeting framework when it used a 'discretionary monetary policy' or an 'eclectic approach' with evident switches between exchange-rate and monetary-aggregate targeting.

The SARB also states that it uses a 'flexible inflation-targeting framework', explaining that "[t]his flexibility … allows for interest rate smoothing over the cycle, which may mitigate any output variability from the monetary policy response to the shock". In other words, there is a tradeoff between output variability and inflation variability that monetary policymakers consider in choosing a rules-based approach that delivers good economic performance.

3. A simple theoretical framework[3]

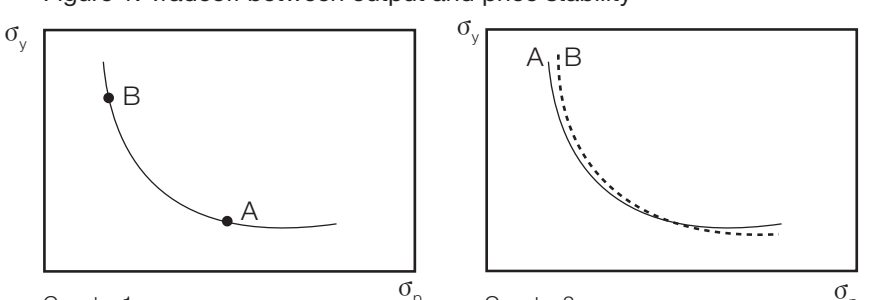
The idea that a rules-based policy for the policy instruments along with an inflation target delivers good economic performance comes out of basic monetary research. It applies to the conduct of policy in a single country, but it also applies to the global economy, as I want to emphasise here using a multi-country modelling framework (see, for example, Carlozzi and Taylor (1985) and Taylor (1993, 2013a)). The framework takes highly mobile capital as a given. It also assumes staggered wage and price setting as in the Taylor (1980) model, so that inflation today depends in part on inflation in the future. Domestic prices in each country are affected by both domestic wages and the price of foreign imports, so the law of one price does not hold in the short run. Output in each country is influenced by the real interest rate, the real exchange rate, and expectations of future output due to forward-looking consumers who take account of their future income prospects when deciding how much to consume.

Shocks can hit anywhere in the economy and may be due to shifts in policy, preferences or technology. Shocks to the wage and price-setting process are central to the modelling framework and preclude any miraculous divine coincidence, as defined by Blanchard and Galí (2007). Indeed, the essence of the monetary policy problem is characterised by a policy tradeoff between price stability and output stability. The task of monetary policy in both emerging-market and developed countries is to find a policy in which the policy instrument is adjusted so as to reach an efficient point on that tradeoff.

The problem for the central bank is to decide how to respond to shocks and fluctuations in the economy while not creating its own shocks and disturbances either domestically or internationally. By choosing the size of its responses, it can affect the relative amount of price stability and output stability. For example, when the interest rate reaction to inflation increases, then price stability increases and output stability falls. Conversely, if the central bank chooses to react less to inflation, then there will be less price stability but more output stability. And by minimising deviations from its optimal policy responses – that is, by not adding shocks to its policy rule – it will minimise monetary policy-induced fluctuations.

In such a monetary policy framework, the central bank's choice of a policy rule – the decision to be more or less responsive – has relatively little impact on output and price stability in the other countries. Figure 1 illustrates the idea in the case of two countries. We can suppose that Country 1 is a developed country and Country 2 is an emerging-market country. Figure 1 shows the tradeoff between output and price stability in both countries. Measures of the size of output and price fluctuations are on the vertical and horizontal axes respectively. The tradeoff curve is like a frontier. Points on the curve represent optimal policy. Monetary policy cannot take the economy to infeasible positions to the left or below the curve. But suboptimal monetary policy – due to policy errors, reacting to the wrong variables, and so forth – can take the economy to inefficient higher variability points above and to the right of the curve. Along the curve, lower price variability can only be achieved with greater output variability corresponding to different values of the reaction coefficient. The existence of such a tradeoff curve is quite general, and the curve has been used in many different monetary policy studies over the years.

Figure 1: Tradeoff between output and price stability



If Developed Country 1 chooses Optimal Policy Rule B rather than Optimal Policy Rule A, then the policy frontier in Emerging-Market Country 2 shifts from Curve A to Curve B, or by a very small amount.

The shape and the position of the tradeoff curve depend on the parameters of the model and the size of the shocks. An increase in the variance of the shock to wage setting in one country, for example, will move that country's curve up and to the right. A reduction in the size of the response of wages to the state of the economy – effectively more price-wage stickiness – will also result in a shift in the tradeoff curve in the northeast direction.

Points A and B, which are on the tradeoff curve for Country 1, represent two alternative choices for optimal policy, reflecting different weights on the macroeconomic objective function for Country 1. The policy at point A results in a relatively small variance of output and a relatively large variance of prices compared with point B. The two different tradeoff curves for Country 2 show the effect on Country 2 of a change in policy in Country 1 from A to B. The important point is that the tradeoff curve for Country 2 is virtually the same regardless of which of the optimal policies are chosen by Country 1. Curve B is drawn with a slight twist relative to Curve A, but that is not a general result.

This is the sense in which monetary policy research, as discussed in Taylor (1985, 1993), implies that there is little to be gained by Country 2 coordinating its own policy rule with Country 1 if both Country 1 and Country 2 are following policy rules that are optimal domestically. In game theory terminology, macroeconomic performance under a Nash non-cooperative monetary policy is nearly as good as under the optimal cooperative monetary policy, and far superior to a policy which is suboptimal on purely domestic grounds. If the Country 2 curve were to shift significantly with a change from one optimal policy to another optimal policy in Country 1, and vice versa, then a cooperative monetary policy might be worth pursuing even if the policies were optimal from a domestic point of view.

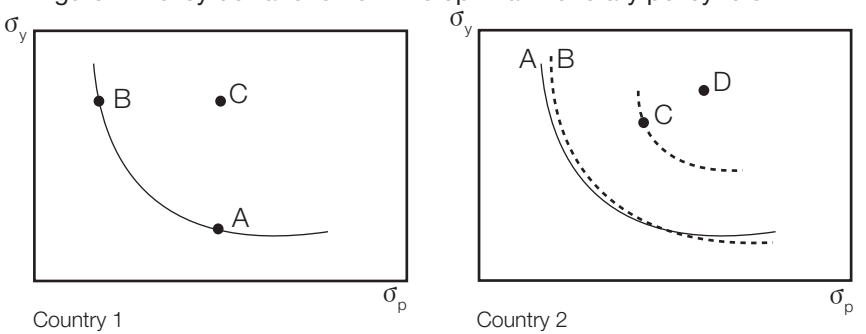
4. International spillovers on policy tradeoffs and on policy deviations

These results, however, do not hold if monetary policy in Country 1 deviates from its monetary policy rule. This is shown in Figure 2. Suppose Country 1 deviates from its optimal monetary policy rule and moves in the direction of an inefficient policy as shown by point C in Figure 2. There are two types of spillover effects in the emerging-market country to consider.

First, the *tradeoff curve could be shifted out in the emerging-market country*. The change in policy in the developed country could spill over, for example, in the form of more volatile export demand, as was demonstrated vividly in the financial panic in late 2008, or simply in more volatile exchange rates or

commodity prices. Bordo and Lane (2013) have shown that policy deviations can have a variety of adverse effects on economic performance which can be transmitted globally. These shocks would be very hard for even the best monetary policy to fully counteract. Figure 2 shows this shift in the tradeoff curve in Country 2; the original curve – either A or B – moves out to the curve with the long dashed lines. Hence, Country 2 is forced to the point C, or perhaps to another point on the new less-favorable tradeoff.

Figure 2: Policy deviations from the optimal monetary policy rule



If Developed Country 1 deviates from its optimal policy rule, moving to point C, then the impact on Emerging-Market Country 2 can be quite large: it either causes the emerging-market country to choose a poor policy rule C with no change in the tradeoff, or it causes the tradeoff curve to shift out, or both, as in point D.

Second, *policy deviations from the optimal monetary rule could become larger* in the emerging-market country due to the change to a less efficient monetary policy in Country 1. For example, if the policy change in Country 1 is to bring about an excessively easy policy with very low interest rates, then the policy makers in Country 2 may be concerned about exchange-rate appreciation and thus keep their interest rate too low too – deviating from their policy rule – which could cause an increase in price volatility and output instability. The central bank might do this even if there was an offsetting effect from higher export demand from higher output in Country 1. They might perceive that offsetting effect to be too low or too delayed or they may be concerned about the hit to certain export sectors. Of course it is possible that both international effects of the change in policy in Country 1 occur at the same time, in which case the outcome could be point D in the right-hand panel of Figure 2.

There is considerable evidence that the world economy has moved from the situation illustrated in Figure 1 to the situation in Figure 2 in recent years. Nikolsko-Rzhevskyy, Papell and Prodan (2014) provide the latest evidence using modern time series techniques that there was a shift away from rules-based policy in the US. Hofmann and Bogdanova (2012) and Ahrend (2010) show similar changes in other developed countries. Nikolsko-Rzhevskyy, Papell and Prodan (2014) also provide evidence for an earlier shift in the US in the 1980s corresponding to a move from Figure 2 to Figure 1. This earlier benign shift was originally documented by Clarida, Galí and Gertler (1998 and 2002) and recently reviewed by Clarida (2014).

There is also evidence that shifts in policy tradeoffs are due to such policy deviations, though more research is needed. Rey (2013) has shown that a good portion of the large destabilising capital flows motivated by a search for yields has been induced by erratic swings in monetary policy which are related to such policy deviations. Vegh and Vuletin (2012) found that the adoption of rules-based inflation targeting had the effect in a number of emerging-market countries of reducing large capital movements associated with "fear of free falling" exchange rates. Empirical research by Eichengreen and Taylor (2003) found that "countries that target inflation have significantly less volatile exchange rates". Inflation targeting also created forces that reduced exchange rate pass-through to inflation.

There are of course different views about the recent change in policy. Some argue that the monetary policies undertaken by the developed country central banks have been appropriate. Yellen (2013) argues, for example, that "the simple rules that perform well under ordinary circumstances just won't perform well with persistently strong headwinds restraining recovery…". According to this alternative view, the shift in the tradeoff curves or policy in Figure 2 is not due to monetary policy deviating from a rules-based approach but rather to other factors. King (2012) argues that the tradeoff curve shifted out because financial stability during the Great Moderation eventually bred instability, largely through the complacency of investors who, thinking that stability conditions would continue, took on too much risk and thereby increased instability. Bernanke (2013) argues that the effect of what I call a policy deviation in Country 1 on policy in Country 2 is entirely appropriate for some countries. He compares recent monetary policy shifts to what happened during the Great Depression when countries moved off the gold standard and started what were called competitive devaluations, but in essence were a move towards more monetary ease.

5. Empirical estimates of the spillovers from monetary policy deviations

I next consider the size of the spillover effects of deviations from policy rules. Here I draw on the evidence embodied in a state-of-the-art estimated global policy model, the IMF's model, GPM6. This model includes both developed and emerging-market monetary policies – some with inflation-targeting rules and flexible exchange rates and others with fixed or nearly fixed exchange rates (Hong Kong and Singapore).

There are six countries or groups of countries:

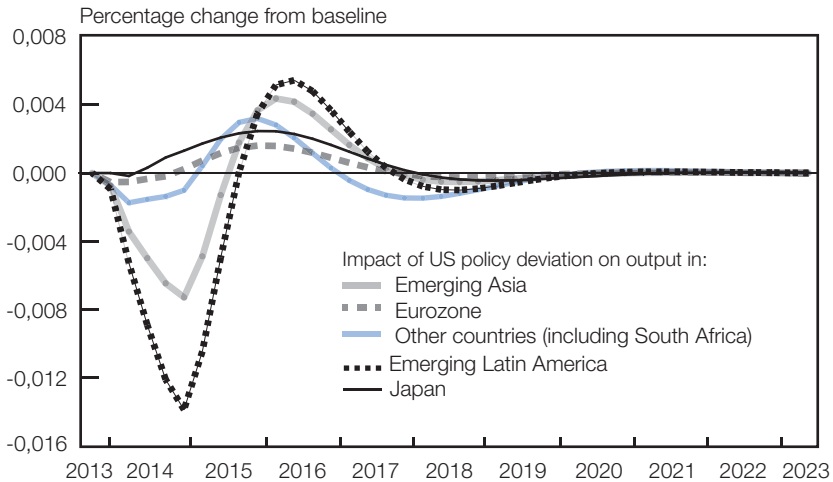
- United States;
- Japan;
- eurozone;
- emerging Asia (China, India, South Korea, Indonesia, Taiwan, Thailand, Malaysia, Hong Kong, Philippines and Singapore);
- emerging Latin America (Brazil, Chile, Colombia, Mexico and Peru); and
- other countries (United Kingdom, Canada, Turkey, Australia, Argentina, South Africa, Venezuela, Sweden, Switzerland, Czech Republic, Denmark, Norway, Israel, Bulgaria, New Zealand and Estonia).

The GPM6 model is described in Carabenciov, Freedman, Garcia-Saltos, Laxton, Kamenik and Manchev (2013).[4]

Figure 3 shows the impact on real GDP of a deviation from the monetary policy rule in the US on the various countries or regions in the model.

The monetary shock is a deviation from the monetary policy rule in the US. The deviation initially causes the interest rate to fall by about 0,2 percentage points and then the dynamics of the policy rule lead to a gradual rise in the interest rate back to its starting point in about 5 quarters. The interest rate overshoots before returning to normal due to the response of the policy rule to the economy after the shock. As a result of this shock, the dollar depreciates by 1,0 per cent in GPM6 (not shown in the figure). US output rises by about 0,2 the percentage points for each percentage-point reduction in the interest rate.

Figure 3: The global output effects of a US policy rule deviation



The deviation is a temporary negative shock to a US interest rate rule of 0,2 percentage points simulated in the GPM6 model.

According to the GPM6 model, the change translates into a negative effect on output in the emerging-market economies. As described by the authors of the IMF's GPM6 model, this occurs in these countries because "the exchange rate channel is stronger than the direct output gap effect". The impact on Japan's output is not negative, but it is quite small: only about 1/20th of the US output increase.

These policy simulations differ from the view put forth by some central banks. Bernanke (2013), for example, argues that "[t]he benefits of monetary accommodation in the advanced economies are not created in any significant way by changes in exchange rates; they come instead from the support for domestic aggregate demand in each country or region. Moreover, because stronger growth in each economy confers beneficial spillovers to trading partners, these policies are not 'beggar-thy-neighbor' but rather are positive-sum, 'enrich-thy-neighbor' actions".

While these simulations do not consider quantitative easing, there are also reasons to doubt the 'enrich-thy-neighbor' view in that case too. Stroebel and Taylor (2012) found very little effect of large-scale purchases on mortgage rates when controlling for other risks, and the announcement effects detected by Gagnon et al. (2011) likely phase out over time.

6. Historical and statistical evidence of policy spillovers from monetary policy deviations

The policy simulations show why a policy deviation in the developed countries may put pressure on central banks in emerging-market countries to deviate from their otherwise optimal policy rule.

6.1 Interest rate decisions

First consider interest rate decisions. As the empirical model shows, a reduction in policy interest rates abroad causes the exchange rate to appreciate. Even though there may be countervailing effects as economic output abroad is stimulated, for the emerging-market countries the exchange-rate effect dominates according to the empirical model simulations. Moreover, the output effect may occur with a lag and is less visible than the exchange-rate appreciation.

Many central banks will tend to resist large appreciations of their currency, and thus will hold their own policy rate down relative to what it would be otherwise. This will reduce the difference between the foreign interest rate and the domestic interest rate and will thus mitigate the appreciation of their exchange rate.

Another concern of some central banks is that very low interest rates at the major central banks can increase risky capital flows in their countries, as shown by Bruno and Shin (2012), and one way to combat this is to lower the policy interest rate. Firms abroad are able to borrow in dollars to finance investment projects even though the returns on these projects are denominated in local currency. The loans made to the firms by banks to fund these projects are subject to default in the event that the project earns less than the loan, including interest payments. In such a circumstance, a central bank can mitigate the increase in foreign lending by keeping its own interest rate lower than it otherwise would for domestic stability purposes. This reduces the incentive to borrow abroad and the associated risk.

There is considerable empirical evidence of the impact of foreign interest rates on central bank interest rate decisions. Many central bankers readily admit to these reactions, and some issue public reports. The Norges Bank explicitly reported that it lowered its policy interest rate in 2010 because interest rates were lower abroad. It also reported the details of its own policy rules, showing that there was a large deviation in 2010; the actual policy rate, at about 2 per cent, was much lower than the rate implied by its domestic

monetary policy rule, which called for a policy rate of about 4 per cent. This deviation was almost entirely due to the very low interest rate abroad. The Norges Bank reported that a policy rule with external interest rates included came much closer to describing the actual decisions than the policy rules without external interest rates.

There is also considerable econometric evidence of the spread of central bank policies. Gray (2013) estimated policy rate reaction functions in which the US federal funds rate or other measures of foreign interest rates entered on the right-hand side as deviations from their respective policy rules. He used panel data from 12 central banks, and found that the reaction coefficient on the foreign rate was large and significant.

6.2 Quantitative easing decisions

The recent case of the Bank of Japan's move towards quantitative easing and large-scale asset purchases provides another example of policy spillovers. After the financial crisis, the yen significantly appreciated against the US dollar as the US Federal Reserve (Fed) extended its zero interest rate policy and its large-scale asset purchases. Concerned about the adverse economic effects of the currency appreciation, the new government of Japan urged the Bank of Japan to implement its quantitative easing, and this is exactly what happened. As a result of this change in policy, the yen fully reversed its course and has returned to the exchange rate just before the panic of 2008. In this way, the policy of one central bank appeared to affect the policy of another central bank.

The recent moves of the European Central Bank (ECB) towards quantitative easing of some kind may have similar motivations. In the view of the ECB, an appreciating euro was a cause of both the low inflation and the weak economy. With the prolonged zero interest rates in the US, an understandable response was to shift to even lower rates in the eurozone and the initiation of quantitative easing. Indeed, the shift and initiation has been followed by a dollar strengthening and a weaker euro.

There is also evidence that shifts in monetary policy in the form of quantitative easing have an impact on monetary policy decisions abroad. Chen, Filardo, He and Zhu (2012) found that "the announcement of QE [quantitative easing] measures in one economy contributed to easier global liquidity conditions".

6.3 Capital controls

Concerned about the ramification of deviating from their normal interest rate policy, central banks in some emerging-market countries have looked for other ways to deal with the impacts of policy deviations abroad. The imposition of capital controls is one approach. Capital controls limit the flow of capital and are usually aimed at containing the demand for local currency and its appreciation, but also to mitigate risky borrowing and volatile capital flows.

However, capital controls create market distortions and may lead to instability as borrowers and lenders try to circumvent them and policymakers seek even more controls to prevent the circumventions. Capital controls are thus one reason why the output and price stability tradeoff curve will shift adversely. Capital controls also conflict with the goal of a more integrated global economy and higher long-term economic growth. The unusual spillovers of recent years have even led the IMF to suggest that capital controls might be used as a defense despite these harmful side effects.

6.4 Currency intervention

Currency intervention is another way that emerging-market countries might try to prevent unwanted appreciation of a currency either as an alternative or as a supplement to lower interest rates. In fact, currency intervention has been used widely in recent years by many emerging-market countries. However, currency interventions can have adverse side effects even if they stabilise exchange rates for a while. Currency intervention leads to an accumulation of international reserves which must be invested somewhere. In the case where the low policy interest rates are set in the US, the gross outflow of loans due to the low policy rates is accompanied by a gross inflow of funds from central banks into dollar-denominated assets, such as US Treasury or mortgage-backed securities, which affect prices and yields on those assets.

Borio and Disyatat (2011) and Beckworth and Crowe (2012) analysed the possible adverse effects of these flows during the period of the low federal funds rate in the US from 2003 to 2005. They show that the inflow of funds from abroad into US mortgage-backed securities helped keep mortgage rates low, worsening the housing boom leading up to the financial crisis. In this case, the policy deviation not only had an effect on the policy tradeoffs abroad, but it fed back on the policy tradeoff in the US.

6.5 Macroprudential policies as an imperfect substitute for rules-based inflation targeting

Another policy reaction has been the increased use of substitutes for monetary policy in emerging-market countries, especially when their policy is impacted by policies from abroad. This is most obvious in emerging-market economies closely tied to the major currencies. Both Singapore and Hong Kong have had near-zero short-term interest rates in recent years because the Fed has had zero rates. Their pegged exchange-rate regimes and open capital markets have left no alternative. So in order to contain inflationary pressures, they have had no choice but to resort to discretionary interventions in housing or durable goods markets, lowering required loan-to-value ratios in housing or requiring larger down payments for automobile purchases. Similarly, Switzerland has introduced explicit restrictions on housing in order to contain a housing boom in the face of near-zero interest rates.

These types of policies are also being discussed in inflation-targeting countries with flexible exchange rates. The SARB's *Financial Stability Review,* March 2014 (page 6), for example, states that "Given the large negative credit-to-GDP gap of mortgage advances, the implementation of other macroprudential instruments could be considered to promote the use of these types of credit, especially since a capital buffer was not initiated during the upswing".

It is understandable that such market-specific measures are being considered with the unprecedented shifts in monetary policy abroad. These so-called macroprudential actions are, however, inherently discretionary, expand the mission of central banks and bring them closer to politically sensitive areas. They also run the risk of becoming permanent even after unconventional policies abroad are removed. A regulatory regime aimed at containing risk taking is entirely appropriate, but that entails getting the levels right and not manipulating them as a substitute for overall monetary policy.

7. Conclusion

In these remarks, I reviewed the experience of emerging-market countries that adopted inflation targeting in recent years in the context of the global monetary policy environment of the past decade. While the adoption of rules-based inflation targeting resulted in improvements in domestic macroeconomic performance in emerging-market countries, the major departure from rules-based monetary policy in developed countries has blurred these effects and made the implementation of inflation targeting more difficult. One result has been a questioning by some of the inflation-targeting

approach, with recommendations that more emphasis be placed on capital controls, currency-market interventions, fine-tuning of new macroprudential instruments and other expansions of central bank actions.

My conclusion is that emerging-market countries such as South Africa should be sticking to rules-based inflation targeting with macroprudential policy concentrating on the overall risk environment rather than on trying to fine-tune sectors of the economy over the cycle. In the meantime, the developed countries should endeavour to return to the more rules-based monetary policy that worked well for them in the 1980s and 1990s and until recently. Experience shows that these monetary policies will lead to smoother adjustments and less volatility internationally.

Notes

[1] See Hofmann and Bogdanova (2012) who define 'global' as comprising both advanced economies (Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, United Kingdom and United States) and emerging-market economies (Argentina, Brazil, China, Chinese Taipei, the Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Poland, Singapore, South Africa and Thailand).

[2] See Taylor (2014).

[3] The diagrams in this section are based on Taylor (2013b).

[4] I am grateful to these authors for running the policy simulations described below with their model.

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Inflation targeting and leaning against the wind

*Lars E O Svensson**

Abstract

Should inflation targeting involve some leaning against the wind? Leaning against the wind – a tighter monetary policy than is justified for stabilising inflation around an inflation target and resource utilisation around a long-run sustainable rate – has been advocated as a policy to counter rapid credit growth and rising asset prices. Sweden provides a case study, as the Riksbank has been leaning against the wind quite aggressively since 2010, stating concerns about risks associated with household indebtedness. The cost of this policy is high, in the form of inflation much below the target and a higher unemployment rate, arguably as much as 1,2 percentage points higher than necessary. In contrast, according to the Riksbank's own calculations, the benefit of a higher policy rate in terms of a lower probability and less severity of a future crisis is miniscule. Expressed in the form of a lower expected future unemployment rate, the benefit is only about 0,004 of the cost in the form of a higher unemployment rate over the next few years. Furthermore, much lower inflation than expected has actually substantially increased households' debt burden and, if anything, increased any risks. Since the fall of 2011, the real value of a given loan has become almost 6 per cent larger than if inflation had been on target.

JEL codes: E52, E58, G21.

1. Flexible inflation targeting

Let me start from standard flexible inflation targeting, according to which monetary policy aims at stabilising inflation around the inflation target and resource utilisation around a long-run sustainable rate. Furthermore, let me for concreteness assume that the unemployment rate is a satisfactory measure of resource utilisation, so stabilising resource utilisation means stabilising unemployment around an estimated long-run sustainable rate.

A main current question is: should standard flexible inflation targeting be combined with some degree of 'leaning against the wind'?

* Presented at the Conference on Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate, South African Reserve Bank, Pretoria, 30–31 October 2014. A previous version of this paper was presented under the working title 'Inflation targeting and leaning against the wind: a case study' at the National Bureau of Economic Research (NBER) 25th Annual East Asian Seminar on Economics, Unconventional Monetary Policy, held in Tokyo from 20 to 21 June. A shorter version has been published under the title 'Inflation targeting and leaning against the wind' by the *International Journal of Central Banking*, June 2012, pp 103–114.

2. Leaning against the wind

Leaning against the wind implies a bias towards a somewhat tighter policy than justified by stabilising inflation and unemployment in order to avoid financial 'imbalances' and threats to financial stability (Bank for International Settlements 2014). As discussed by Smets (2013), it presumes that (1) macroprudential instruments or polices are ineffective, and that (2) a higher policy rate has a significant negative impact on threats to financial stability.

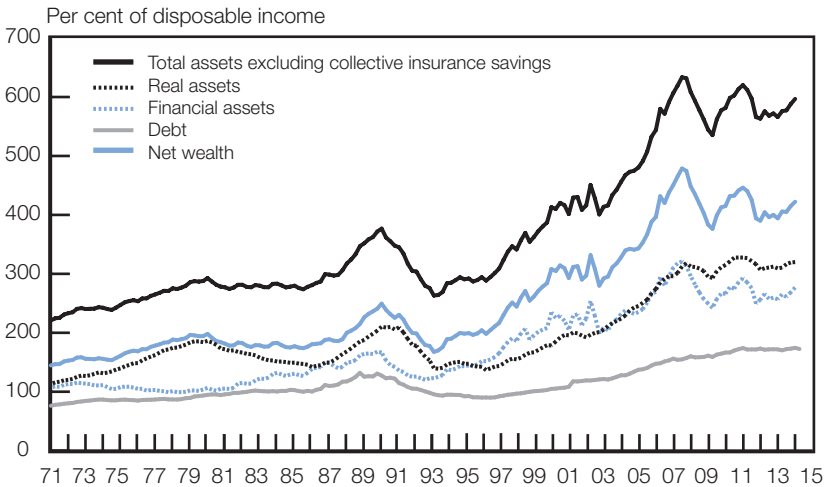
My view is that presumption (1) varies much from country to country, and that presumption (2) has little theoretical and empirical support, although the latter may depend on the structure of the financial sector, whether it is competitive or oligopolistic, the relative importance of shadow banking, and so on. This means that it is difficult to generalise from one country to another. Each country and economy needs to be scrutinised before one can judge whether there is a case for leaning against the wind or not.

3. Case study: Leaning against the wind in Sweden

I will use the monetary policy and macroprudential policy in Sweden over the past few years as a case study. Regarding monetary policy, the Riksbank has been leaning against the wind quite aggressively since the summer of 2010, stating concerns about risks associated with household indebtedness as measured by the household debt-to-income (DTI) ratio. This has led to inflation much below the target and unemployment much above any reasonable long-run sustainable rate.

Figure 1 shows how Swedish households' aggregate assets, debt and net wealth have developed since 1971. Since the mid-1990s, that is, after the big crisis in the early 1990s, the DTI ratio has almost doubled to a little above 170 per cent currently. This increase in the DTI ratio is what concerns the Riksbank. However, total assets (excluding collective insurance savings) have doubled to about 600 per cent of disposable income. Net wealth has increased to about 420 per cent of disposable income. Including collective insurance savings, total assets and net wealth would be about 720 per cent and 540 per cent respectively of disposable income. Real assets (owner-occupied houses and flats as well as leisure homes) have increased to about 320 per cent of disposable income.

Figure 1: Swedish households' assets, debt and net wealth



Source: Sveriges Riksbank

For leaning against the wind to be justified, presumptions (1) and (2) above need to apply. Regarding presumption (1), it seems that macroprudential instruments and polices are indeed both effective and being used in Sweden, as discussed in Svensson (2013c). Finansinspektionen (the Swedish financial supervisory authority) and the government have in the past few years taken or announced several effective measures, namely a mortgage loan-to-value (LTV) cap of 85 per cent (which has had a clear effect on the loan-to-value ratio for new mortgages, according to Finansinspektionen's annual mortgage market report, *The Swedish Mortgage Market 2013*), higher capital-adequacy requirements for systemically-important banks, and higher risk weights on mortgages. Since the LTV cap was introduced in October 2010, the DTI ratio has been stable at around 170 per cent. Finansinspektionen has also recommended mortgage lenders to provide suggestions to borrowers about individually adjusted amortisation plans. Furthermore, Finansinspektionen, in its annual reports on the Swedish mortgage market, thoroughly monitors that mortgage lending standards are sufficiently strict, that borrowers' debt-service capacity is good, and that borrowers' resilience to disturbances in the form of increased mortgage rates, increased unemployment and housing-price falls is sufficient.

In August 2013, in particular, the government announced a new strengthened framework for financial stability in Sweden (Swedish Government 2013). Finansinspektionen will have the main responsibility for micro- and macroprudential policy, and will control all the micro- and macroprudential

instruments, including the new countercyclical capital buffer. Assigning the main responsibility and control of both micro- and macroprudential instruments to a single authority allows for both efficiency and accountability. Furthermore, a Financial Stability Council has been created, with the Minister of Financial Markets as Chair and with the Director Generals of Finansinspektionen and the Swedish National Debt Office and the Governor of the Riksbank as additional members. The Council will assess financial stability, publish its positions and assessments and manage crises. Sweden should now have an effective framework for financial policy and financial stability. Thus, presumption (1) does not seem to apply in Sweden.

What about presumption (2), that a higher policy rate has a significant effect on threats to financial stability? The Riksbank has admitted that a lower policy rate would result in better target achievement for inflation and unemployment, with inflation closer to the target and unemployment closer to a long-run sustainable rate. However, it has maintained that such a policy would lead to a higher household DTI ratio and thereby increase the risks associated with household debt. A minority of the Riksbank's executive board has argued that the beneficial impact of a higher policy rate and tighter monetary policy on any risks associated with household debt in Sweden is too small to compare with the costs of the resulting too-low inflation and too-high unemployment.[1] The question is: who is right, the majority or the minority?

The Riksbank's leaning against the wind was undertaken without presenting any previous supportive analysis of the impact of monetary policy on household debt and on any risks associated with it. In response to this, I have recently undertaken such an analysis of the impact on household mortgages in Svensson (2013b).

A higher policy rate has, all else equal, a negative impact on housing prices and nominal mortgage debt, as well as on the price level and nominal disposable income. Real debt is the ratio between nominal debt and the price level. The DTI ratio is the ratio between nominal debt and nominal income. Since a higher policy rate has a negative impact on both numerator and denominator of both real debt and the DTI ratio, a priori it is likely that the impact of a higher policy rate on these ratios is small. Furthermore, a priori it is not obvious whether the impact on the ratios will be positive or negative. That depends on the policy rate's relative impact on the numerator and the denominator.

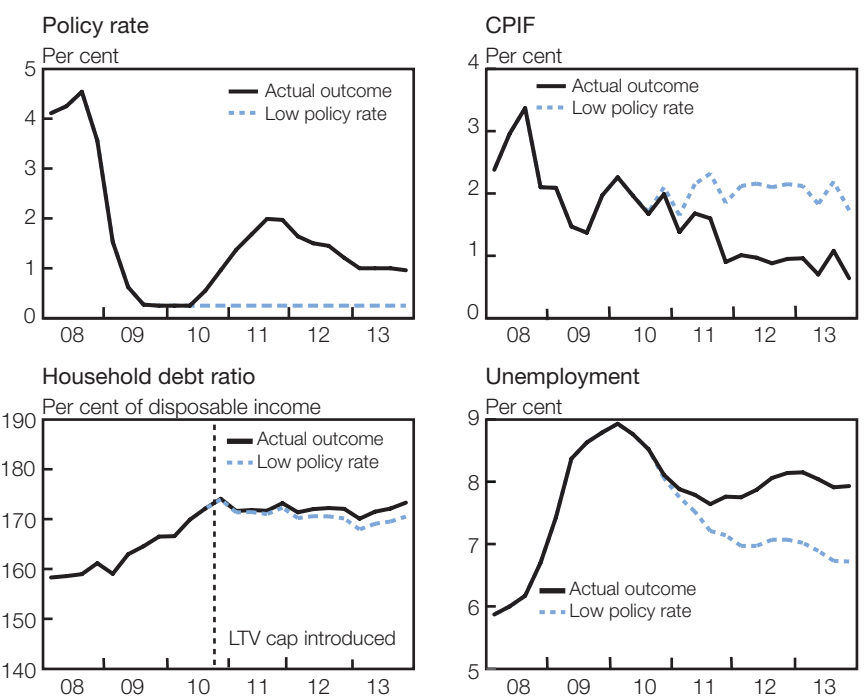
Svensson (2013b) shows that under assumptions that are realistic for Sweden, the policy rate is likely to have a slower impact on nominal debt than on the price level and nominal disposable income.[2] The main reason is that only a fraction of the mortgage stock is turned over each year. In Sweden, the average loan length of a mortgage is about seven years, and there is little amortisation of debt during the length of the loans. This means

that nominal debt is quite sticky. As a result, a higher policy rate is more likely to increase real debt and the DTI ratio than to decrease them. In any case, the impact on real debt and the DTI ratio is likely to be small. Furthermore, the long-run impact of the policy rate on the ratios is likely to be zero, since these ratios between nominal variables are real variables on which monetary policy normally has no long-run effect.

4. A counterfactual experiment

In order to summarise the effects of the Riksbank's leaning against the wind, I have used the Riksbank's main dynamic stochastic general equilibrium (DSGE) model, Ramses, to conduct a counterfactual experiment. This experiment compares the actual outcome for inflation and unemployment to the outcome if policy had been easier (Svensson 2014a). Furthermore, I have combined this with the results of Svensson (2013b) on the impact of the policy rate on the DTI ratio in order to compare the actual and counterfactual outcome for the household DTI ratio. The results are shown in Figure 2.

Figure 2: Actual and counterfactual outcome for the policy rate, inflation, unemployment, and the household DTI ratio



Source: Svensson (2014a)

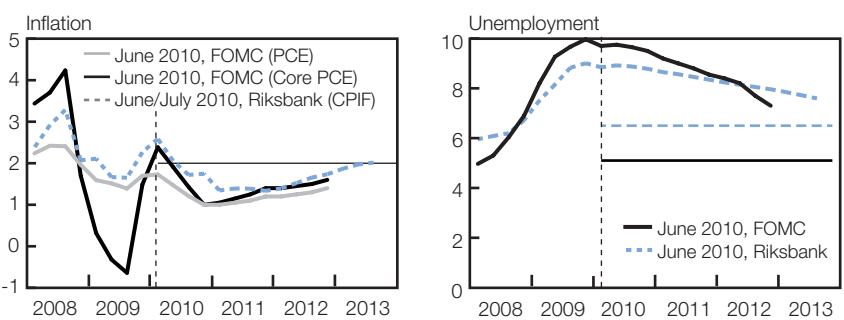
The black solid lines show the actual outcome for the policy rate, the CPIF inflation rate, the unemployment rate and the household DTI ratio.[3] The vertical dashed line in the panel for the DTI ratio marks the month, October 2010, when the LTV cap of 85 per cent was introduced.

The blue dashed lines show the counterfactual outcome: the outcome if the policy rate had been kept constant at 0,25 per cent from the summer 2010. CPIF inflation would have stayed very close to the target of 2 per cent, and unemployment might have been about 1,2 percentage points lower. Furthermore, the DTI ratio might have been a bit lower, around 170 per cent of disposable income instead of around 173 per cent, since nominal disposable income might have increased a bit more than the stock of nominal debt. However, the difference in the DTI ratio is in any case too small to have any impact on any risks associated with it.

5. A premature exit

The above counterfactual experiment and Figure 2 give an example of the evaluation of monetary policy ex post, that is, after the fact. However, it is arguably more relevant to evaluate monetary policy ex ante, that is, in real time, taking into account only the information available at the time of the decision.[4] In this case, it is the information available in June 2010, when the decision to start raising the policy rate was taken. Figure 3 summarises this information in the form of the Riksbank forecasts in June 2010 for the CPIF inflation rate and the unemployment rate. As a comparison, the United States Federal Reserve's Federal Open Market Committee (FOMC) forecasts in June 2010 for personal the consumption expenditure (PCE) inflation and core PCE inflation rates and for the unemployment rate are also shown (see Svensson 2011 for details).

Figure 3: Inflation and unemployment forecasts in June 2010 of the Riksbank and the United States Federal Reserve



Source: Svensson (2011)

The blue dashed line in the left panel shows the Riksbank's inflation forecast. The black and grey solid lines show the FOMC's PCE and core PCE inflation forecast respectively (the median of the FOMC participants' forecasts in the FOMC's Summary of Economic Projections). We see that both central banks' inflation forecasts were below the target (the explicit target of 2 per cent for the Riksbank and the widely understood implicit target of 2 per cent for the Federal Reserve).

The right panel shows the Riksbank's and the FOMC's forecast for the unemployment rate. The horizontal blue dashed and black solid lines show the Riksbank's and the FOMC's estimate of the long-run sustainable unemployment rate at the time. We see that both central banks' unemployment forecasts were significantly above the long-run sustainable rate.

The Riksbank and FOMC forecasts were thus quite similar. The low inflation forecasts and high unemployment forecasts clearly justified easier policy, if possible, for both central banks. Indeed, the FOMC continued to keep the federal funds rate between 0 per cent and 0,25 per cent, and started to prepare easier policy in the form of QE2 (the second round of quantitative easing). But, in contrast, the Riksbank started to raise the policy rate. Such a policy was thus hardly justified by the information available at the time on the outlook for inflation and unemployment.

Thus, from both an ex ante and an ex post point of view, it seems clear that the Riksbank's exit from the low policy rate was premature.

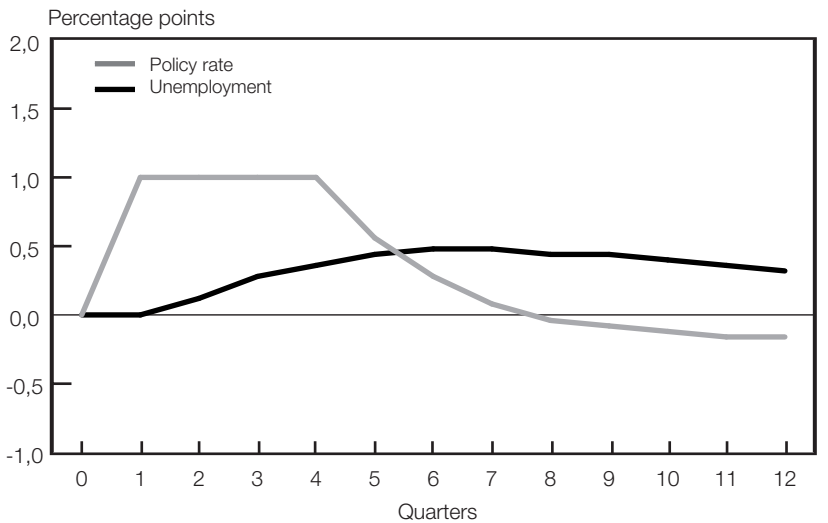
6. The Riksbank's recent estimates

As mentioned, the Riksbank's leaning against the wind was undertaken without any previous supportive analysis of the impact of monetary policy on any risks associated with household debt. Recently, however, the Riksbank (Sveriges Riksbank 2014a) presented its own estimates of the impact of the policy rate on household real debt and the DTI ratio. The Riksbank also regularly publishes, in its *Monetary Policy Report*, its estimates of the impact of alternative policy-rate paths on inflation and unemployment (Sveriges Riksbank 2014b). This makes it possible to assess the relative costs and benefits of the Riksbank's leaning against the wind, using the Riksbank's own estimated numbers.

7. The cost of a higher policy rate

A higher policy rate results in higher unemployment. According to Sveriges Riksbank (2014b, figures 2:13 and 2:15), a 1-percentage-point higher policy rate during four quarters (the grey line in Figure 4) leads to about a 0,5-percentage-point higher unemployment rate during the next few years (the black line in Figure 4).[5] This represents the *cost* of a higher policy rate, to be compared with any benefits of a higher policy rate.

Figure 4: Effect on the unemployment rate of a 1-percentage-point higher policy rate during four quarters



Source: Sveriges Riksbank (2014b)

8. The benefits of a higher policy rate

A higher policy rate might reduce household indebtedness. The reduced indebtedness might lower the *probability* of a future crisis, with its associated bad macroeconomic outcome with low inflation and high unemployment. The reduced indebtedness might also, conditional on a crisis occurring, reduce the *severity* of a crisis – for instance, reduce the increase in unemployment. The reduced probability of a crisis and the reduced severity of a crisis constitute the *benefits* of a higher policy rate.

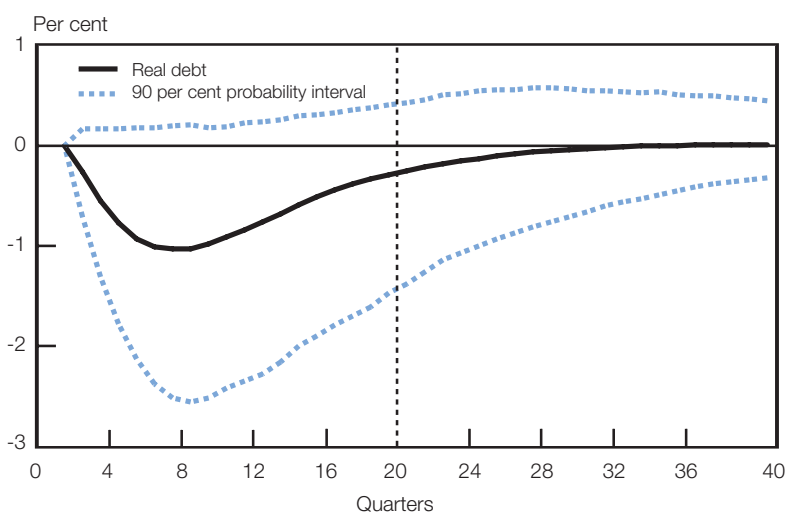
What then are the benefits of a higher policy rate, according to the Riksbank's own estimates?

8.1 How does a higher policy rate affect the probability of a crisis?

So, what is the effect of a higher policy rate on the probability of a crisis? First, regarding the probability of a crisis, Sveriges Riksbank (2013) refers to Schularick and Taylor (2012). According to that paper, lower growth of real debt over a 5-year period reduces the probability of a crisis occurring. More precisely, a 1-percentage-point lower annual growth of real debt for five years (that is, 5 per cent lower real debt in five years) would, everything else equal, reduce the probability of a crisis by 0,4 percentage points.[6]

Second, according to the Riksbank's own estimate, a 1-percentage-point higher policy rate during four quarters results in 0,25 per cent lower real debt in five years (the black line in Figure 5 for quarter 20).[7]

Figure 5: Effect on real household debt of a 1-percentage-point higher policy rate during four quarters



Source: Sveriges Riksbank (2014a)

Altogether, this would thus imply a reduction of the probability of a crisis by 0,25*0,4/5 = 0,02 percentage points. This is, of course, an insignificant reduction of the risk.[8]

The benefit of a lower probability of a crisis can be expressed in terms of lower unemployment, if one makes an assumption of how much higher unemployment would be in a crisis. Sveriges Riksbank (2013, figure A10) assumes a crisis scenario where the unemployment rate becomes about 5 per cent higher. I will use that assumption.

If the probability of a crisis falls by 0,02 percentage points, that is, by 0,0002, the expected future unemployment rate will then fall by 0,0002*5 = 0,001 percentage points. This is thus the benefit expressed in terms of lower expected future unemployment because of a lower probability of a crisis. It is obviously miniscule relative to the cost of a 0,5-percentage-point higher unemployment during the next few years.

The benefit of a higher policy rate, in the form of a reduced probability of a crisis and thereby lower expected future unemployment, is thus completely insignificant compared to the cost in the form of a 0,5-percentage-point higher unemployment rate over the next few years.

Furthermore, in the long run, as is seen in Figure 5, the policy rate has no effect on real debt and thus, according to the Riksbank's estimates, no effect on any long-run risks associated with real debt.

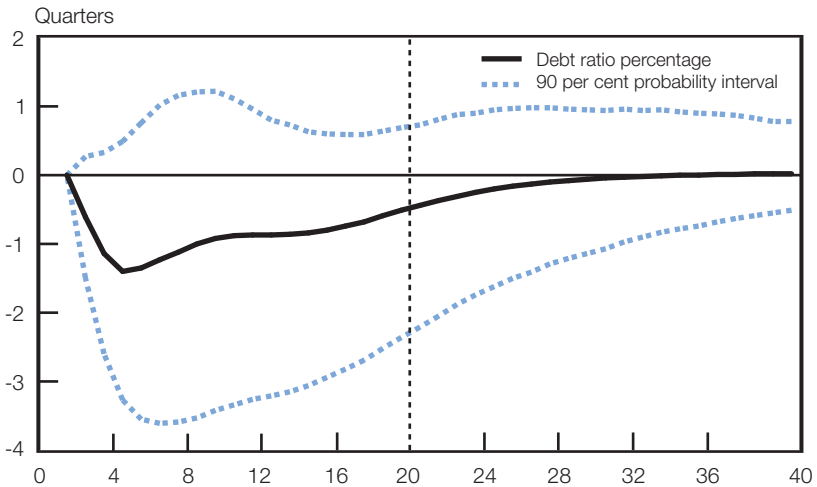
8.2 How does a higher policy rate affect the severity of a crisis?

But what is the effect of a higher policy rate on the *severity* of a crisis? First, according to a note by Riksbank Deputy Governor Martin Flodén (2014, Table 1, Column 2), a 1-percentage-point lower DTI ratio might, all else equal, result in the increase in the unemployment rate in a crisis being 0,02 percentage points lower.

Second, according to Sveriges Riksbank (2014a, Figure A22), a 1-percentage-point higher policy rate during four quarters would lead to a 0,44-percentage-point lower DTI ratio in five years (the black line in Figure 6 for 20 quarters).[9]

Altogether, this means that the increase in the unemployment rate might be 0,44*0,02 = 0,009 percentage points lower, if the crisis occurs in five years. If the crisis occurs with the probability 4 per cent (the average probability of a crisis according to Schularick and Taylor (2012), corresponding to a crisis, on average, every 25 years), the expected lower increase in unemployment is only 1/25 of 0,009 percentage points. It is clearly completely insignificant.

Figure 6: Effect on household DTI ratio of a 1-percentage-point higher policy rate during four quarters



Source: Sveriges Riksbank (2014a)

If we instead assume as high a risk as 10 per cent, corresponding to a crisis every 10 years, the expected lower increase in unemployment is only 0,0009 percentage points. This is still completely insignificant.

Furthermore, in the long run, as can be seen in Figure 6, the policy rate has no effect on the DTI ratio and thus, according to the Riksbank's estimates, has no effect on any long-run risks associated with the DTI ratio.

9. Adding up

Adding up the two benefits of a higher policy rate, in terms of a lower probability of a crisis and a less severe crisis we get an expected lower future unemployment rate of 0,001 + 0,0009 = 0,0019 percentage points (where I have used the higher probability of a crisis: 10 per cent). This is, of course, completely insignificant in comparison with the cost of a higher policy rate: 0,5 percentages points higher unemployment during the next few years. The benefit is only about 0,4 per cent of the cost, instead of the more than 100 per cent required to justify the policy of leaning against the wind.

The cost and benefits expressed in unemployment are summarised in Table 1. Clearly, presumption (2) does not apply for Sweden.

Table 1: Cost and benefit in unemployment of a 1-percentage-point higher policy rate during four quarters

Cost: higher unemployment during the next few years, percentage points	0,5
Benefit: lower expected future unemployment, percentage points	
1. Because of lower probability of a crisis	0,001
2. Because of a smaller increase in unemployment in a crisis.....	0,0009
Total benefit, percentage points.....	0,0019
Total benefit as a share of the cost	0,0038

Furthermore, as noted, the Riksbank's estimates are not statistically significant. Also, as discussed in Svensson (2014b), there are reasons to believe that the vector-auto-regression (VAR) model used is misspecified. A more thorough empirical study is necessary to judge whether leaning against the wind might make real debt and the DTI ratio actually increase rather than decrease, as under the assumptions in Svensson (2013b).

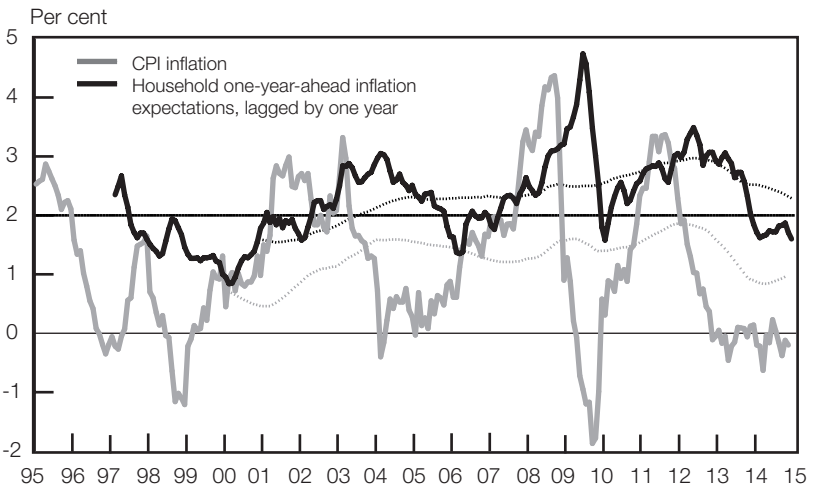
10. The effect of inflation below expectations

However, both the Riksbank's estimates in Sveriges Riksbank (2014b) and my discussion in Svensson (2013b) disregard the effect on real debt of low inflation falling substantially below household expectations during the past few years. This effect increases the cost of leaning against the wind.

Figure 7 shows households' expectations of inflation for the next year, lagged one year (the black solid line), and annual CPI inflation (the gray solid line). Thus, the gap between the grey and the black solid lines shows by how much actual inflation has deviated from previously held expectations.

Actual inflation has indeed fallen much below household expectations. This means that the real value of any given nominal debt has become higher than households have expected.

Figure 7: Household one-year-ahead inflation expectations, lagged one year and CPI inflation

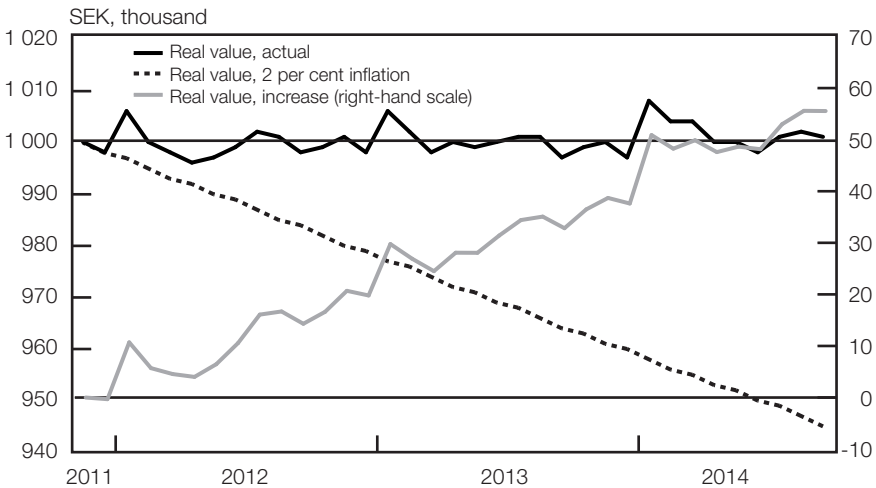


Sources: National Institute of Economic Research and Statistics Sweden

Note: The black solid line shows 3-month moving averages of household expectations of inflation the next year lagged by one year. The dashed lines are trailing five-year moving averages of housheld expectations and CPI inflation.

Figure 8 shows the real value of a given loan of SEK 1 million taken out in November 2011. The black dashed line shows the real value of the loan if inflation had been 2 per cent. In September 2014, the real value would then have fallen to SEK 945 000. The black solid line shows the actual real value of the loan. Since inflation has been close to zero, the real value of the loan in September 2014 remains at SEK 1 million. The grey line shows the difference between the black solid and dashed lines: the increase in the real value of debt due to actual inflation falling below 2 per cent. The real value is SEK 55 000 higher in September 2014.

Figure 8: Real value of SEK 1 million loan taken out in November 2011, actual and for 2 per cent inflation

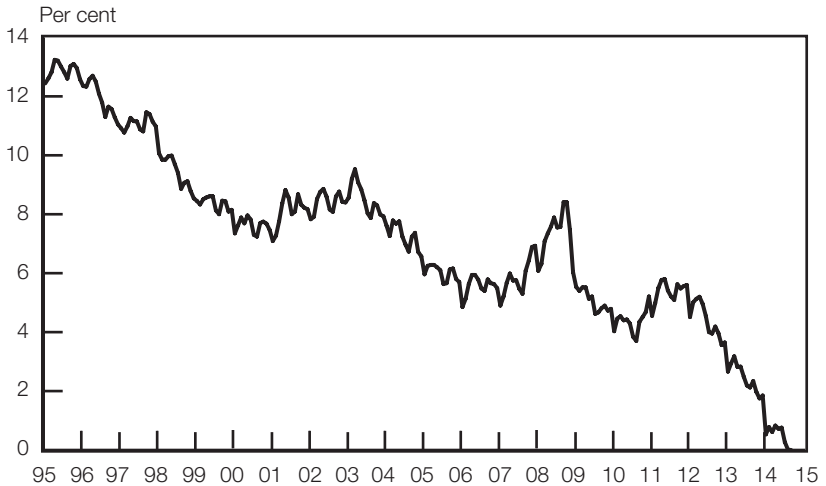


This means that the real value of nominal debt has become higher than expected and planned for. The real value of any mortgage that is close to three years old has become almost 6 per cent larger, compared to if inflation had equalled 2 per cent (Svensson 2013a). This is a substantial effect on the real debt – much larger than the one discussed above.

This almost 6 per cent increase in real debt in less than three years can be compared with the Riksbank's estimated reduction in real debt of 0,25 per cent in five years in Figure 2. It is almost 24 times larger in magnitude and of the opposite sign. Using the estimates of Schularick and Taylor (2012), it would lead to an increase in the probability of a crisis of more than 0,4 percentage points, compared with the reduction in the probability of a crisis of 0,02 percentage points. Using the Riksbank assumption of a 5-percentage-points higher unemployment rate in a crisis, it implies an increase in the expected future unemployment rate of more than 0,02 percentage points, compared with the reduction of 0,001 percentage points. Fortunately, an increase in the expected future unemployment rate of 0,02 percentage points is still a small number.

Figure 9 shows, for each date a given nominal loan is taken out, the percentage increase in the actual real value to September 2014, relative to if inflation had been 2 per cent. We see that the real value of a loan taken out in the fall of 2011 has increased almost 6 per cent, in line with the above detailed example. The real value of a loan taken out in 2002 has increased by more than 8 per cent due to average inflation having been below 2 per cent.

Figure 9: Increase to September 2014 in the real value of a given nominal loan, compared to if inflation had been 2 per cent



11. Conclusion

According to the Riksbank's own estimates, monetary policy has a very small effect on any risks associated with household indebtedness. Compared to the large costs of too-high unemployment and too-low inflation, the possible benefit of leaning against the wind is, according to these estimates, completely insignificant.

Furthermore, because the Riksbank's leaning against the wind has led to inflation much below household inflation expectations over the past few years, the real value of nominal debt has become higher than expected and planned for. The real value of any mortgage that is about three years old has become almost 6 per cent larger, compared to if inflation had equalled 2 per cent. This is a much larger effect on real debt than the ones that follow from the Riksbank's estimates. Given this effect, Riksbank policy has almost certainly increased real debt and actually been counterproductive; the Riksbank has consequently made any problem and risks with household indebtedness worse.

Thus, if the purpose is to limit household debt, leaning against the wind does not seem to be an effective policy – definitely not in Sweden. Macroprudential policies are more effective – definitely so in Sweden. As discussed above, Finansinspektionen and the government have used several

effective macroprudential tools, and since August 2013 Sweden has a new strengthened framework for financial stability, with Finansinspektionen having the main responsibility and being accountable for financial stability. It then seems clear that monetary policy in Sweden should definitely not lean against the wind, but focus on stabilising inflation around the inflation target and unemployment around a long-run sustainable rate.

As for other economies, it would seem unlikely that conditions would be such that the policy rate would be an effective measure to affect household indebtedness and manage any risks associated with this. Macroprudential policies are most likely the only effective way to materially affect household debt and manage any associated risks.

Notes

[1] During my six-year term as a Deputy Governor of Sveriges Riksbank and member of the executive board, which ended in May 2013, I belonged to that minority and dissented in favour of easier monetary policy.

[2] See Svensson (2013b) for details. The assumptions are: (1) new mortgages have a constant LTV ratio of 70 per cent (the average LTV ratio for mortgages in Sweden in the past few years); (2) mortgages are refinanced every seven years (the average loan length of mortgages in Sweden); and (3) mortgages are kept constant until refinanced (consistent with current amortisation behaviour in Sweden). As a result, only a seventh of the mortgages are turned over each year, resulting in the stock of mortgages being sticky and adjusting very slowly. Furthermore, for simplicity, (4) the stock of housing and the number of borrowers is assumed to be constant. In reality, there has been little construction of new housing, but the share of housing owned and the number of borrowers has increased considerably. This trend may not continue in the future, though.

[3] CPIF inflation is consumer price index (CPI) inflation calculated with constant mortgage rates. This excludes the direct effect of changing the policy rates on CPI inflation through the effect of changing mortgage rates. The Riksbank's inflation target applies to CPI inflation, but the Riksbank used CPIF inflation to guide its policy.

[4] See Svensson (2012) for more on the evaluation of monetary policy.

[5] The figure is constructed from the numerical data for Sveriges Riksbank (2014b, figures 2:13 and 2:15), available at www.riksbank.se. The effect on the unemployment rate of a 0,25-percentage-point higher policy rate during four quarters has been multiplied by 4 to correspond to the effect of a 1-percentage-point higher policy rate during four quarters.

[6] See Table 3, Sum of lag coefficients, Column (1) to (3), in Schularick and Taylor (2012). I believe the coefficient 0,4 might be too high because data for a

number of reasonable control variables are not available. A lower coefficient would result in an even less effect of the policy rate on the probability of a crisis.

[7] The figure uses the numerical data for Sveriges Riksbank (2014a, Figure A20) with the opposite sign. We see from the blue dashed lines that a 90 per cent probability interval is not below the zero line, so the effect on real debt is not statistically significantly different from zero, and it may be positive. The policy rate behind figures 5 and 6 returns to zero after four quarters somewhat quicker than in Figure 4, but this does not affect the conclusions.

[8] According to Schularick and Taylor (2012), the average probability of a crisis is almost 4 per cent (per year). A probability of 4 per cent then corresponds to a crisis on average every 25th year. A reduction of the probability by 0,02 percentage points to 3,98 per cent means that the average time between crises increases by 1,5 months to 25 years and 1,5 months. This is hardly a big increase.

[9] As noted in Svensson (2014b) and can be seen from the blue dashed lines in Figure 5, the change in the DTI ratio is not statistically significant from zero, and it cannot be excluded that it has the opposite sign.

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Emerging economies: developments and challenges

Vivek Arora[1]

Abstract

The paper will discuss recent macroeconomic and financial developments in key emerging economies, policy responses, and key risks and vulnerabilities. In particular, it will discuss the disconnect between downward revisions in growth prospects on the one hand and elevated capital flows on the other hand, and the implications of this disconnect for macroeconomic and financial risks. The paper will also discuss the differentiation that exists across emerging markets in terms of policy buffers and available policy space, and on this basis draw policy conclusions for macroeconomic and prudential policies.

1. Context

The starting point of the paper is a key question that policymakers in emerging economies face today: how to handle immediate macroeconomic policy challenges while also preparing for a potential re-emergence of global market volatility that can hit emerging economies. Such volatility could be triggered by a variety of factors that are not difficult to imagine, such as shocks that occur during the normalisation of United States (US) monetary policy as the US Federal Reserve begins to raise interest rates, geopolitical tensions, revisions in market expectations of emerging economy fundamentals, or events in emerging economies themselves.

The volatility associated with the May 2013 'taper tantrum' is an example of the kind of risk that might materialise, and its lessons are informative. In this context, the paper discusses recent macroeconomic policy developments and challenges across emerging economies, both under inflation targeting and otherwise. The cross-country perspective may be useful for policymakers as they deliberate on circumstances in their specific countries.

The paper makes four main points:

- First, the market volatility of 2013 was followed during most of 2014 by a resurgence of capital inflows and asset prices in emerging economies. However, this resurgence is difficult to ascribe to an improvement in emerging economy fundamentals and growth prospects, which have not strengthened commensurately; growth prospects might even have weakened slightly. The rise in capital inflows and asset prices therefore poses risks in terms of potential reversals.

- Second, emerging economies' policies since the May 2013 taper tantrum have generally moved in the right direction. Monetary policy and exchange-rate flexibility have played a key role, and some progress has been made towards rebuilding external buffers and addressing vulnerabilities. But challenges remain: notably, in several countries output gaps are low or negative but, even so, inflation is elevated, posing a dilemma for policymakers, and external and fiscal deficits have been slow to adjust.

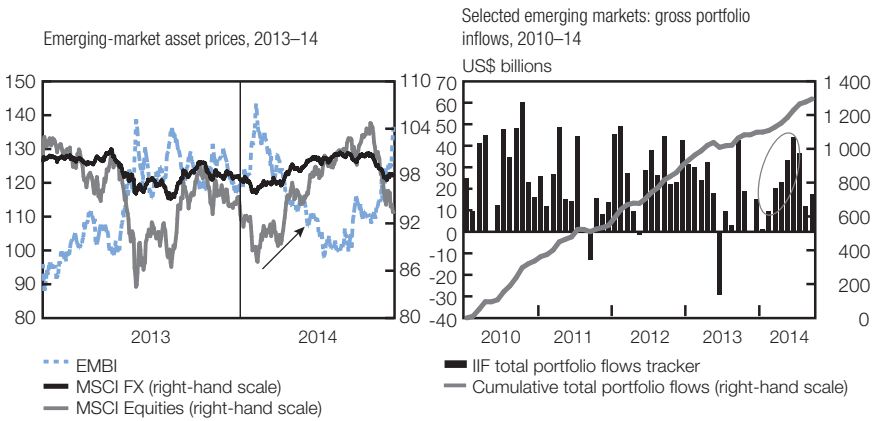
- Third, gross domestic product (GDP) growth for emerging economies as a whole is projected to pick up in 2015, but the pickup is likely to be weaker than previously expected and, as noted, is subject to downside risks. Moreover, the medium-term outlook for emerging economies has also weakened, reflecting a lower assessment of potential growth than before. The latter observation points to the importance of structural reforms to boost supply potential in many economies.

- Finally, the task for emerging economy policymakers is a challenging one because it involves particularly difficult tradeoffs at the present juncture. Policymakers need to support growth, manage inflation and strengthen resilience to shocks, which are difficult to handle all at once because the imperatives can pull in different directions. Managing inflation and strengthening resilience, for example, can call for a different policy stance than the stance that is helpful for short-term growth. Where the balance should lie depends very much on country-specific circumstances. But the severity of the tradeoffs can be eased by strengthening the credibility and coherence of policy frameworks, building adequate buffers and making decisive progress with structural reforms. Structural reforms would both help raise potential growth and, by making the real economy more flexible and resilient, reduce the need to place an undue burden on macroeconomic policy for responding to shocks.

2. Disparity between financial flows and real developments

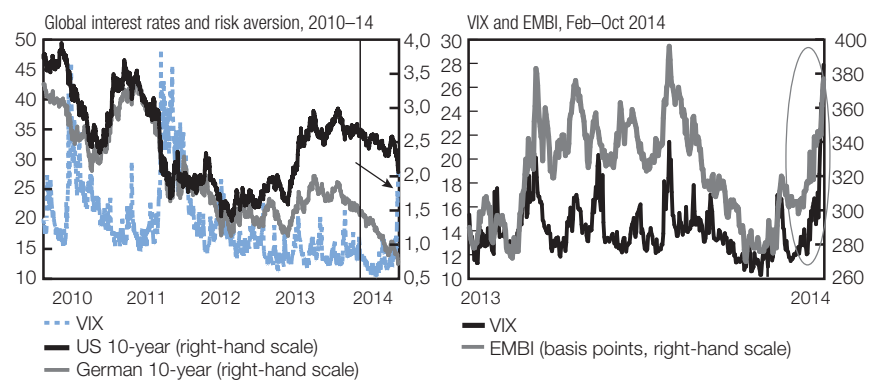
After some weakening early in the year, emerging-market capital flows and asset prices recovered strongly and, despite some temporary jitters in October, remained strong through late 2014. Bond spreads, measured by the Emerging Market Bond Index (EMBI), have narrowed, equity prices increased during the period March–October 2014 and currencies strengthened (Figure 1). These developments mirror those in portfolio inflows to emerging economies. The strength in asset prices and capital flows has been supported by global financial conditions, which have eased since early 2014 but exhibited some volatility in October.

Figure 1: Emerging-market asset prices and capital flows have resumed since early 2014



Sources: Bloomberg, IIF Portfolio Flows Tracker, IFS and IMF staff calculations
Note: Selected emerging markets include India, Indonesia, Malaysia, Thailand, Brazil, Chile, Mexico, Peru, Hungary, Poland, South Africa and Turkey. Data through September 2014.

Figure 2: Global financial conditions have remained accommodative



Sources: Bloomberg and IMF staff calculations

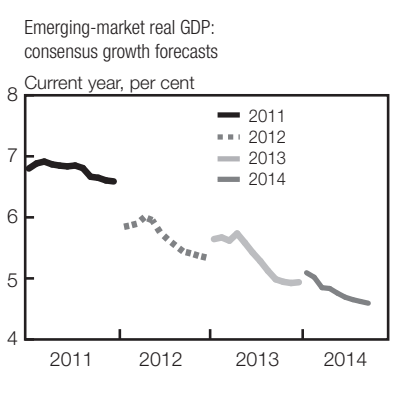
Emerging economy growth prospects do not, however, appear to be the foundation for the rising capital flows and asset prices. A striking aspect of growth forecasts in recent years has, in fact, been the steady downward revisions over time. The market consensus forecasts, for example, have been steadily marked down as the year has progressed; in 2014, for example, average emerging-market growth was projected at 5 per cent in January but had fallen to 4½ per cent by September (Figure 3). The same pattern can be observed in previous years. Over the years, near- and medium-term growth forecasts have also been steadily marked down, and growth has turned out

to be weaker than initially expected. In April 2009, for example, emerging economy growth was projected to rise to nearly 7 per cent on average by 2013, but this expectation was steadily marked down in successive vintages of consensus forecasts and the *World Economic Outlook*, and the eventual outturn was under 5 per cent.

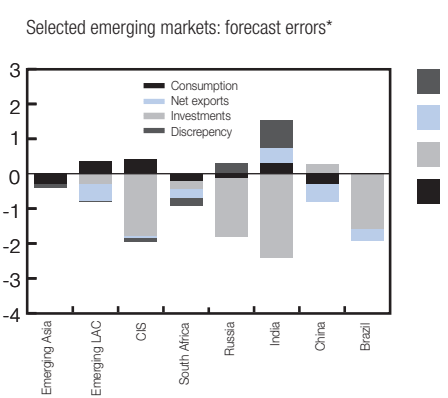
It is difficult to pinpoint a single reason for these downward revisions in the growth outlook, seemingly owing to a combination of external and domestic factors, including the effects of a weaker-than-expected global economy on emerging-market exports, updates to recognise actual outcomes that are weaker than expected, a reassessment by investors of the strength of emerging-market policies and fundamentals, and the recognition of structural constraints on growth such as infrastructure needs.

The component of growth that has accounted for most of the downward growth revisions in many countries, albeit not in South Africa, is investment. The reasons for the markdown in investment projections vary across countries, but it is possible that it partly reflects a weakening of expected returns as *medium-term* growth expectations and assessments of potential growth have also come down.

Figure 3: Emerging-market growth forecasts have been steadily marked down, particularly the investment component



Source: Consensus Economics



*Commonwealth of Independent States (CIS), excluding Russia; emerging markets in Latin America and the Caribbean (LAC) include Argentina, Chile, Colombia, Mexico, Peru and Venezuela; emerging markets in Asia include Indonesia, Malaysia, Phillipines and Thailand.

Source: IMF *World Economic Outlook*

While the resurgence in emerging-market capital flows and asset prices in recent quarters does not reflect a corresponding strengthening in growth

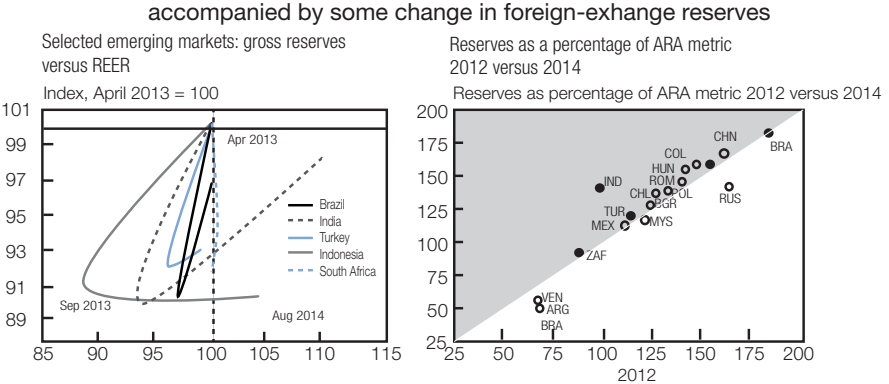
prospects, there is a risk that some of the resurgence may prove to be temporary and its unwinding may contribute to macroeconomic and financial volatility. The question this leads to is how policymakers should prepare for such an unwinding of capital flows and asset prices, and an attendant pickup in volatility.

3. Diverse responses to shocks

In discussing how best to prepare for future shocks, it is instructive first to look at how policymakers have responded to similar shocks in the recent past, particularly starting with the taper tantrum of 2013.[2] In general, policies have adjusted appropriately and the experience provides a useful basis for formulating a strategy for the future.

Emerging economies have relied substantially, and appropriately, on letting *exchange rates* adjust to provide a cushion against shocks. In the five countries that faced particularly severe market pressures during the taper tantrum (Brazil, India, Indonesia, South Africa and Turkey), exchange rates depreciated sharply, with the real effective exchange rate falling by about 10 per cent on average during the period May–September 2013. *Reserves* also fell, except in South Africa, partly reflecting central banks' efforts to smooth excessive exchange-rate volatility. After the episode, exchange rates recovered in most countries and reserves increased. A similar story played out in subsequent episodes. It is notable that an exchange-rate adjustment was accompanied in most cases, including in several inflation-targeting economies, by changes in reserves, both on the way down to avoid excessive volatility or depreciation, and on the way up to rebuild buffers.

Figure 4: Exchange-rate flexibility has helped cushion shocks, accompanied by some change in foreign-exhange reserves



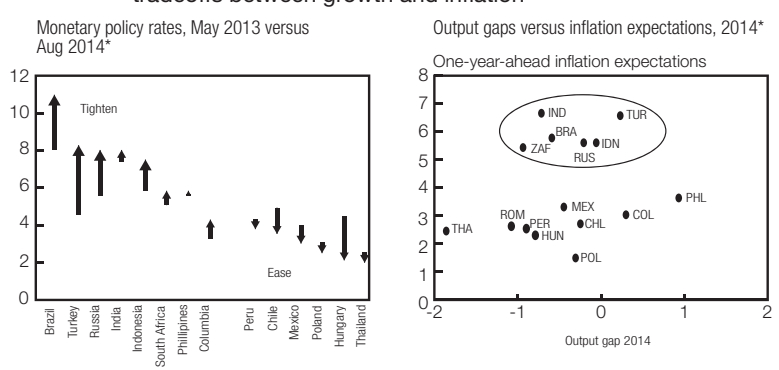
*Reserves exclude gold and assets from Sovereign Wealth Funds

Sources: National authorities, IMF *World Economic Outlook* and IMF staff calculations

More generally, emerging economies, including inflation targeters, have built up reserves in recent years. The International Monetary Fund (IMF) staff has developed a reserve-adequacy metric, which compares reserves against a composite of key variables that are often relevant for assessing reserve adequacy (broad money, short-term debt, trade, and portfolio liabilities).[3] Reserves in the 100 per cent to 150 per cent range relative to this metric could be considered 'adequate' in the sense of having been sufficient to deal with a range of capital-account shocks in the past. On this basis, most emerging economies' reserves would appear to be generally adequate and, moreover, to have increased between 2012 and 2014 (with the exception of Argentina, Russia and Venezuela, which have faced unusual circumstances in recent years).

Monetary policy responses over the past year or so have varied. Several emerging economy central banks have raised *policy interest rates* in response to elevated inflation pressures (including Brazil, Colombia, India, Indonesia, Russia, South Africa and Turkey), while in several others inflation was contained and provided scope to lower rates (Chile, Hungary, Mexico, Peru, Poland and Thailand) (Figure 5). In both sets of countries, the moves generally went in the right direction, with the prevailing policy rates being below the 'neutral' rate (as measured by inflation expectations plus potential growth or by a Taylor rule) in most of the countries that raised rates, and being above neutral in those that lowered them.

Figure 5: Monetary policy has moved in the right direction based on countries' cyclical circumstances, but some emerging markets face difficult tradeoffs between growth and inflation



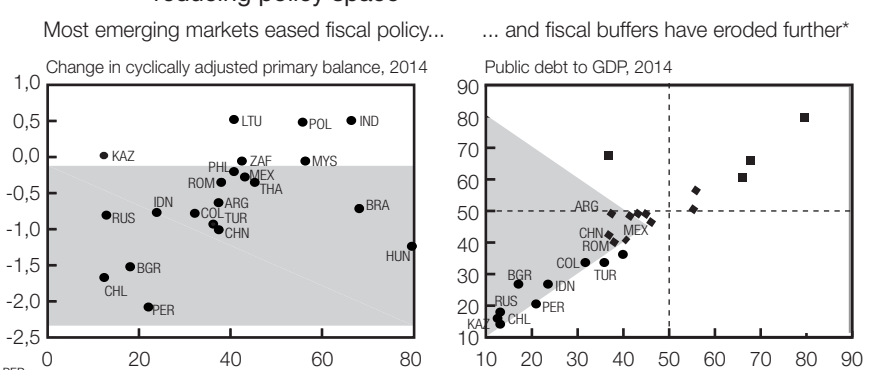
*Includes emerging markets that target inflation. Consensus forecast for one-year-ahead inflation.

Sources: National authorities, Consensus Economics, IMF *World Economic Outlook* and IMF staff calculations

But, overall, several of the larger emerging economies face a macroeconomic policy dilemma. The right-hand panel of Figure 5 plots the output gap (actual minus potential output) on the horizontal axis and inflation expectations on the vertical axis. The northwest quadrant shows countries that have a low or negative output gap but relatively high inflation expectations. They include several major emerging economies, including Brazil, India, Indonesia, Russia and South Africa. The implication is that central banks in these countries may have little room to ease monetary policy if they are to remain consistent with their inflation objectives.

Likewise, the scope for *fiscal policy* easing is limited in many countries by the fact that fiscal policy has already been eased somewhat since 2012 (Figure 6). In most emerging economies, the cyclically adjusted primary fiscal deficit increased during the period 2012–2014, as shown in the shaded area of the left-hand panel of Figure 6. Notable exceptions included India and South Africa, which have appropriately tightened fiscal policy given relatively high deficits to begin with. (The figure does not reflect the positive implications of South Africa's October 2014 *Medium Term Budget Policy Statement*.) While it is true that public debt remains moderate in most emerging economies, as shown in the right-hand panel of Figure 6, fiscal buffers to deal with future shocks are generally smaller than before and debt could rise further if growth were to slow sharply or contingent liabilities materialise.

Figure 6: Emerging markets have generally eased fiscal policy since 2012, reducing policy space

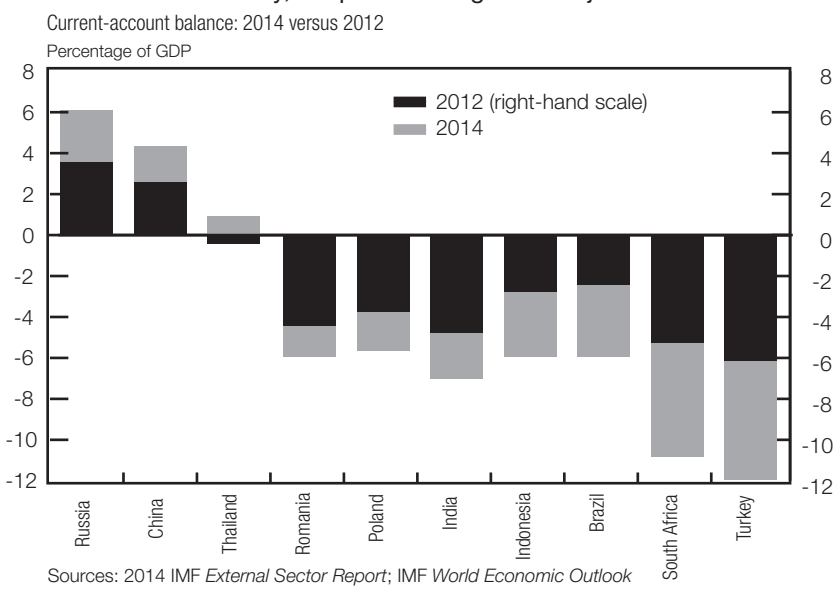


*Circles: public debt in 2014 below 40 per cent of GDP; Diamonds: between 40 and 60 per cent; Squares: above 60 per cent

Sources: IMF *World Economic Outlook* and IMF staff calculations

Consistent with the accommodative macroeconomic policy stances in many emerging economies, *current-account imbalances* have adjusted only moderately (Figure 7). During 2012–2014, current-account imbalances have narrowed somewhat, but progress has been mixed despite exchange-rate adjustments. The mixed progress owes in part to structural factors, such as labour and product-market frictions, that affect current accounts and whose effects are not easily overturned by exchange-rate changes. Trade balances are also affected by the terms of trade, and since 2012 falling commodity prices have benefited commodity importers (such as India, Mexico and Turkey) but contributed negatively to the trade balances of commodity exporters (such as Argentina, Brazil, Indonesia and South Africa). For commodity exporters, the challenge of reducing current-account imbalances is, therefore, made more difficult in an environment of lower commodity prices and will require stronger macroeconomic and structural efforts to keep inflation low and improve competitiveness.

Figure 7: External current-account balances have adjusted only moderately, despite exchange-rate adjustments

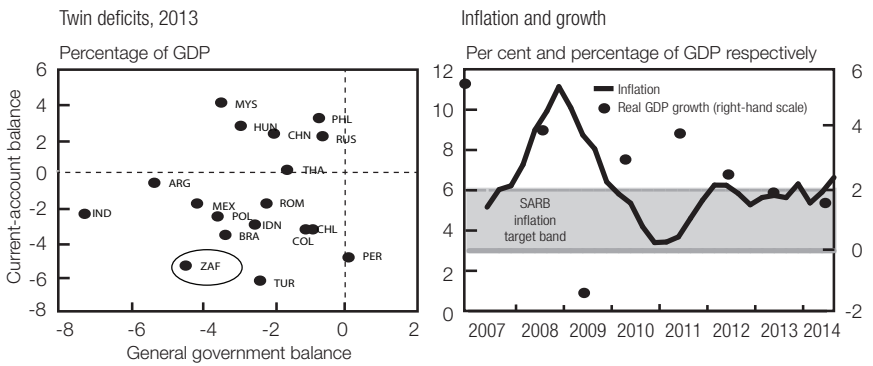


Sources: 2014 IMF *External Sector Report*; IMF *World Economic Outlook*

In South Africa, relatively low growth, high 'twin' deficits and elevated inflation in the recent period have tended to limit the scope for fiscal and monetary policy flexibility (Figure 8). A general government deficit near 4½ per cent of

GDP in 2013 and a current-account deficit near 5¾ per cent have limited the scope for a countercyclical policy response to negative shocks. Meanwhile, even though growth has been relatively low, inflation has been above the 3 to 6 per cent target range for much of 2014, in part owing to the rand depreciation, before falling just within the band in September. While wage settlements and electricity tariffs could pose risks to inflation going forward, the large reduction in oil prices since October that is expected to persist for some time represents a powerful moderating force.

Figure 8: South Africa's 'twin deficits' and elevated inflation have limited the scope for fiscal and monetary policy flexibility to respond to shocks

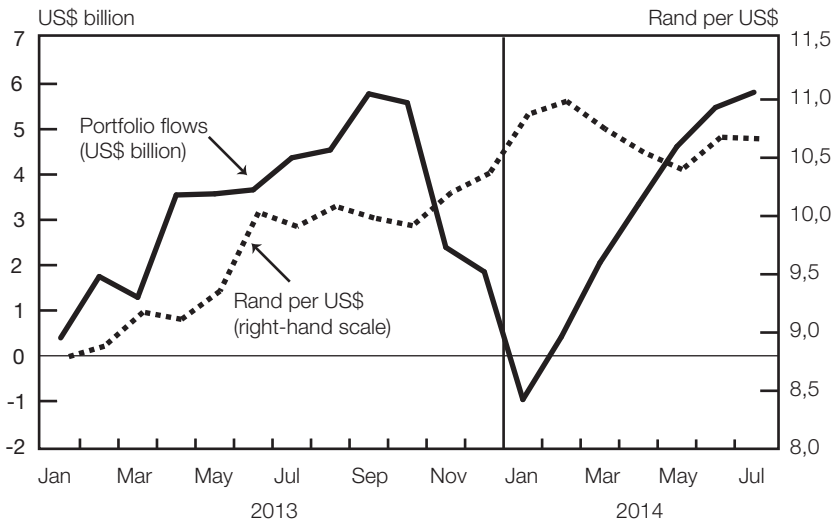


Sources: National authorities, IMF *World Economic Outlook* and IMF staff calculations
Domestic: Growth in emerging markets, REER misalignment, and domestic interest rates. External: growth in the US, US interest rates, the expansion in the US Fed's balance sheet, and global risk appetite. The unexplained residual totals US$550 billion during 2002–12

In dealing with shocks, South Africa is helped by one of the most flexible exchange-rate regimes among emerging-market peers. Exchange-rate flexibility has helped for managing the effects of capital flows during both normal times and surges in financial-market volatility. In 2013, South Africa was among the countries most severely affected during the period of emerging-market volatility, with portfolio flows falling particularly sharply (Figure 9). The flexible exchange rate has helped cushion the impact on the real economy and is considered by investors to be an important 'pull' factor that attracts capital flows to South Africa.

Figure 9: South Africa's flexible exchange rate is an important cushion against shocks

Portfolio flows and bilateral exchange rate, 2013–14



Note: Portfolio flow = bond (trading) + equity flows

Sources: Bloomberg and IMF staff calculations

4. Growth is projected to recover but remains subject to downside risks

Looking ahead, the outlook for emerging economies as a whole in the IMF's most recent *World Economic Outlook* (October 2014) is for growth to pick up in the near term, but by somewhat less than was expected only six months ago. Even so, it is subject to downside risks. The outlook for emerging-market growth is 4½ per cent in 2014 and 5 per cent in 2015, which reflects markdowns for most of the major emerging economies, with India being a notable exception (Table 1). The markdowns reflect a combination of weaker global prospects and recent emerging economy data. Moreover, the downward revision in emerging-market growth outlooks in recent years has mainly represented lower estimates of *potential* growth.

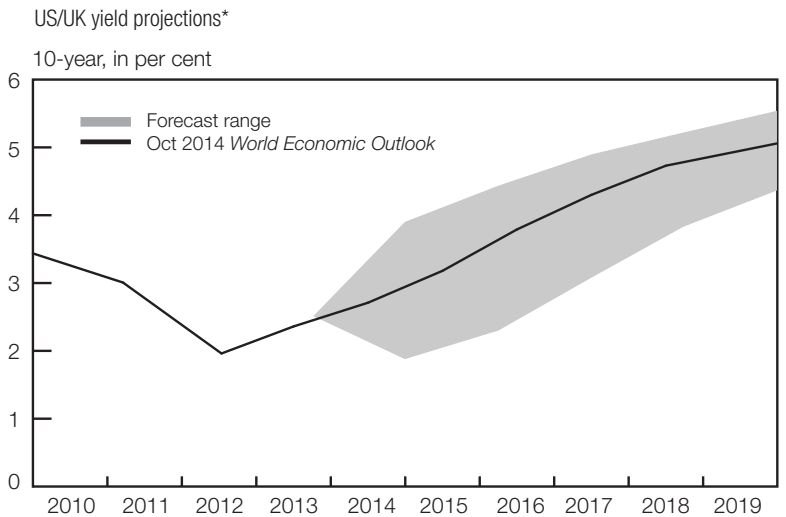
Table 1: World and emerging-market growth is projected to pick up in 2015, but less strongly than previously envisaged (IMF October 2014 *World Economic Outlook* projections)

	World	Emerging and developing economies	China	India	Russia	Brazil	South Africa
2014	3,4	4,5	7,4	5,6	0,2	0,3	1,4
Revisions from April 2014	-0,4	-0,4	-0,1	0,2	-1,1	-1,5	-0,9
2015	3,9	5,0	7,1	6,4	0,5	1,4	2,3
Revisions from April 2014	-0,2	-0,3	-0,2	0,0	-1,8	-1,3	-0,4

The outlook is subject to a range of downside risks, including the following risks that seem particularly relevant. First, the asynchronous recovery in the US compared with Europe and Japan, and the associated path of US monetary policy normalisation that will imply higher US long-term rates is associated with a wide range of potential outcomes (Figure 10). Some of these outcomes can include capital flow reversals and market corrections, of which the world got a taste in 2013. Second, geopolitical tensions can worsen, driving up risk aversion and leading to disruptions in trade and capital flows. Third, a sudden slowdown or financial-market disruptions in China could affect other countries through China's impact on commodity markets as well as the export supply chain of which China is a critical part. Fourth, domestic problems could arise in emerging economies from the effects of rising foreign exchange-denominated debt on corporate balance sheets, rising leverage in household balance sheets or volatility in local currency bond markets where a high degree of foreign participation is not matched by a deep domestic investor base.

Emerging economies are increasingly vulnerable to global shocks because they are more financially integrated with global markets than before and absorb a larger share of capital flows from advanced economies. As a result, correlations between emerging and advanced economy bond and equity prices have increased. Non-resident investors, meanwhile, account for a substantial share of local currency government bond markets in many countries: an average of 22 per cent (weighted by debt outstanding) in the 10 largest emerging economies, and well over 30 per cent in a few cases that include Mexico and South Africa.

Figure 10: US monetary policy normalisation can lead to a wide range of potential outcomes for long-term rates

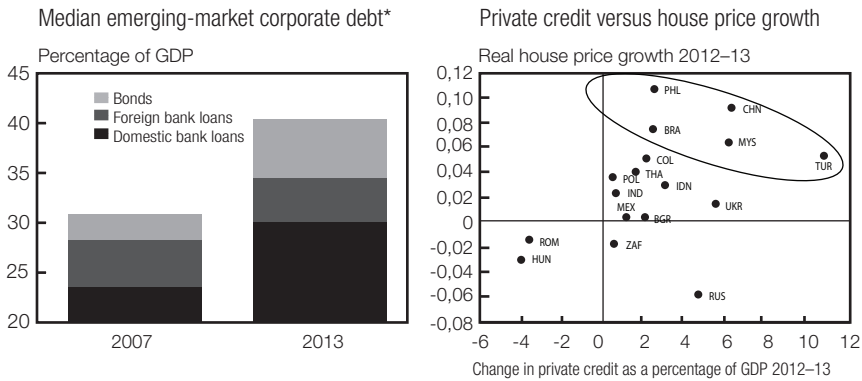


*Weighted average for United States and United Kingdom. Range based on *World Economic Outlook* forecasts since October 2009 used to measure +/-1 standard deviation.

Source: IMF *World Economic Outlook*

At the same time, there are also domestic risks, including risks from rising leverage in corporate and household balance sheets. Corporate debt in emerging economies as a whole has risen by more than 15 per cent of GDP since 2007 (Figure 11). The increase has been roughly evenly split between bank loans and (domestic and foreign) bond issuances. The high leverage makes corporate balance sheets more vulnerable to higher interest rates and the rising foreign-currency component makes them more vulnerable to exchange-rate shocks. Household leverage has also increased, with particularly rapid growth in house prices being fuelled by credit growth in several emerging economies (although not in South Africa).

Figure 11: Emerging-market corporate and household balance sheets show rising leverage



*Excludes some emerging-market European countries (Bulgaria, Hungary, Kazakhstan, Lithuania and Romania), where corporate debt has declined since the 2008–09 crisis

Sources: IMF *Global Financial Stability Report*, Fall 2014 and IMF staff calculations.

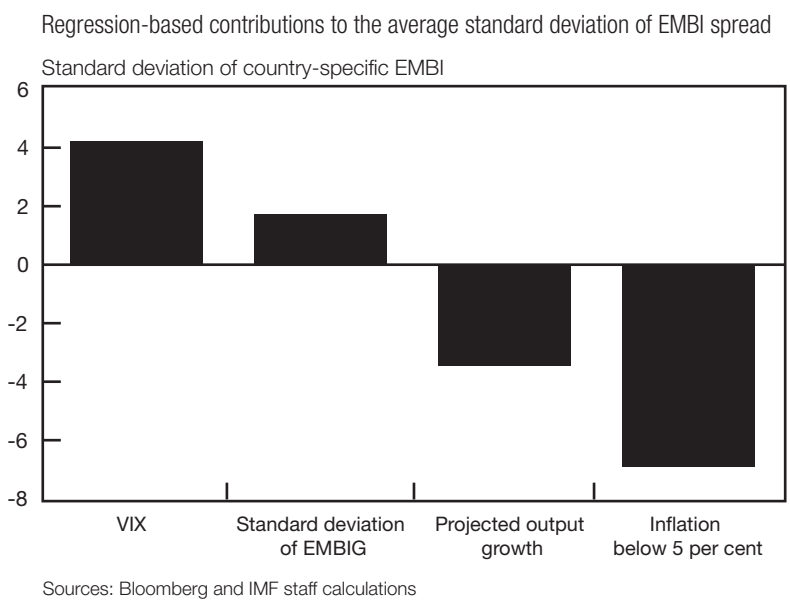
5. Policy challenges for emerging economies are complex

In the context of the foregoing discussion, the policy challenges for emerging economies are complex and involve particularly difficult tradeoffs at the current juncture. The key challenge is to support growth, manage inflation and build resilience to shocks. It is difficult to handle these elements all at the same time, and country-specific circumstances will ultimately dictate where the balance of the decision should lie. But policymakers can take actions to help mitigate the severity of the tradeoff and increase the scope for countercyclical policy.

On macroeconomic policies, the policy mix in each country will need to be defined by the cyclical position and constraints from existing vulnerabilities. Exchange-rate flexibility is a key instrument for cushioning against shocks. Too-abrupt changes can, however, be costly and there is scope to intervene to smooth excessive volatility if countries have adequate reserves. Likewise, capital inflow episodes can be used to build reserves if these are not already adequate and currencies not undervalued. Monetary policy easing to support growth is feasible in some cases, but the scope for it is limited where inflation expectations are elevated. The scope for fiscal policy to support growth depends on the available policy space and financing; where these are constrained, the scope for fiscal easing is limited. Macroprudential measures can be useful where financial stability is a concern.

Well-anchored inflation expectations can help ease the severity of the tradeoff for macroeconomic policy. In particular, they can help lower market volatility. An analysis of data for market volatility in 25 emerging economies during 2010–2014 is suggestive (Figure 12). The analysis is based on a fixed-effects panel regression to assess the effect of external conditions and domestic fundamentals on market volatility, which is proxied by the standard deviation of the EMBI for each country. The analysis indicates that volatility in an individual emerging economy is lower when inflation is better anchored, as well as when growth is stronger and global and aggregate emerging-market volatility lower. Lower volatility, in turn, provides greater scope for policy flexibility.

Figure 12: Well-anchored inflation expectations help to reduce market volatility



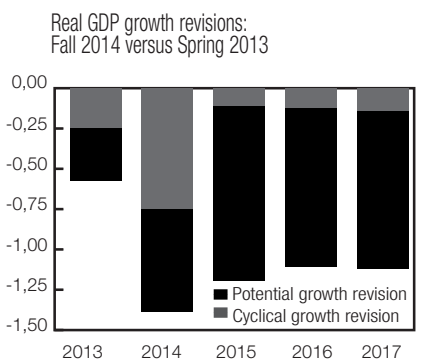
Sources: Bloomberg and IMF staff calculations

Other factors may also increase the scope for policy flexibility and ease the severity of the policy tradeoff, particularly for monetary policy. Exchange-rate flexibility can bear a substantial part of the burden of adjusting to shocks. The less flexible the exchange rate, the greater the share of the burden of adjustment that macroeconomic policies, or the real economy itself, have to bear. Moreover, an adequate balance between fiscal and monetary policy is important, as the more expansionary the fiscal stance already is, the more

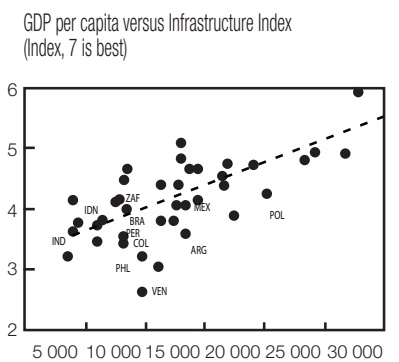
constrained is the ability of monetary policy to respond to shocks. Finally, structural reforms that make labour and product markets more responsive to market signals can strengthen the ability of these markets to respond to shocks and make macroeconomic policies more flexible and effective.

Structural reforms would also help to lift potential growth, providing more of a cushion against shocks and helping to improve livelihoods. The structural reform agenda is diverse as countries' specific needs differ widely across emerging economies. Areas for attention include human capital, the business environment, and product and factor markets. One key area for many countries is infrastructure. The right-hand panel in Figure 13 shows an 'infrastructure index' for emerging economies on the vertical axis, plotted against per capital income levels on the horizontal axis. If one selects a particular point on the horizontal axis and looks upwards, one can see how countries at a particular income level compare in terms of infrastructure. Infrastructure investment could support demand in the short term as well as medium term and make it more sustainable.

Figure 13: Structural reforms are important for lifting potential growth as well as increasing the scope for macroeconomic policy flexibility



Sources: IMF *World Economic Outlook* and IMF staff calculations



Sources: Penn World Tables 7.1; World Economic Forum, *Global Competitiveness Report* (2013/14); and IMF staff calculations

Notes

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[2] For an early review of policy lessons from the taper tantrum, see Sahay et al. (2014).

[3] For a detailed discussion on the 'assessment of reserve adequacy' (ARA) metric, see International Monetary Fund (2011) and International Monetary Fund (2013).

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Targeting core inflation in emerging-market economies

Stan du Plessis[1]

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 that of reformulating 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.

1. Introduction

The pre-North Atlantic crisis monetary policy consensus[2] has been challenged on a number of fronts. Financial stability has risen to the top of the monetary policy debate, and macroprudential 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 macrostability 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.

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 (CPI) (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 (SARB) 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 SARB's forecast for core inflation are evidently part of the information used by the Monetary Policy Committee in their deliberations (South African Reserve Bank 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.

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) had 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) stated that he had found no consensus among 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 CPI 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 CPI, 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, 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 is 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. Statistical agencies also work diligently to diminish the impact of these biases through the regular rebalancing of the indices.

These biases are not at stake in this paper though. Instead, I am concerned with what 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 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 Rangasamy (2009; 2011), and Ruch and Bester (2013); new work has been done by Kotze (2014); as well as joint work by Blignaut, Farrell, Munyama and 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 inflation.[6]

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 theory[7] 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 productions 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 the trend in this kind of model either when demand pressure on capacity pushes up wage and material costs or when labour productivity falls below the 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).

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, that is, 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 inflation, 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 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 policymaker 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 four ways (Mishkin 2007).

First, 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 among 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).

Second, 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. 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 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 among 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 determines the weights in the core index, as proposed by 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, that is, 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 policymaker. 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 argues 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's (BER) inflation expectations survey. Aron and Muellbauer (2007) are among 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 counties) 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 its 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, and not only will the SARB's attempts to combat such inflation with interest rate adjustments fail, but they will also cause procyclical 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, policymakers 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, namely Iceland, where relative price shocks to food and fuel have little predictive power for subsequent inflation, while core inflation does. Federal Reserve Board Chairperson, Jannet 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 United States (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). Contrary to 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 value-at-risk (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 the 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 policymaker 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 apparent persistent gap between the practice of inflation-targeting central banks and the academic consensus on the need to target core inflation 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 a theoretically grounded core inflation from the information set of monetary policy to the target.

Notes

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[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.

[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 and United Kingdom.

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

[6] There are a number of different strategies for identifying core inflation empirically: Brischetto and Richards (2007) suggest 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 CPI 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 these 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 mean 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 CPI, 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).

[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).

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Monetary policy and heterogeneous inflation expectations in South Africa☆

Alain Kabundi, Eric Schaling and Modeste Some*

Abstract

This paper examines the relationship between inflation and inflation expectations of analysts, business and trade unions in South Africa during the inflation targeting (IT) regime. We consider inflation expectations based on the Bureau of Economic Research (BER) quarterly survey observed from 2000Q1 to 2013Q1. We estimate inflation expectations of individual agents as the weighted average of lagged inflation and the inflation target. The results indicate that expectations are heterogeneous across agents. Expectations of price setters (business and unions) are closely related to each other and are higher than the upper bound of the official target band, while expectations of analysts are within the target band. In addition, expectations of price setters are somewhat related to lagged inflation and the opposite is true for analysts. The results reveal that the South African Reserve Bank (SARB) has successfully anchored expectations of analysts but that price setters have not sufficiently used the focal point implicit in the inflation-targeting regime. The implication is that the SARB may be pushed to accommodate private agents' expectations.

Keywords: monetary policy; inflation targeting; heterogeneous inflation expectations; expectations trap

1. Introduction

Prior to the recent financial crisis, many countries – advanced and emerging-market economies – adopted inflation targeting (IT) as a monetary policy strategy to address the breakdown of the relationship between money growth rates and inflation (New Zealand, Canada and South Africa), or the

☆ We thank the anonymous referee for the constructive comments and suggestion. The views expressed in this paper are those of the authors and do not necessarily represent those of the South African Reserve Bank or South African Reserve Bank policy. The authors acknowledge financial support of the Economic Research Southern Africa.

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disappointment following the use of exchange rates as an intermediate target (United Kingdom, Sweden and Finland). Most of these countries experienced a sharp decline in inflation right after the adoption of IT. The success of IT is attributed to, among others, the ability of central banks to anchor expectations of agents around its set targets (see Demertzis and Viegi, 2008). To achieve this objective, the central bank should clearly communicate its policy and should aim at further increasing its credibility. It is only in such an environment that the public would believe that the central bank is resolute in steering inflation towards the official target. Then inflation expectations will also converge to the official target and are likely to remain unchanged even in the presence of negative supply shocks such as a rise in oil or food prices. In this instance, the public is convinced that the central bank will act to bring back inflation within the established target band. In that case, inflation expectations will be tied closely to the target and the associated output cost of the disinflation will be lower. It is therefore crucial to analyse the expectations formation of agents in an IT regime and determine the credibility of monetary policy.

Many studies have focused on the success of monetary policy in South Africa in curbing inflation in the IT era. For example, Gupta et al. (2010), Kabundi and Ngwenya (2011), Gumata et al. (2013), and Aron and Muellbauer (2007) found that the South African Reserve Bank (SARB) has been successful in decreasing inflation in the IT regime compared to pre-IT periods. The SARB has achieved single-digit inflation for more than a decade, even though there were two instances (2002 and 2008) where inflation has risen to more than 10 per cent due to the depreciation of the rand and a rise in food prices. Notice that in these two instances inflation has stayed above the upper bound of the target band for less than three years. However, all the aforementioned studies are silent about the role played by expectations in the IT regime, and whether this success was a result of the ability of the SARB in anchoring expectations within the target band.

The following questions are crucial in determining the role played by expectations: (i) How does the SARB shape expectations of agents? (ii) Are these expectations homogeneous? (iii) Are perceived targets of agents consistent with its objective? (iv) What explains the upward bias of inflation towards the upper bound of the target band? Kabundi and Schaling (2013, henceforth KS) attempt to answer these questions using a simple macroeconomic model which estimates inflation expectations as a linear function of the inflation target and lagged inflation. They use aggregate (macroeconomic) inflation expectations obtained from the quarterly survey

conducted by the Bureau of Economic Research (BER). Their results indicate that the expectations formation of agents is backward-looking and that the implicit target of agents lies above the target band of 3 to 6 per cent. This suggests that their expectations were not properly anchored. However, KS results can be somewhat misleading for two reasons. First, they assume that economic agents in South Africa are homogeneous. Aron and Muellbauer (2007) and Reid (2012), using the BER survey expectations and expectations obtained from Reuters, show that expectations of agents in South Africa are heterogeneous. The expectations of analysts adjust quickly to the official target band, while expectations of price setters (business and trade unions) adjust slowly. In general, price setters are somewhat backward-looking owing to the fact that wage setting in South Africa is backward-looking (Aron et al., 2004). Wage negotiation takes into account past inflation instead of the future path in inflation. According to Aron and Muellbauer (2007), expectations of price setters eventually converge to those of analysts within the target band. They conclude that the SARB has been able to anchor expectations of all agents. Nevertheless, their study covers the sample period from 1994 to 2004, which misses important dynamics in inflation, such as the rise of 2008 due to exogenous shocks. Second, they work with current-year expectations.

In this paper we extend the KS analysis and decompose aggregate inflation expectations into individual expectations of three types of agents: businesses, trade unions and financial analysts. We use one-year and two-year-ahead inflation expectations and a simple macroeconomic model with three key equations, namely aggregate supply, monetary policy preferences, and inflation expectations. The expectations equation is estimated with a panel-data regression with a fixed-effects approach where expectations of agents are linear functions of the inflation target and lagged inflation. The setting is appropriate to deal with heterogeneity observed in the intercepts and slopes, which in turn enables us to answer some key questions in determining the role of inflation expectations in the conduct of IT in South Africa. Those questions are: (i) Are inflation expectations different across agents (business, trade unions and analysts)? and (ii) To what extent do potentially diverging inflation expectations imply different perceptions of the credibility of South Africa's IT framework? The second question is important, as a regime that is perceived as non-credible, say, by unions has different policy implications for the SARB than a lack of buy-in from analysts. We also address the possible dilemma faced by a central bank that is confronted with non-anchored inflation expectations. Should it accommodate these or

not? This is known in the literature as the expectations trap. We discuss this issue in the context of our model and suggest a way out.

The remainder of the paper is organized as follows: Section 2 presents an overview of the relationship between inflation and inflation expectations for the aggregate and each individual agent, and is based on graphical representation of these variables. Section 3 presents the model. We describe the data, their transformation and the estimation of the model in Section 4. We discuss anchoring of expectations by the SARB and an analysis of the heterogeneity of expectations in Section 5. Section 6 concludes the paper.

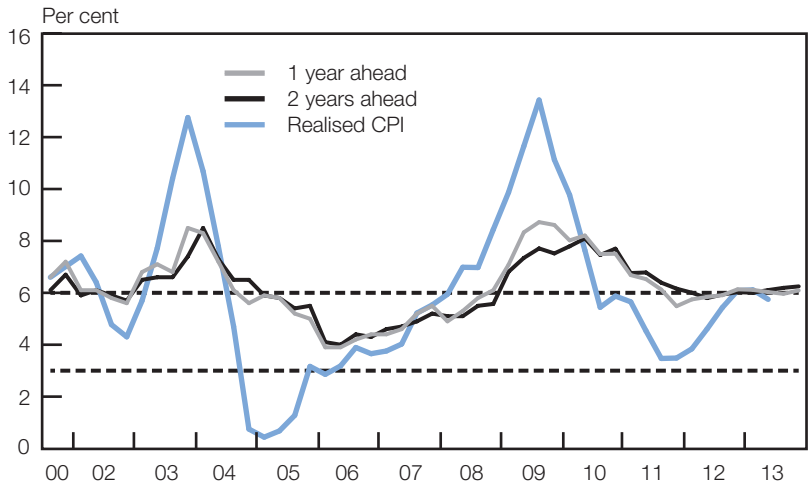
2. Inflation and inflation expectations in South Africa: an overview

Monetary authorities care about inflation expectations because realised inflation itself is partially driven by the public's expectations about future inflation. One channel is that nominal wages are partially set based on expected inflation. Inflation targeting was pioneered in New Zealand in 1990, and is now also in use by the central banks in the United Kingdom, Canada, Australia, South Korea, Egypt, South Africa, Iceland and Brazil, among other countries. The success of the regime depends largely on the behaviour of the public's inflation expectations. If inflation expectations are equal to a point target or within the targeting band set by the central bank, the monetary policy regime is perfectly credible. But if the target or band – and thereby the IT framework – is imperfectly credible, long-term inflation expectations will be volatile and transitory shocks to inflation will also have an impact on inflation expectations. In a perfectly credible IT framework, long-term inflation expectations should be flat and tied to the central bank's inflation target level, or at least fluctuate inside the target band. In that case, any adverse supply shock which increases the current inflation rate would have little effect on long-term inflation expectations because the public – and thereby wage setters – have confidence in the ability of the central bank to bring down inflation back to the target level – or into the band – over a certain time horizon, where the latter depends to what extent the central bank engages in flexible inflation targeting (this term was introduced by Svensson (1999)). It then appears that the presence of a strong correlation between long-term inflation expectations and the realised inflation rate is a sign of a lack of credibility of the IT regime. The latter is in line with the theoretical model put forward by King (1996). He emphasises the role of learning by the private

sector and shows how the optimal speed of disinflation depends crucially on whether the private sector immediately believes in the new low inflation regime or not. If it does, the best strategy is to disinflate quickly, since the output costs are zero. If expectations are slower to adapt, disinflation should be more gradual as well. Learning by the central bank is addressed by Sargent (1999). He analyses how, after World War II, policymakers in the United States (US) learned to believe and act upon a version of the natural rate unemployment rate hypothesis to create an econometric model of an adaptive monetary policy that could produce outcomes persistently better than the time-consistent one predicted by Kydland and Prescott (1977).

As is common in countries that have adopted an IT framework, the SARB conducts a quarterly survey on inflation expectations to guide its policy. Figure 1 plots the BER inflation expectations at different horizons along with the realised CPI inflation (year-on-year change) from 2000Q3 to 2012Q3. Clearly, inflation fluctuated a lot in 2000Q3–2009Q3 with two big negative shocks in 2002Q4 (due to the massive depreciation of the South African rand) and in 2008Q3 (due to an increase in the global food price coupled with a rise in the oil price and another depreciation of the South African rand) and a positive shock in 2004Q1 (due to an appreciation of the rand) before stabilising near the upper bound of the target (6 per cent) during the financial crisis. Below we will look at inflation expectations of different agents; for now we will look at the average across agents. The average inflation expectations series closely tracked actual inflation – seemingly with a lag – in 2000Q3–2009Q3, especially in periods when inflation exceeded the upper bound of the band. This suggests that during this period the shocks discussed above that increased inflation also drove up inflation expectations. Thus, from this graphical inspection, it seems that most of the time the SARB's monetary policy hardly anchors inflation expectations. However, after the financial crisis, both inflation and inflation expectations have converged to the upper bound of 6 per cent. We will provide formal tests for anchoring in the following sections. Notice that the SARB survey – conducted and published by the BER – has separate questionnaires for different societal groups: financial analysts (including economists), business people, and trade union representatives. Thus, the BER dataset has a panel structure. This will be used in our empirical work. Note that the inflation expectations series discussed above relates to the aggregate across these agents.

Figure 1: Inflation and inflation expectations: aggregate

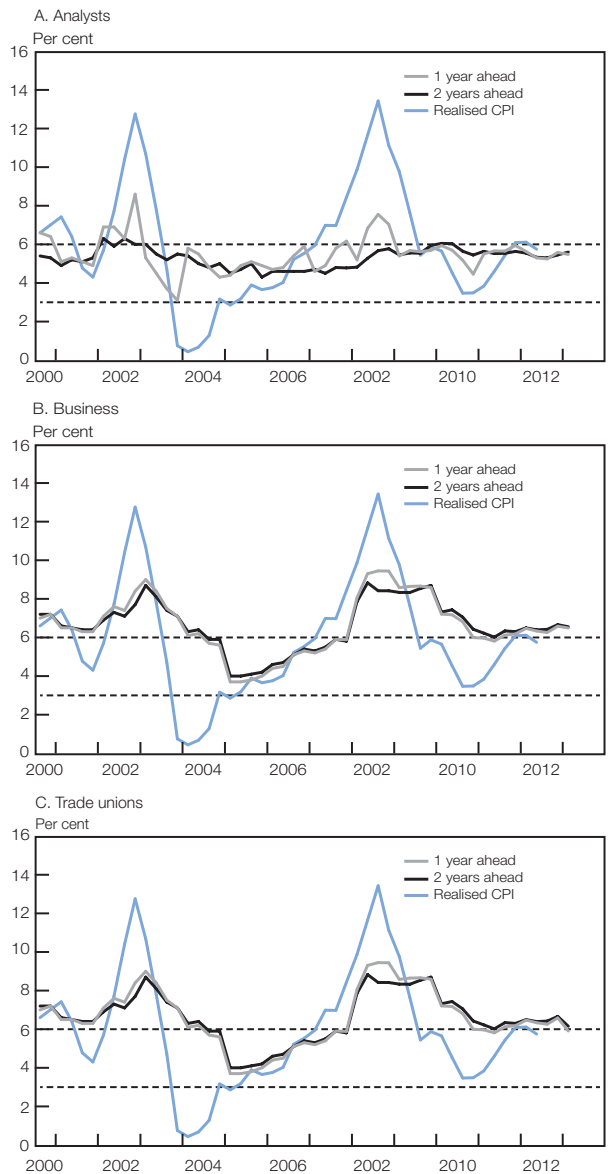


For policy implementation purposes, it would be interesting for the SARB to understand whether these groups are homogeneous in terms of their expectations formation for a number of reasons. First, if there is heterogeneity in expectations, it may be the case that some groups do not have a good understanding of the IT framework. Identifying these groups may help the SARB with its communication strategy. Second, trying to influence inflation expectations requires an understanding of the process by which these expectations are formed. Third, the appropriate monetary policy response to an expectations shock may differ across sectors or agents. For example, a shock to analysts' expectations may have a less potential impact on actual inflation than a similar shock to unions' or business' expectations. Finally, inflation expectations across sectors or agents may influence each other because of the relationship between these two groups. In fact, employees' wages are usually negotiated in advance and are based on expected future prices. Next, firms will set prices according to a mark-up over marginal cost. For South Africa, research on the determinants of inflation has been done by, inter alia, Fedderke and Schaling (2005) and Fedderke et al. (2007). Both papers found that the mark-ups in South Africa over marginal cost are approximately twice that found in the US. This may give rise to a classic wage-price spiral.

In Figure 2, we plot the inflation expectations of the three types of agents at one-year and two-year-ahead horizons along with the realised CPI inflation rate and the SARB official target range of 3–6 per cent. Panel A depicts the

expectations of the analysts, Panel B business expectations and Panel C trade unions' expectations. The inflation expectations pattern seems to be significantly different across agents. First, the analysts' expectations pattern is relatively flat with their two-year-ahead inflation expectation within the target band. Second, the business and the trade unions' expectations patterns

Figure 2: Inflation and inflation expectations of agents



are very similar and seem to track realised inflation seemingly with a lag — as was the case with the aggregate inflation expectations pattern. Thus, it appears that the expectations of the analysts are well anchored, whereas those of business and unions are not. It means that analysis based solely on aggregate expectations, such as KS, may lead to misleading conclusions.

3. The model

Kabundi and Schaling (2013) discuss disinflation policy in South Africa using a simple macroeconomic model based on King (1996), which combines nominal wage and price stickiness and the slow adjustment of expectations to a new monetary policy regime. The model analyses the interaction between private-sector expectations and the monetary regime and, in particular, the speed at which the inflation target implicit in the latter converges to price stability. It features nominal rigidity and an optimising central bank that trades inflation versus output stabilisation.

More specifically, the model has three key equations: aggregate supply, monetary policy preferences, and inflation expectations. Aggregate supply exceeds the natural rate of output when inflation is higher than was expected by agents when nominal contracts were set. This is captured by a simple short-run Phillips curve.[1]

$$z_t = \pi_t - \pi_t^e - \epsilon_t \tag{1}$$

Here π_t is the rate of inflation, z_t is the output gap, π_t^e indicates the expectation of inflation as the aggregate of the subjective expectations (beliefs) of private agents and ϵ_t is the supply (cost-push) shock.

$$\pi_t^e = 1/3 \sum \pi_t^{e,i} \tag{2}$$

where $i = a, b, u$ (and a denotes the analysts group, b the businesses group and u the unions group). Those beliefs do not necessarily coincide with rational expectations.[2] The model is not restrictive as long as inflation expectations are in part influenced by past monetary policy (see for example Bomfim and Rudebusch (2000).[3]

The regime change is represented by a new inflation target π^*, which is announced to the public (business, unions and financial analysts) at the end of period $t-1$. The new target is lower than the initial steady state inflation rate, denoted by π_0.

The central bank's objective as of period t is to choose a sequence of current and future inflation rates $\{\pi_t\}_{t=0}^{\infty}$ so as to minimise its intertemporal loss

$$\sum_{t=0}^{\infty} = \beta^{t}\frac{1}{2}[\phi(\pi_t - \pi^*)^2 + (z_t)^2] \quad (3)$$

where parameter $0 \leq \phi < \infty$ is the relative weight on inflation stabilisation, while $0 < \beta \leq 1$ is the discount factor.

The timing of events is such that the central bank chooses its disinflation policy after private-sector inflation expectations are set. In the terminology of game theory, the private sector is the Stackelberg leader. In Section 5.4 we analyse the opposite case.

The above statements can be analysed more precisely by explicitly considering the central bank's optimisation problem (where it takes inflation expectations as given, that is, under naïve discretion). The central bank's optimal inflation rate — or Best Response in terms of Sargent (1999) is [4]

$$\pi_t = \frac{1}{1+\phi}(\pi_t^e + \varepsilon_t) + \frac{\phi}{1+\phi}\pi^* \quad (4)$$

Of course, from Equation (4) it is clear that if expectations are slower to adapt, the disinflation should be more gradual as well. The inflation rate should decline as a constant proportion of the exogenous expected inflation rate.

In a standard New-Keynesian model the Phillips curve is

$$\pi_t = \beta\pi_{t+1}^e + \lambda z_t + \epsilon_t$$

and the first order condition under discretion is

$$\pi_t = \frac{\beta}{1+\lambda^2\phi}\pi_{t+1}^e + \frac{1}{1+\lambda^2\phi}\varepsilon_t + \frac{\lambda^2\phi}{1+\lambda^2\phi}\pi^*$$

where π_{t+1}^e is the time t expectations of time $t+1$ inflation, that is, $\pi_{t+1}^e = E_t[\pi_{t+1}]$, and E_t is the mathematical expectation given time t information set operator.[5] This is very similar to the first order condition of the specification adopted in this paper if $\lambda = 1$[6] since the discount factor $0 < \beta \leq 1$ is typically calibrated at 0,99 (see for example Woodford (2003)). This implementation of flexible inflation targeting is what Evans and Honkapohja (2003) call an expectations-based optimal rule. By construction, it implements what they label 'optimal discretionary policy' in every period and for all values of private expectations. Here, as above, the central bank also chooses its disinflation policy after private-sector inflation expectations are set. The only difference is the timing of expectations (set at time t or $t-1$) which has no bearing on our empirical results. What matters is who moves first: the central bank or the private sector.

In general, expectations are affected both by the inflation target and by actual inflation performance. After experiencing high inflation for a long period of time, there may be good reasons for the private sector not to believe the

disinflation policy fully (see also Bomfim and Rudebusch (2000)). In light of this, in this section, following King (1996) we assume that for each agent inflation expectations follow a simple rule, that is, a linear function of the inflation target and the lagged inflation rate.

$$\pi^{e,i}_{t+h} = \rho^i \pi_{t-1} + (1-\rho^i)\pi^* \tag{5}$$

where h is the forecast horizon. Put differently, the lower ρ, the better inflation expectations are anchored at long horizons.[7] Note that in this case, expectations are neither rational (which would be the case where inflation expectations equal the target as the central bank has no incentive to generate surprise inflation) or given by a rational learning process. For the latter case (of Bayesian learning), Schaling and Hoeberichts (2010) – for a two-period version of the above model – show that then ρ can be interpreted as $(1 - \mathcal{X}_1)(1 - q)$. Here $\mathcal{X}_1$ is the prior probability assigned by wage setters to the event that the central bank disinflates everything in one go (follows a cold turkey policy) and $0 < q \leq 1$ is the fraction of the disinflation that takes place in period 1. Thus, with a structural interpretation of ρ, rational expectations can display some of the backward-looking characteristics of adaptive expectations. Notwithstanding the above, we stress that the focus of this paper is on the anchoring of expectations to the inflation target (where inflation expectations are given by survey data), rather than on rationality or rational learning. Note that if the regime switch to the new inflation target is completely credible, inflation expectations are immediately anchored by the inflation target, that is, $\pi^{e,i}_{t+h} = \pi^*$ (we have $\rho^i = 0$). Conversely, if the regime switch is not credible at all, inflation expectations remain driven by the past inflation rate; $\pi^{e,i}_{t+h} = \pi_{t-1}$ ($\rho^i = 1$).[8] In reality – and in the case of South Africa – we are likely to find in-between cases. To that end, we will now estimate Equation (5) for South Africa (for each agent) over the period 2000–2013.

$$\pi^{e,i}_{t+h} = c^i + \rho^i \pi_{t-1} + \varepsilon^i_t \tag{6}$$

and ε^i_t is the *iid* stochastic error term which follows a normal distribution. In so doing, we obtain $\hat{\rho}^i$ and $\hat{c}^i$, where $\hat{c}^i = (1- \hat{\rho}^i)\, \hat{\pi}^*$. Therefore, for each agent we can easily compute their perceived (implicit) inflation target as: $\hat{\pi}^{i*} = \frac{\hat{C}^i}{1 - \hat{\rho}^i}$.

4. Econometric and data analysis

4.1 Econometric analysis

Fully anchoring inflation expectations would mean that inflation expectations are equal to the target and hence completely uncorrelated with realised

inflation. Then any shock to inflation has a limited effect on inflation expectations. One way to test whether expectations are well anchored is to perform a Granger causality test between inflation expectations and realised inflation. If realised inflation, Granger causes inflation expectations that signals a lack of 'anchoredness' as then lagged realised inflation will have an impact on expected inflation. We report the results of this test in our section on the empirical results.

To account for a potential heterogeneity in expectation formations, we exploit the panel structure of the BER dataset and estimate the following panel model:

$$\pi^{e,i}_{t+h} = \alpha_{i_o} + \alpha_1 D^{i_1}_t + \alpha_2 D^{i_2}_t + \delta_0 \pi_{t-1} + \delta_1 D^{i_1}_t \pi_{t-1} + \delta_2 D^{i_2}_t \pi_{t-1} + \varepsilon^i_t \qquad (7)$$

where i_0, i_1, $i_2 \in \{a, b, u\}$, $i_0 \neq i_1 \neq i_2$, $\pi^{e^i}_t$ is a measure of time t inflation expectations of agent i, D^i_t is a dummy variable taking 1 if the agent type is i and 0 otherwise, π_{t-1} is lagged realised inflation, ε^i_t is a time t independently distributed error term of agent i, and α_{i_o}, α_1, α_2, δ_0, δ_1, and δ_2 are constant parameters. i_0 is a reference category and i_1 and i_2 represent one of the two other categories.

Notice that Equation (7) nests the equation by equation estimation. That is, for a given type i, the model is reduced to a regression of agent i's inflation expectations on a constant and lagged realised inflation. Since we have three agents, and the expectations of the analysts group seem to be anchored rather well relative to other groups, we use the analysts group as the reference category and hence only use the business and trade unions groups as dummies in the model. Thus $i_0 = a$ and α_{i_o} and δ_0 are respectively the intercept and the slope coefficients of the analysts' expectations equation. The intercept and the slope coefficients of the type i_1 agent are given by $\alpha_{i_o} + \alpha_1$ and $\delta_1 + \delta_0$ respectively (the corresponding coefficients of the type i_2 are $\alpha_{i_o} + \alpha_2$ and $\delta_2 + \delta_0$ respectively).

This panel framework is interesting in the sense that it allows heterogeneity in the intercept as well as in the slope coefficients. The advantage is that we are able to directly test whether there is heterogeneity in the intercepts as well as in the slope coefficients. As a consequence, we can derive each agent's perceived inflation target in Equation (6). For example, a Wald test can be used to test heterogeneity in the intercepts by simply testing the significance of α_1 and α_2, while a Chow-type test can be used to test differences in the slope coefficients.

Since the validity of the above regression requires the series to be stationary, we employ the Phillips–Perron (PP) unit root test as well as the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test developed by Kwiatowski et al. (1992) to test the stationarity of the inflation and inflation expectations series. In the PP

test case, the alternative model is an autoregression with a constant but no trend. The spectral estimation method used is the autoregressive spectral (AR spectral) method and the lag truncation is automatically selected using recursive t-tests. With regard to the KPSS test, we used the same spectral estimation method (AR spectral) and lag length selection criteria as in the PP test case. The results of the test are reported in Table 1 and reveal that the inflation and inflation expectations series are stationary at the 1 per cent level of significance. Except for the trade unions' inflation expectations, the null hypothesis of a unit root can be rejected at the 1 per cent level for all series in the PP test case. As for the KPSS results, the null hypothesis of stationarity cannot be rejected at the 1 per cent level (5 per cent for the aggregate one-year-ahead inflation expectations) except for the business inflation expectations rate. However, when we apply a Dickey–Fuller test based on the generalised least squares (DF-GLS) method, we are able to reject the null hypothesis of a unit root for all of our series at the 5 per cent level. Elliott et al. (1996) show that the DF-GLS test performs well in small samples compared to existing unit root tests. Since our sample size is relatively small (49 observations), we use the DF-GLS test results and conclude that all of our series are stationary.

Table 1: Stationarity test of inflation and inflations expectations

Variable	Test statistic	
	KPSS	PP
Aggregate		
π_t^e	0,47††	–3,35*
π_t	0,06†	–7,62*
Analysts		
π_t^e	0,26†	–4,07*
Businesses		
π_t^e	-2,02	1,27*
Trade unions		
π_t^e	1,64†	–1,8

Note: π_t is the realised CPI inflation. The superscript * and ** denote rejection of the null hypothesis of unit root at 1% and 5% levels respectively for the PP test, whereas the superscript †, †† denote the inability to reject the stationarity hypothesis in the KPSS test.

4.2 The data

In this paper we consider aggregate inflation expectations as well as expectations of three agents: business, trade unions and analysts (including

economists). The data for these expectations are obtained from the BER. The BER conducts a survey in South Africa where major market participants are asked questions about the prospect of inflation. More specifically, the panel is made up of 1 061 business people, 40 financial-sector participants and 25 participants representing the labour market. According to Kershoff and Smit (2002), the BER survey uses the questionnaires of the Reserve Bank of New Zealand as a guideline. This series is released each quarter.

Realised inflation is the quarterly year-on-year percentage change in the headline consumer price index (CPI)[9] and is taken from the SARB. The sample is from the third quarter of 2000 to the first quarter of 2013. There are two main reasons for this sample size. First, we want to examine the dynamics of inflation and inflation expectations during the IT regime in South Africa. Secondly, the BER survey started in 2000, hence there is no reliable series on survey inflation expectations in South Africa before 2000.

5. Empirical results

5.1 Anchoring of inflation expectations

Table 2 presents the empirical results of the Granger causality test between realised inflation and aggregate two-year-ahead inflation expectations, as well as the two-year-ahead inflation expectations per agent. The null hypothesis of 'π_t does not Granger cause π_t^e' can easily be rejected at the 1 per cent level for the aggregate, business people and the trade unions representatives groups. This means that lagged realised inflation impacts on the two-year-ahead inflation expectations of these two groups as well as on aggregate inflation expectations.

On the other hand, this hypothesis cannot be rejected for the analysts group. This confirms the graphical view that analysts' expectations are well anchored, while business people and workers groups' expectations are not. Since business people and trade unions represent two-thirds of the sample and tend to report higher inflation expectations, it follows that aggregate inflation expectations are driven by these two groups and are not anchored. This is an important result which has implications for monetary policy implementation as will be discussed below.

5.2 Heterogeneity of inflation expectation

In this section we investigate whether the three groups of agents form their expectations in a similar way. We start by testing whether the average of the business and trade unions groups, i.e. $\bar{\pi}^i = \frac{1}{T}\sum_{t=1}^{T} \pi_t^{e,i}$ where $i = b, u$, is different from the analysts group. That is, we estimate Equation (7) by ordinary least square (OLS) with the slope coefficients set to zero and test the significance of the intercept coefficients α_1 and α_2. Then we estimate the unrestricted version of Equation (7) and test the heterogeneity of the slope coefficients.

Table 2: Granger causality test

Null hypothesis	F-statistic	P-value
Aggregate		
π_t^e does not Granger cause π_t	0,47	0,628
π_t does not Granger cause π_t^e	8,76	0,00
Analysts		
π_t^e does not Granger cause π_t	1,44	0,25
π_t does not Granger cause π_t^e	0,68	0,51
Businesses		
π_t^e does not Granger cause π_t	2,58	0,09
π_t does not Granger cause π_t^e	5,71	0,00
Trade unions		
π_t^e does not Granger cause π_t	0,24	0,79
π_t does not Granger cause π_t^e	12,39	0,00

Note: π is the realised CPI inflation. The superscript * and ** denote rejection of the null hypothesis of unit root at 1 per cent and 5 per cent levels respectively for the PP test, whereas the superscript †, †† denote the inability to reject the stationarity hypothesis in the KPSS test.

Since the reference category is the analysts group, α_1 or $\alpha_2 \neq 0$ would indicate heterogeneity[10] (relative to the analysts group) in the intercepts. Table 3 reports the results of the restricted model. The F-statistic is significant at the 1 per cent level meaning that the null hypothesis of $\alpha_1 = \alpha_2 = 0$ is rejected. Since α_1 and α_2 are positive, this also indicates that business and trade unions groups tend to report higher inflation expectations on average compared to the analysts group. The estimated average of the one-year-ahead inflation expectations is 5,51 per cent for the analysts group, and 6,61 per cent ($\alpha_{i_0} + \hat{\alpha}_1$) and 6,51 per cent ($\alpha_{i_0} + \hat{\alpha}_2$) for business and trade

unions respectively. On the other hand, a test of $\alpha_1 = \alpha_2$ cannot be rejected, meaning that on average business people and trade unions report similar inflation expectations. This is not surprising given the economic relationship between these two groups. Business and trade unions are price setters and their actions affect each other. Notice that these results imply that the average inflation expectations of the analysts group are within the SARB target band of 3–6 per cent, whereas the business people and the trade unions expectations are outside the band. However, even the analysts group's average inflation expectations (5,51 per cent) are near the upper bound of the target and far from the mid-point of 4,5 per cent. These findings are problematic from a price stability perspective, which will be discussed in more detail.

Table 3: Heterogeneity in average inflation expectations $\pi^{e,i}_{t+4} = \alpha_{i_o} + \alpha_1 D^{i1}_t + \alpha_2 D^{i2}_t$

Parameter	Estimate
α_{i_o}	5,51*
	(0,13)
α_1	1,10*
	(0,25)
α_2	1,00*
	(0,27)
R^2	0,11
F-statistic	13,29

Note: Standard errors are reported in parentheses. π^e_{t+4} is the 1 year ahead inflation expectations. *, ** denote significance at 1 per cent, and 5 per cent respectively. $_{i_o}$ is the analyst group, i_1 is the business group and i_2 is the trade unions group.

Table 4 presents the results of the full estimation of Equation (7) using the one-year-ahead inflation expectations as the dependent variable. Results indicate that past inflation does explain one-year-ahead inflation expectations but differently across agents. On average, 62 per cent of the variation of aggregate inflation expectations is explained by changes in past inflation.[11] Both the intercepts and the coefficients on lagged inflation for business and trade unions are significant at the 1 per cent significance. Notice that the intercept α_1 is not statistically significant, meaning that the intercept of the business group ($\alpha_{i_o} = \alpha_2$) is not statistically different from that of the analysts (α_{i_o}). The estimate of α_2 is negative (–1,11) and significantly different from zero.

It means that the intercept of the trade unions group ($\alpha_{i_o} + \alpha_2$) is lower than that of the analysts. Moreover, the lagged inflation slope coefficient for the analysts group (0,11) is lower than for the two other groups (0,43 (0,13 + 0,30)) for business, and 0,50 (0,13 + 0,37) for trade unions). These findings are in line with the graphical overview and the Granger causality test. In the next section we will derive the perceived (implicit) inflation target for each agent.

Table 4: Heterogeneity in slopes and intercepts:
$\pi^{e,i}_{t+4} = \alpha_{i_o} + \alpha_1 D^{i_1}_t + \alpha_2 D^{i_2}_t + \delta_0 \pi_{t-1} + \delta_1 D^{i_1}_t \pi_{t-1} + \delta_2 D^{i_2}_t \pi_{t-1} + \varepsilon^i_t$

Parameter	Estimate
α_{i_o}	4,71*
	(0,28)
α_1	–0,51
	(0,48)
α_2	–1,11*
	(0,48)
δ_0	0,13*
	(0,05)
δ_1	0,30*
	(0,07)
δ_2	0,37*
	(0,08)
R^2	0,62
F-statistic	60,33

Note: 0Standard errors are reported in parentheses. π^e_{t+4} is the 1 year ahead inflation expectations. *, ** denote significance at 1 per cent and 5 per cent respectively. $_{i_o}$ is the analyst group, i_1 is the business group and i_2 is the trade unions group.

5.3 Credibility and implicit inflation targets

In this section we derive the estimates of the coefficients ρ^i and π^* in Equation (5) from the reduced form estimation of Equation (7). Notice that from Equations (5) and (7) we have the following identification:

$\alpha_{i_o} = (1-\rho^{i_0})\, \pi^{*i_0}$ and $\delta_0 = \rho^{i_0}$ for the analysts group;

$\alpha_1 + \alpha_{i_o} = (1 - \rho^{i_1})\, \pi^{*i_1}$ and $\delta_1 = \rho^{i_1}$ for the business people group; and

$\alpha_2 + \alpha_{i_0} = (1 - \rho^{i_2})\, \pi^{*i_2}$ and $\delta_2 = \rho^{i_2}$ for the trade unions representatives group.

Since the dummy variables version of the model in Equation (7) cannot deal with autocorrelations in the error terms, we do the estimation by agent as in Equation (5) in order to deal with potential autocorrelations in the error terms. Thus, for each group we have estimates of different intercepts as well as different slopes that allow us to infer their estimated perceived inflation target of the central bank by the identification:

$$\hat{\pi}^{i^*} = \frac{\hat{C}^i}{1 - \hat{\rho}^i} \tag{8}$$

where $\hat{c}^i$ is the estimated intercept of type i agent. Notice that the lower $\hat{\rho}^i$ is, the more credible the central bank is viewed by group i agents since they put less weight on past inflation and more weight on the central bank's inflation target.

Table 5 contains the results of the estimation. The first column reports the results for the analysts group, the second column for the business people, and the third column for the trade unions representatives group. Results indicate that past inflation does explain one-year-ahead inflation expectations but differently across agents. Both the intercept and the coefficient on lagged inflation are significant at 1 per cent for business and trade unions. However, the explanatory power of the regression is lower for the analysts group and relatively higher for the business and workers groups. Approximately 26 per cent of the variation of analysts' expectations is explained. Moreover, the lagged inflation slope coefficient for the analysts group (0,11) is not significantly different from zero and is lower than for the two other groups (0,22 for business and 0,35 for trade unions). Once again, these findings corroborate with the graphical overview and the Granger causality test. First, the SARB seems to have a higher credibility among the financial analysts and experts group compared to the price-setters group (business and trade unions). Thus, the hypothesis that the SARB has been successful in anchoring price setters' (business and trade unions) expectations is not supported in that the relevant coefficients of lagged inflation are relatively high and different from zero.[12] In addition, serial correlation tests reveal that the regression residuals are highly autocorrelated in the business (0,86) and trade unions (0,72) cases compared to the analysts group case (0,34). This indicates that all information about inflation expectation is not included in lagged inflation, but can be accounted by other factors (e.g. news).

Table 5: Expectations formation and implicit inflation target by agent

Explanatory variables	Dependent variable $\pi^{e,i}_{t+4}$		
	Analysts	Business	Unions
C	4,82*	5,28*	4,30*
	(0,39)	(0,57)	(0,60)
π_{t-1}	0,11	0,22	0,35*
	(0,08)	(0,07)	(0,09)
ar (1)	0,34**	0,86*	0,72*
	(0,16)	(0,04)	(0,08)
Implicit target (π^*)	5,41	6,77	6,62
R^2	0,26	0,86	0,84

Note: Standard errors are reported in parentheses. $\pi^{e,i}_{t+4}$ is the 1 year ahead inflation expectations of type i. *, ** denote significance at 1 per cent and 5 per cent respectively. ar(1) is an autoregressive error term.

We now turn to analyse whether there is heterogeneity in the perception of the different agents of the SARB's inflation target consistent with the expectations schemes formulated in Equation (6). We then derive the implicit inflation target for each agent as given by Equation (8) in Table 5. The calculated perceived inflation targets are 5,41 per cent, 6,77 per cent, and 6,62 per cent for the analysts group, business people, and the trade unions respectively. Once again, these results confirm the graphical observation that the analysts group's inflation expectations are relatively well anchored although their implicit target level (5,41 per cent) is above the mid-point of the SARB's band and near the upper bound of 6 per cent. These are important results for a central bank, such as the SARB, that targets inflation. The results indicate that the IT regime has buy-in from the analysts but is not seen to be very credible from the perspective of unions who set wages, and firms who set prices.

More specifically, we now know that the lack of anchoring of aggregate inflation expectations (for an analysis of aggregate inflation expectations see Kabundi and Schaling, 2013) is driven by the price-setting side of the economy, namely by business and trade unions, as the financial analysts group's expectations are relatively well anchored. However, those expectations have no direct impact on wages or prices. Thus, the SARB should pay more attention to the price-setters group in its communication strategy. It seems as if these two groups do not have a proper understanding of the SARB's policy framework and/or do not see it as credible. Finally,

even the financial analysts group perceives the SARB's inflation target at a level near the upper bound. Thus, it means that financial analysts and experts seem to believe and/or understand the SARB policy but apparently are not convinced that the SARB is aiming for the mid-point at 4,5 per cent. Perhaps the band is too wide and/or there is no explicit point target to steer expectations appropriately. This introduces uncertainty in predicting inflation since realised inflation can be anywhere in the band.

5.4 Expectations trap?

In this section we analyse the empirical relationship between the SARB's optimal inflation rate and the business and workers groups' inflation expectations.

In this paper, optimal monetary policy implies a strategic interaction between the private sector and the monetary authorities. The central bank's optimal inflation rate as derived in Equation (4) is a weighted average of its concern about the business cycle (as proxied by the public's inflation expectations) and the central bank's inflation target. It is interesting to understand the importance of the public's inflation expectations for the central bank's optimal inflation, that is, we want to understand how the central bank reacts to changes in public inflation expectations. To what extent does the SARB accommodate private-sector inflation expectations? Our paper is related to Chari et al. (1998). Their basic idea is that, under discretion, policymakers can be pushed into pursuing inflationary policies. This can happen when the private sector, for whatever reason, expects inflation. We know from the earlier part of the paper that this definitely applies to business and labour. Under these circumstances, the central banker may find it optimal to accommodate private agents' expectations if the cost of not doing so is a severe and/or persistent loss of output. Chari et al. refer to such a situation as one in which the economy has fallen into an expectations trap. In the context of our model, this can be seen from the central bank's first order condition for the case where $0 < \phi$. Then $\pi_t < \pi_t^e$ and $z_t < 0$. In the case of full accommodation we have $\pi_t = \pi_t^e$ and $z_t = 0$.

One way to get an idea of the severity of the expectations trap is to estimate the central bank's first order condition and test whether the coefficient on expected inflation is one (the case of full accommodation).

To that end, we regress the realised CPI inflation on the average one-year-ahead inflation expectations of business and trade unions. We abstract from

the analysts group because we already know that their expectations are relatively well anchored. Thus, we estimate the following equation:

$$\pi_t = \frac{1}{1+\phi}(\pi_t^e + \epsilon_t) + \frac{\phi}{1+\phi}\pi^*$$

where π_t^e is the average inflation expectation of business and trade unions, that is, $\pi_t^e = 1/2(\pi_t^{e,b} + \pi_t^{e,u})$.

Table 6 presents the results of the regression. After adjusting for autocorrelation in the residuals, we find that the intercept is not significantly different from zero and the coefficient of aggregate inflation expectations is not statistically different from one at the 1 per cent level. When in the expectations trap, a central bank might prefer inflation to temporarily exceed the target if the latter is expected by the private sector. So, our empirical findings support the hypothesis that the SARB may be caught in an expectations trap.

Table 6: Optimal inflation regression

Explanatory variables	Dependent variable π_t
C	–0,33
	(2,44)
π_t^e	0,95*
	(0,34)
ar (1)	0,83*
	(0,11)
R^2	0,83

Note: Standard errors are reported in parentheses. π_t^e is the 1 year ahead inflation expectations of business and trade unions. * denotes significance at 1 per cent. ar(1) is an autoregressive error term.

Chari et al. (1998) investigate alternative institutional arrangements – which in our case have a direct bearing on the implementation of IT in South Africa – that can eliminate the possibility of the expectations traps. One solution is full commitment on the part of the monetary authority. Then the central bank minimises its preference function subject to the Phillips curve and to the public's expectations formation equation.[13] This is a different set-up than we have analysed so far. There – in game theoretic terms – the private sector was the Stackelberg leader and the central bank was the Stackelberg follower. Now we reverse that order, but using the same model. This means

that now we move away from the empirics and end with some theoretical considerations.

This implies the following Lagrangian[14]:

$$L = E_t\left[\sum_{t=t}^{\infty}\left\{\frac{\beta^{t-t}}{2}\left[-\phi\,(\pi_t)^2 - (\pi_t - \pi_t^e)^2\right] - \beta^{t-t+1}\,\mu_{t+1}\left[\pi_{t+1}^e - \rho\pi_t\right]\right\}\right]$$

where π_t^e is the state variable, π_t is the control, and μ_t is the Lagrange multiplier.[15]

The solution of this problem (the central bank's first order condition) is: $\pi_t = \pi_t^e$

where

$$C = \frac{1}{2}\left\{\left[\frac{(1+\phi) + \beta\rho^2}{\beta\rho^2}\right] - \sqrt{\frac{\left[(1+\phi) + \beta\rho^2\right]^2 - 4\beta\rho^2}{\beta^2\rho^4}}\right\}$$

and $C < \frac{1}{1+\phi}$, where $\frac{1}{1+\phi}$ is the coefficient on expected inflation in Equation (4).[16] In this case the (optimal) disinflation under commitment is always faster than under discretion (which was the previous set-up). Now recall the equation for the agent's expectations formation process in Equation (5) where if the inflation target is less credible the higher ρ, as then inflation expectations remain largely driven by the past inflation rate π_{t-1}. According to Proposition 4 of Schaling and Hoeberichts (2010), the higher ρ the lower the monetetary accommodation parameter C, and therefore the lower the central bank's optimal inflation rate. The argument is that the higher the ρ, the more leverage the central bank has over inflation expectations via past inflation.[17] Now the central bank no longer treats inflation expectations as exogenous variables. It realises that those figures are partly the outcome of its own policy decisions which imply actual inflation figures. This appears to be a subtle difference but it is fundamental and is of major practical relevance. If inflation expectations are partly driven by past inflation by reducing actual inflation quicker, those expectations will be adjusted downwards by private agents closer to the official inflation target. Lower inflation expectations translate into lower wages and prices (given the mark-up) so that a virtuous cycle emerges.

Such a policy is also less costly in terms of the output cost of the disinflation than under discretion (where the central bank treats inflation expectations as given). In line with the above discussion about commitment, Schaling and Hoeberichts (2010) – using precisely the algebra above – show that a central bank may try to convince the private sector of its commitment to price stability by choosing to reduce inflation (more) quickly. They call this 'teaching by doing'. They find that allowing for teaching-by-doing effects always speeds

up the optimal disinflation (which balances inflation and output) and leads to lower inflation persistence. This 'speed' result also holds in an environment where private agents rationally learn about the central bank's inflation target using a constant gain algorithm of the Kalman Filter.

6. Conclusion

In this paper we have found empirical evidence for South Africa that suggests that economic agents' inflation expectations are not fully anchored by the inflation target (which would be the preferred outcome in an IT regime).

We have extended the analysis of Kabundi and Schaling (2013) who focus on aggregate expectations and are therefore unable to identify which economic agents, business, unions or financial analysts drove their results. In this paper we have decomposed these results and looked at those individual agents' inflation expectations based on the BER survey data. We find that business and unions perceived inflation targets to lie outside the official target band. This is relevant for monetary policy as inflation expectations of business people and workers may influence each other because of the relationship between these two groups. In fact, employees' wages are usually negotiated in advance and are based on expected future prices. Next, firms will incorporate any expected increase in their marginal cost in to their product prices.

As a consequence, the SARB may find itself in an expectations trap. This is the case because inflation expectations of business and labour – as proxied by their perceived inflation targets of 6,77 per cent and 6,62 per cent respectively – are outside the band. Thus, when in the expectations trap, the SARB may be pushed to accommodate inflation expectations. This is in fact fully supported by our estimation of the central bank's first order condition where we find that the coefficient of aggregate inflation expectations is not statistically different from one at the 1 per cent level.

In general, the best way out of this trap is to commit to a faster reduction of inflation, as shown by our solution for commitment or 'teaching by doing' which in practical terms may imply moving to a more narrow band which is consistent with price stability.

Finally, the SARB may need to further improve the transparency of the framework and proactively signal its concerns about potential inflationary pressures – and likely responses – to unions and business. This would be another operationalisation of commitment with – in the terminology of game

theory – the central bank becoming the Stackelberg leader in the interaction with the private sector.

Prior to the establishment of the European Central Bank, such a practice was regularly followed by the Deutsche Bundesbank, arguably one of the most successful monetary institutions in the post-World War II era.

Notes

1 In their analysis of US monetary policy experimentation in the 1960s, Cogley et al. (2005) use a model similar to ours but with unemployment instead of output.

2 For a New-Keynesian model where the central bank has a similar incentive structure and private agents are learning, see Bullard and Schaling (2009).

3 In the present paper – given expectations – the output costs of disinflation are constant and given by the slope of the Phillips curve. Here this parameter is normalised at unity. However, if we allow the output costs of disinflation to vary with the inflation rate, the central bank's incentives change substantially. Thus, one way of extending the model with state-contingent output costs of disinflation would be by means of a non-linear Phillips curve as discussed in Schaling (2004). For a preliminary analysis along those lines, see Hoeberichts and Schaling (2006).

4 According to the central bank's first order condition, monetary policy responds to aggregate expectations. Thus, the heterogeneity of agents is not taken into account in monetary policy. We leave this for further research.

5 Note that $E_t \pi_{t+1} = \pi^e_{t+1}$, we will use the latter notation throughout the article when necessary.

6 As pointed out by Clarida et al. (2000, p. 170) there is no widespread consensus on the value of the output elasticity of inflation, λ. Values found in the literature range from 0,05 to 1,22.

7 For an empirical analysis of the US examining observable measures of long-run inflation expectations, see Kiley (2008). Further, our model generates persistent inflation (decreasing in ϕ), although the central bank does not aim for an output target above the natural rate. An alternative framework that also generates an inflation bias is the paper by Cukierman and Gerlach (2003). Here the central bank aims for the natural rate – as in this paper – but is more concerned about negative rather than positive output gaps.

8 Note that if we see the above as a game between the private sector and the central bank, then the former's expectations formation equation can be interpreted as its reaction function. The solution for inflation can be obtained by substituting the latter in the central bank's first order condition: $\pi_t = \frac{p}{1+\phi}\pi_{t-1} + \frac{(1-p)+\phi}{1+\phi}\pi^*$

9 As a robustness check, we also tried the core CPI inflation but the results of the paper are unchanged.

10 Notice that the OLS estimation with dummies in the intercept yields the same results as the fixed effect concept of the panel data regression.

11 However, an agent-by-agent (decomposition) based estimation of Equation (7) shows that the explanatory power of the regression is lower for the analysts group and higher for the business and trade unions groups (see Table 5).

12 The Wald test rejects the hypothesis that $\rho = 0$ with a *p-value* of zero.

13 We assume that the central bank has full knowledge of the process of private-sector learning or, in other words, we have what Gaspar et al. (2006) call 'sophisticated central banking'.

14 For a zero inflation target, but results do not depend on that.

15 Without loss of generality we have set $h = 0$, so that expectations look one period ahead.

16 For proof, see Schaling and Hoeberichts (2010).

17 If we assume that the private sector's expectations about the central banks' inflation target are formed according to the adaptive (rational) learning literature, that is $E_{t-1}\pi_t = C_{t-1} = C_{t-2} + \kappa(\pi_{t-1} - C_{t-2})$ where $\kappa \in (0, 1)$, then one get precisely the same result: a higher gain parameter is associated with less monetary accommodation. In the limit we reach the Ramsey equilibrium where $z = 0$ and $\pi = \pi^* = 0$.

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Inflation targeting and the global financial crisis: successes and challenges

*John C Williams**

Abstract

Inflation targeting has become the predominant monetary approach across the globe. In a very real sense, "we are all inflation targeters now". Before, during, and after the financial crisis, nearly all central banks following an inflation-targeting approach – whether explicit or implicit – have been highly successful at achieving price stability and anchoring inflation expectations. Recent events, however, highlighted two critical issues for inflation targeting going forward: the constraint of the zero lower bound on nominal interest rates and the appropriate role of monetary policy in supporting financial stability. This has led to the development of alternative approaches to inflation targeting that offer, in theory, potential advantages with respect to the zero lower bound and financial stability.

1 Introduction

Twenty-five years ago the Reserve Bank of New Zealand bravely embarked on a new framework for monetary policy: inflation targeting. Today, some 20 central banks – representing economies from small to large, emerging markets to advanced – practice some version of inflation targeting.[1] Approaches differ in the details, but it is striking how similar inflation-targeting practice is across a diverse set of countries with distinct economic and institutional landscapes. Although the central banks of the three largest advanced economies – the Bank of Japan, the European Central Bank (ECB) and the United States (US) Federal Reserve (Fed) – do not explicitly identify themselves as practicing inflation targeting, all three have enunciated numerical longer-term inflation goals, a cornerstone principle of inflation targeting. To paraphrase Milton Friedman, "we are all inflation targeters now".[2]

This essay assesses the macroeconomic performance of inflation targeting and other central bank monetary policies during and after the global financial crisis and discusses two critical challenges for central banks in the future.

* Canyon Bosler and Ben Pyle supplied excellent research assistance. The views expressed in this paper are the author's and do not necessarily reflect those of others in the Federal Reserve System.
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Spoiler alert: My main conclusion is that inflation targeting and related approaches to monetary policy have been remarkably successful at providing a nominal anchor and keeping inflation low and relatively stable during a period of severe turbulence. Nonetheless, recent events have revealed some chinks in the armour of inflation targeting related to the zero lower bound on interest rates and financial instability –issues I will also address. I will conclude by outlining some alternative, as yet untested approaches that have the potential to improve inflation targeting, options for Inflation Targeting 2.0, if you will.

Before turning to these issues, it is worthwhile to ask two basic questions: what is inflation targeting, and why has it become so widespread? At its core, inflation targeting is an answer to the oldest and thorniest problem of monetary policy: providing a nominal anchor for the economy. Past regimes – including the gold standard, pegged exchange rates and targeting monetary aggregates – all sought to do so, but proved to be fatally flawed when it came to providing the flexibility to deal with economic cycles and crises. In a nutshell, inflation targeting is designed to anchor inflation expectations, enabling central banks to achieve greater macroeconomic stability in the short run, while ensuring price stability in the long run.

Although the implementation of inflation targeting differs across countries, three elements are central to the framework.[3] First and foremost is the announcement of an explicit quantitative inflation target coupled with the central bank's assuming responsibility for delivering price stability. Second is clear communication of the central bank's policy strategy and the rationale for its decisions, which enhance the predictability of the central bank's actions and its accountability to the public. Third is a forward-looking policy orientation, with a particular focus on inflation expectations. Together, these elements provide a focal point for inflation, facilitate the formation of inflation expectations, and provide a transparent framework for actions fostering price stability. It is important to note that although inflation is front and center in each of these elements, inflation-targeting central banks also recognise a role for stabilising economic activity – what is often referred to in the economics literature as 'flexible inflation targeting'.

Success at taming inflation has fuelled wide adoption of inflation targeting (both explicit and implicit) over the past 25 years. Since the breakdown of the Bretton Woods international monetary system in the early 1970s, most countries have faced bouts of high and volatile inflation as they sought a suitable nominal anchor. Some chose to explicitly adopt an inflation-targeting framework with all the bells and whistles, while others did not. However, in the following, I do not distinguish between countries that have explicitly adopted inflation targeting and others, like the US, whose behaviour is in many ways similar to inflation targeting but which have not made such specific commitment.

Since the adoption of inflation targeting and similar approaches, inflation in these countries has been relatively quiescent. The first column of Table 1 shows the average rates of inflation in a number of countries in the decade before the global financial crisis (1998–2007). Compared to double-digit inflation rates in prior periods, nearly all of these countries experienced relatively low inflation rates in the run-up to the crisis. Inflation tended to be relatively stable as well, as shown in column 3 of the table, which reports the standard deviations of inflation rates in each country during this period.

Table 1: Consumer price inflation

	Mean		Standard deviation	
	1998Q1–2007Q4	2008Q1–2014Q2	1998Q1–2007Q4	2008Q1–2014Q2
Australia	2,8	2,8	1,3	0,9
Canada	2,2	1,6	0,9	1,0
Chile	3,3	3,2	1,3	2,9
Eurozone*	2,0	1,9	0,5	1,1
Japan	-0,2	0,1	0,6	1,2
Mexico	7,4	4,3	4,8	0,9
New Zealand	2,2	2,4	1,1	1,4
Norway	2,0	2,1	1,1	1,0
South Africa	4,9	6,3	3,4	2,0
South Korea	3,2	2,9	1,8	1,2
Sweden	1,2	1,2	1,0	1,5
Switzerland	0,8	0,3	0,5	1,1
United Kingdom	1,6	3,1	0,5	0,9
United States	2,6	2,0	0,8	1,5

* The country composition of the eurozone has varied over time.

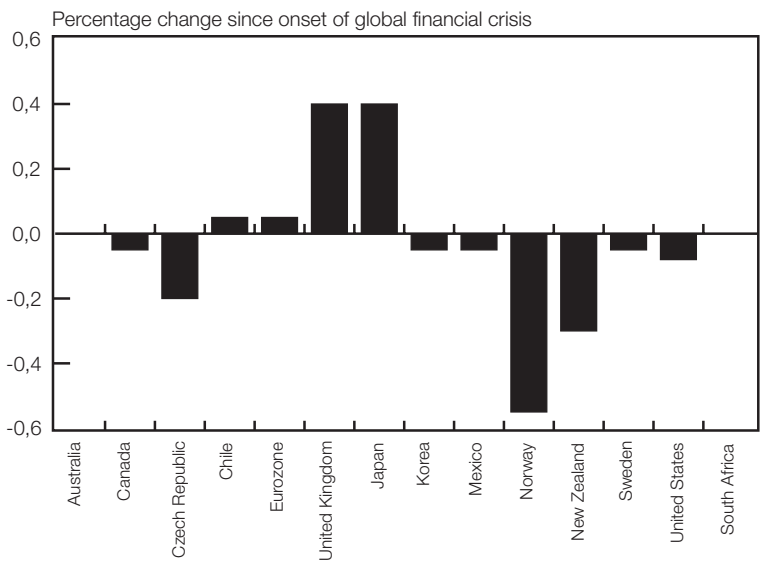
Sources: Eurozone data from IFS; all else from OECD

Although the stabilisation of inflation in so many countries was a great accomplishment, the real test for inflation targeting was yet to come. The global financial crisis and the resulting recessions presented a massive challenge for monetary policy. As has been widely remarked, inflation-targeting central banks generally did not foresee or forestall the ballooning risks to financial systems that eventually exploded. Moreover, central banks were not able to fully mitigate the spillovers to economic activity, and the resulting economic costs of the crisis proved enormous. These are subjects that I will return to later.

However, when gauged by the behaviour of inflation since the crisis, inflation targeting delivered on its promise. Columns 2 and 4 of Table 1 report the average inflation rates and their associated standard deviations respectively since the beginning of 2008. Inflation rates stayed remarkably low and stable during this otherwise turbulent period. The crisis and economic downturns left virtually no traces in terms of the ability of central banks to maintain price stability. This is an important achievement in and of itself, but also because the stability of inflation provided many central banks with room to take aggressive actions to foster economic recovery.

What explains this impressive performance with regard to price stability? The key is the anchoring of inflation expectations before the crisis and the actions taken to maintain price stability, and thereby hold the anchor in place, during and after the crisis. Figure 1 shows the net change in survey measures of longer-run inflation expectations from the start of the crisis until today for a number of countries. In most cases, the anchor held firmly (to put these numbers in perspective, the inflation targets are typically between 2 and 3 per cent). In a few cases, such as Japan and New Zealand, the observed shift represented a desirable move back towards the announced target. In only two other cases, Norway and the United Kingdom, do we see a non-trivial shift in inflation expectations. I will return to the case of Norway later.

Figure 1: Longer-term inflation expectations



Source: Consensus Forecasts and Survey of Professional Forecasters (United States). Change in 6–10 year-ahead CPI inflation expections between 2007 and 2014

With inflation expectations firmly anchored and the public apparently confident that central banks would hold the line on price stability, the

transmission of economic turmoil to inflation was muted. Inflation (and, on the downside, deflation) proved to be the dog that did not bite.

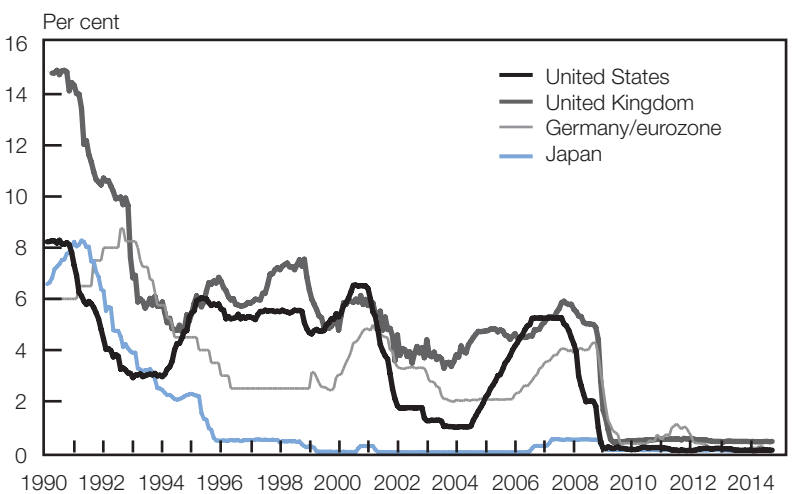
2. Two critical challenges

Despite inflation-targeting central banks' noteworthy successes in maintaining low inflation and anchoring inflation expectations during and after the crisis, inflation targeting faces two critical challenges. The first is the zero lower bound on nominal interest rates, which has constrained conventional policy actions for most major central banks during the past six years. The second is the appropriate role of monetary policy in maintaining financial stability.

2.1. The zero lower bound

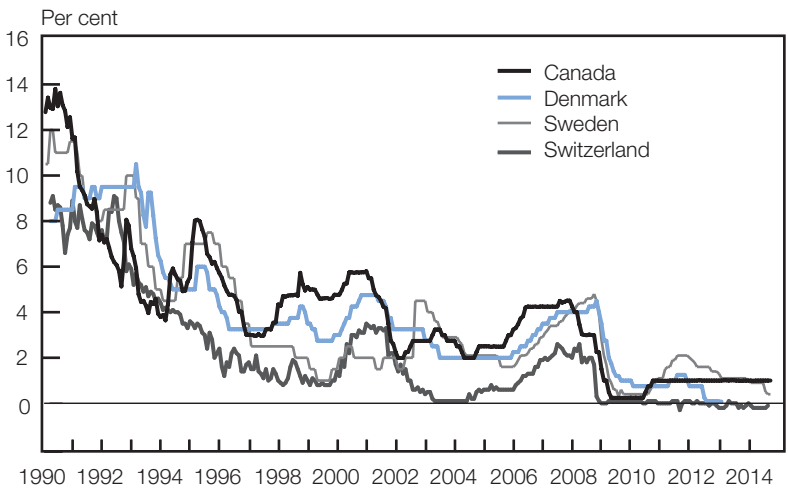
The zero lower bound (ZLB) has been a significant constraint for many central banks across the globe. Figure 2 shows the policy rates for four major advanced economies since 1990. Combatting persistent deflation and a stagnant economy, the Bank of Japan moved its policy rate close to zero in the 1990s. Then, following the financial crisis, the Bank of England, the Bank of Japan, the ECB and the US Fed all brought their policy rates to their respective effective lower bounds in late 2008 or early 2009. In addition, central banks in many other economies – including Canada, Denmark, Sweden and Switzerland – cut policy rates to near zero in the aftermath of the crisis, as seen in Figure 3.

Figure 2: Short-term interest rates



Sources: OECD and Federal Reserve Board

Figure 3: Short-term interest rates



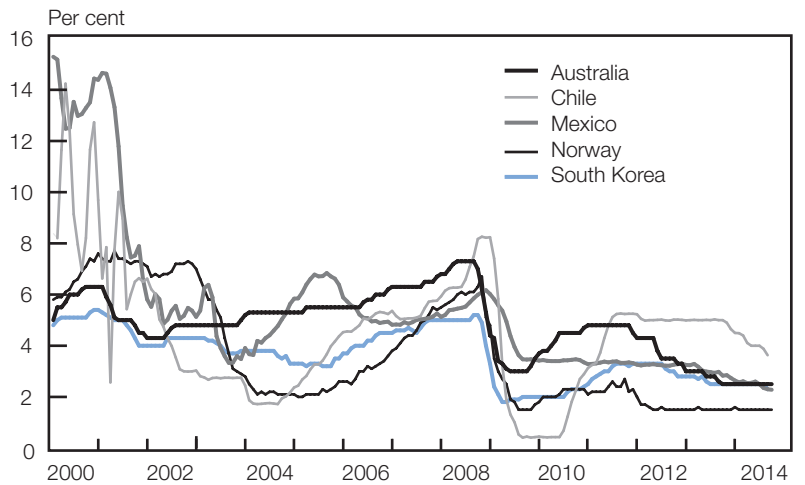
Source: OECD

In countries where the ZLB has been a major constraint, achieving inflation goals has been especially challenging. In response to shocks that lower inflation below the target, the ability to lower short-term rates and stimulate the economy and thereby inflation is curtailed at the zero lower bound. This has been an ongoing problem for Japan, contributing to an extraordinarily long period of deflation. Central banks have turned to unconventional policies to mitigate the constraint of the ZLB, but even with these interventions, inflation has been persistently running below target levels in several countries in the aftermath of the crisis.

Although most central banks in emerging-market economies and advanced economies rich in natural resources did not hit the ZLB during the recent episode, they did see interest rates reach very low levels in many cases. Historically, emerging-market economies have typically experienced relatively high nominal interest rates, reflecting higher inflation and higher real rates than in advanced economies. All else equal, this elevated level of average interest rates reduces the chance of hitting the ZLB. Figure 4 shows policy rates for Australia, Chile, Mexico, Norway and South Korea. In the cases of Chile and Norway, short-term rates did fall below 2 per cent for a time.

So, how important an issue is the ZLB likely to be in the future? Are the events of the past decade a harbinger of regular future bouts with the ZLB or an outlier that will not be repeated? The answer to that question may be best found by looking further into the past rather than focusing on recent history.

Figure 4: Short-term interest rates



Source: OECD

In considering the likelihood of another bout with the ZLB, one important factor is the probability of another severe recession of the kind the US and many other countries recently experienced.[4] If one tries to answer this question by looking at post-war US data before the financial crisis, one would conclude that such an outcome is highly unlikely. For example, in the 50 years before the crisis, there was no year in which US per capita real gross domestic product (GDP) fell by as much as it did in 2009 – the worst year of the recession. A statistical analysis of the US data over the 50 years prior to the crisis would lead one to expect a downturn of this magnitude or larger once every 430 years.[5] The data would show an even greater sense of complacency if one based this calculation solely on the 25 years leading up to the crisis – the so-called Great Moderation period. In that case, such a drop in output would be expected to occur only once every 33 000 years! This extremely optimistic prediction reflects the unusually tranquil quarter-century before the global financial crisis.

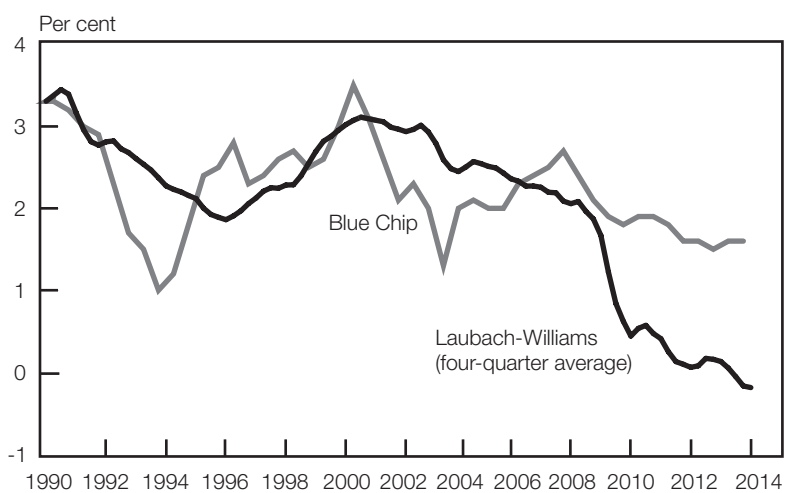
A very different conclusion is reached when one considers a broader view of historical experience. If, instead of concentrating on the US post-war experience, one includes the history of numerous countries over more than a century, then deep recessions are not that rare.[6] Specifically, analysis of data from 17 advanced countries over the past 140 years (1871–2012) shows a decline in per capita real GDP of the magnitude experienced in the US in 2009 occurs, on average, about once every 20 years. Using this metric, the recent

US recession is far from unprecedented or an outlier. A broad view of history teaches us that very large downturns are not only possible, they are common.

The point of this example is that the assessment of tail risks – and thereby the incidence of the ZLB – depends on the breadth of economic experiences that one considers relevant. Looking at broad international experience over a protracted period is likely to mute the overconfidence garnered by a more limited set of data points. It rejects the 'this time is different' view that downplays distant events, and instead treats a wide range of historical experience as potentially informative in describing the types of risks the future may hold.

A second factor influencing the incidence of ZLB episodes is the level of the normal or 'natural' real rate of interest expected to prevail over the foreseeable future. This is because the lower the natural rate of interest, the thinner the available cushion to lower rates when needed. A number of factors – including persistent changes in productivity growth, demographics, pricing of risk and fiscal policy – potentially affect the natural rate of interest. In my research with Thomas Laubach, we developed a statistical model that provides estimates of the natural rate of interest for the US.[7] Figure 5 shows these estimates, compared with the medium-term forecasts of the real federal funds rate from the 2014 Blue Chip Financial Forecasts survey.

Figure 5: Estimates of the US natural rate of interest



Source: OECD

Both the model-based and survey-based estimates of the medium-term natural rate of interest show significant declines since the onset of the global financial crisis. It is too early to judge whether this downward shift in the natural rate will endure. However, if it does, then it raises the specter of the ZLB being a more frequent problem than in past decades when the natural rate of interest was higher.

In summary, based on the broader historical experience and potential for a lower level of the natural rate of interest, the ZLB is likely to be a recurring issue for central banks that target low levels of inflation. This analysis has focused on advanced economies, particularly the US. Although most emerging-market economies have not yet been constrained by the ZLB, this situation may change. Looking to the future, circumstances may be different – commodity prices may not be booming as they did during the global financial crisis, and global growth trends and real interest rates may be lower – with the result that the ZLB may become a more palpable constraint on monetary policy, even in emerging-market economies.

2.2. A monetary policy mandate for financial stability?

The second challenge concerns the appropriate role for monetary policy in sustaining a stable financial system. From the beginning, the inflation-targeting approach has focused on a single outcome: price stability. As I have argued, according to this measure, inflation targeting has been an unmitigated success. But the global financial crisis has called into question whether a singular focus on price stability suffices, and some have argued that monetary policy should be directed at minimising risks to financial stability as well.

In this regard, it is important to recall that the near single-mindedness regarding the nominal anchor was originally seen as a virtue, not a vice. Muddying the waters by adding concern for financial stability was typically viewed as a potentially dangerous distraction, risking policymakers' attention to, and credibility in, maintaining price stability. Indeed, this attitude was codified in numerous central bank charters, which in some cases dictated consequences if the inflation goal was not met.

To be sure, the elevation of financial stability concerns at central banks and other regulatory agencies is a natural and appropriate reaction to the events of the global financial crisis, when the near meltdown of the financial systems in many countries almost toppled the global economy. Even with the dramatic – and in many cases, unprecedented – actions of governments and central

banks, the fallout from the financial crisis has been greater and longer-lasting than had been experienced in generations. In fact, this renewed concern for financial stability represents more a return to the roots of central banking than new-age thinking. After all, the US Fed was created from the ashes of the panics and resulting depressions that tormented the US economy in the late 19th and early 20th centuries.

It has become a mantra in central banking that robust micro- and macroprudential regulatory and supervisory policies should provide the first and second lines of defense for financial stability. Still, some are concerned that is not enough and call for including a financial stability goal in the monetary policy mandate as well. Doing so, however, raises the important issue of how one commits to taking financial stability into account while simultaneously preserving the nominal anchor. If financial stability and price stability goals are in conflict, there is a risk that price stability will be subordinated to the financial stability goal, with serious long-run consequences for economic performance.

This issue of the appropriate role of monetary policy in fostering financial stability at the potential cost to inflation goals has been playing out in policy debates and decision in two Scandinavian countries: Norway and Sweden. In discussing these examples, let me be absolutely clear that I am not judging the wisdom of these decisions. Rather, they provide useful case studies of the possible tradeoffs between financial stability and inflation goals that we can and should learn from.

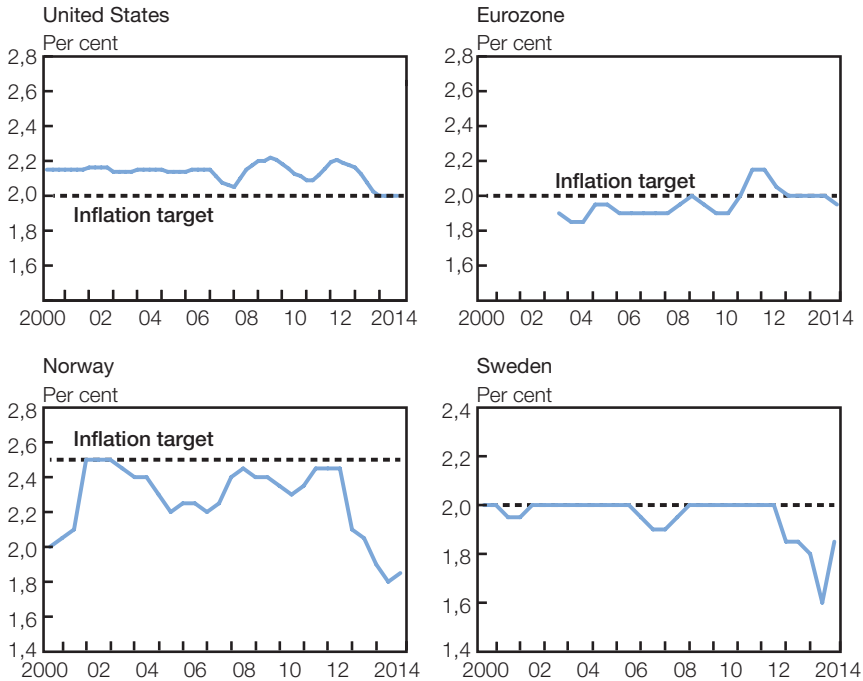
Take the case of Sweden. As background, Sweden's economy has experienced inflation persistently below target, while at the same time, household debt and house prices have grown enormously. In response to the growing level of debt and the potential risks to financial stability it entailed, the Sveriges Riksbank undertook a somewhat tighter stance of monetary policy than it would otherwise have, were it based purely on macroeconomic conditions. The predicted result was a more gradual return to inflation and unemployment goals (Sveriges Riksbank 2014a: 17). Similarly, in Norway the Norges Bank framed a recent policy decision as follows: "Both the objective of keeping consumer price inflation close to 2.5% and the objective of sustaining capacity utilization in the years ahead could in isolation imply a somewhat lower key policy rate forecast. … On the other hand, a lower key policy rate may increase the risk of a further buildup of financial imbalances" (Norges Bank 2014: 16).

These examples illustrate the tradeoff between price and macroeconomic goals on the one hand, and financial stability goals on the other, when using monetary policy to mitigate risks to financial stability. For example, Lars Svensson (2013, and references therein) uses model simulations to show that the monetary policy actions of the Riksbank, based on a concern for financial stability, have induced a significantly higher rate of unemployment and a sustained shortfall of inflation relative to its target. He goes on to argue that the policy, by reducing income, has actually increased the already high household debt-to-income ratio, potentially exacerbating financial stability risks.

These calculations focus on the short-run costs of these policies; the more significant issue is whether concern for financial stability undermines the nominal anchor. If the central bank actions aimed at addressing financial stability risks are large and persistent, the inflation rate will likely deviate from target for many years. The protracted failure to deliver on the inflation objective could undermine the credibility of the central bank's commitment to its inflation target and unmoor inflation expectations.

In this regard, it is instructive to examine the behaviour of inflation expectations in Norway and Sweden. Figure 6, based on Levin (2014), shows survey data on longer-run measures of inflation expectations for the US, the euro area, Norway and Sweden. Longer-run inflation expectations have remained very stable in the US and euro area, despite the tumult of the global financial and euro crises and the subsequent aggressive monetary policy undertaken by the US Fed and the ECB. In contrast, Norway and Sweden saw some slippage in long-run inflation expectations below target levels, based on this survey.[8] This follows a long period of realised inflation averaging below-target levels and central bank communication that financial stability concerns have been affecting policy decisions. Interestingly, the Riksbank cut the policy rate in July 2014, arguing that "expansionary monetary policy can also contribute to inflation expectations remaining anchored around 2 per cent by sending a clear signal that monetary policy will ensure that inflation approaches the inflation target within the reasonably near future" (Sveriges Riksbank 2014b). Subsequently, longer-run inflation expectations bounced back, as seen in the figure.

Figure 6: Longer-run inflation expectations



Note: Each panel depicts the central bank's inflation target with a dashed black line and the evolution of inflation expectations with a solid blue line. Inflation expections for non-US countries is defined as the average of the last two semi-annual Consensus Forecast surveys of CPI inflation projections 6 to 10 years ahead. Inflation expections for the United States for 2007 and after is the 4-quarter average of the 10 year PCEPI inflation forecast from the quarterly Survey of Professional Forecasters (SPF) and an adjusted 10-year CPI inflation forecast from the SPF prior to 2007.

So far, it is unclear how durable a slippage in inflation expectations resulting from a focus on financial stability concerns will prove to be. Nonetheless, it is an apt reminder of the potential long-run costs of losing sight of the price stability mandate. The steadfastness of the nominal anchor in most advanced economies has been, and continues to be, a key factor in many central banks' ability to maintain low and stable inflation during and after the global financial crisis. It was forged over many years of consistent commitment to price stability and successfully taming the inflation dragon. If the anchor were to slip, it would wreak lasting damage to a central bank's control over both inflation and economic activity, at considerable cost to the economy. This applies equally to deviations above and below the target.

3. Inflation Targeting 2.0

The two challenges that I have highlighted – the ZLB and the role of monetary policy in support of financial stability – are not entirely new, but the events of the past seven years have highlighted their importance for central banks. Much of the research and discussion has been centered on how to adapt the existing monetary policy framework to account for and mitigate the negative effects of these issues. For example, real-world experience with the ZLB has led to the development and use of various unconventional policy approaches such as forward policy guidance and variations on using the central bank's balance sheet to affect financial conditions.[9] Similarly, recognising the need for a more resilient financial system has led to the introduction of stronger and more comprehensive micro- and macroprudential regulations and supervision.

Beyond adapting inflation targeting to these realities, there remains the question of whether the inflation-targeting framework itself should be modified or replaced by a new regime better suited to deal with the ZLB and financial stability concerns. Given the limitations and costs of using unconventional policies and the residual risks to the financial system even with stronger regulation, is there an alternative approach to monetary policy that may engender more favourable tradeoffs? In other words, after 25 years of inflation targeting, is it time for a reboot to Inflation Targeting 2.0? In the following, I am not advocating any particular position; rather I am highlighting some research on alternative approaches to inflation targeting that may have advantages with respect to the ZLB and financial stability.

Two closely related alternatives to inflation targeting have been proposed: price-level targeting and nominal income targeting. Under price-level targeting, the central bank aims to keep the price level on a predetermined growing path. It differs from inflation targeting in that past deviations from the target rate of inflation must be made up by offsetting deviations in the other direction. Nominal income targeting is similar, but posits a deterministic growing path of nominal GDP that the central bank aims to achieve. In the following, I first consider the merits of price-level targeting and then turn to nominal income targeting.

In theory, price-level and inflation targeting are close cousins, with relatively little to distinguish them in terms of macroeconomic outcomes in 'normal' times (Williams 2003). Both approaches aim for a low average rate of inflation and put price stability front and center as a goal of monetary policy. However,

price-level targeting possesses some potential advantages over inflation targeting in mitigating both the economic repercussions of the ZLB and risks to financial stability.

The difference between price-level and inflation targeting really shows up in situations of negative shocks to the economy when inflation falls well below the targeted level. With inflation targeting, monetary policy acts to bring inflation back to the target level, with past misses below target ignored: that is, bygones are bygones. In contrast, price-level targeting requires more aggressive monetary policy action that promises future above-target inflation needed to bring the price level back up to its desired path. This promise of sustained future monetary stimulus provides a powerful pull on an economy experiencing disinflationary pressures, even in the presence of the ZLB. Indeed, according to model-based research, a price-level targeting central bank can, in theory, successfully target a very low trend inflation rate with very little cost in terms of macroeconomic stabilisation resulting from the ZLB (Reifschneider and Williams 2000, Svensson 2001, Eggertsson and Woodford 2003, and Williams 2006).

Price-level targeting also has potential positive attributes related to financial stability. Because debt contracts are typically written in nominal terms, a period of unexpectedly low inflation or even deflation causes the real value of debt to rise relative to expectations when the contract was signed. This can contribute to a weakening of households', businesses' and banks' balance sheets, resulting in a decline in economic activity and greater stress in the financial system. Under inflation targeting, the increase in the real value of debt is not reversed. In contrast, if the central bank acts to keep overall prices on a steady growth path, then episodes of excessively low inflation or deflation are eventually reversed, mitigating this type of debt deflation problem and the deadweight losses and disruptive effects associated with foreclosure and bankruptcy. In this way, price-level targeting has the potential to reduce the risks to the financial system and spillovers to the economy from debt-fuelled booms.

Nominal income targeting takes these arguments a step further. Instead of a price path that sets the goal for policy, it is a path for nominal GDP. In terms of the ZLB, nominal GDP targeting shares the advantage of price-level targeting. Specifically, it promises higher inflation in the future following a period of low inflation that helps dampen deflationary pressures. On the financial stability front, it may be an even more powerful deterrent to debt-fuelled crashes. If aggregate nominal income is kept close to a steady growth path, then on the aggregate, incomes will not fall as much during a

downturn, allowing people to continue to repay their loans and avoid default and bankruptcy (Koenig 2013 and Sheedy 2014).

These potential benefits of price-level and nominal income targeting are worthy of further careful study and discussion. It is too early to judge whether one approach or the other would provide a better framework than inflation targeting. In contemplating a shift away from inflation targeting, it is crucial to consider what unintended negative consequences these approaches might entail. For example, nominal income targeting could generate persistent deviations of inflation from target, which may interfere with the credible communication of the price stability objective. There are also practical considerations in the communication of policy decisions and goals that need to be fully analysed. In weighing all the potential advantages, disadvantages and risks of these and other alternative approaches, it is absolutely essential that any modification of approach not undermine the hard-fought achievement of price stability and well-anchored inflation expectations that have been of great benefit, especially during the recent challenging economic times.

Notes

1 See Kuttner (2004) for a concise summary of the history of inflation targeting and its spread across the globe.

2 Milton Friedman is widely credited with coining the phrase 'we are all Keynesians now' back in the mid-1960s.

3 Numerous treatises have been written on inflation targeting. See, for example, Leiderman and Svensson (1995), Bernanke and Mishkin (1997), Bernanke et al. (1999), and citations therein.

4 This discussion is based on Williams (2014).

5 This calculation is taken from Williams (2014). It assumes the variance of the growth rate is set equal to that observed in the US data over the period 1958–2007 and that the distribution of outcomes is normally and independently distributed.

6 Following Jordà, Schularick and Taylor (2011), the data are taken from Barro and Ursúa (2010), and updated for 2007–2012 using data from the World Bank. For the US, data for 1930–2012 are the current national income and product accounts data from the Bureau of Economic Analysis. The countries in the sample are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the US.

7 Laubach and Williams (2003).

8 I should note that other surveys show smaller downward movements in long-run inflation expectations. See Norges Bank (2014) and Sveriges Riksbank (2014a).

9 See Williams (2013) for a discussion.

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Labour market and monetary policy in South Africa

Vincent Dadam and Nicola Viegi

Abstract

This paper analyses the influence of the South African labour market on the conduct of monetary policy. Because of the weak response of wages to changes in employment, the South African Reserve Bank is confronted by an unfavourable short-run unemployment–inflation tradeoff that complicates the implementation of the inflation-targeting framework. First, we provide some reduced-form evidence by estimating a form of the traditional wage Phillips curve, showing the weak relationship between wage dynamics and unemployment in South Africa. We then confirm this result by presenting an estimation of a structural model of the South African economy and give a quantitative assessment of the constraint imposed by the labour market on monetary policy. Finally, we interpret these results in a strategic framework, analysing the role that inflation targeting might play in either improving coordination or worsening the conflict between the trade unions and the central bank.

> "The MPC is also increasingly concerned about the inflation outlook, and the further upside risks to the forecast. Although the exchange rate remains a key factor in this regard, the possibility of a wage-price spiral should wage settlements well in excess of inflation and productivity growth become an economy-wide norm has increased". – Monetary Policy Committee statement, 17 July 2014.

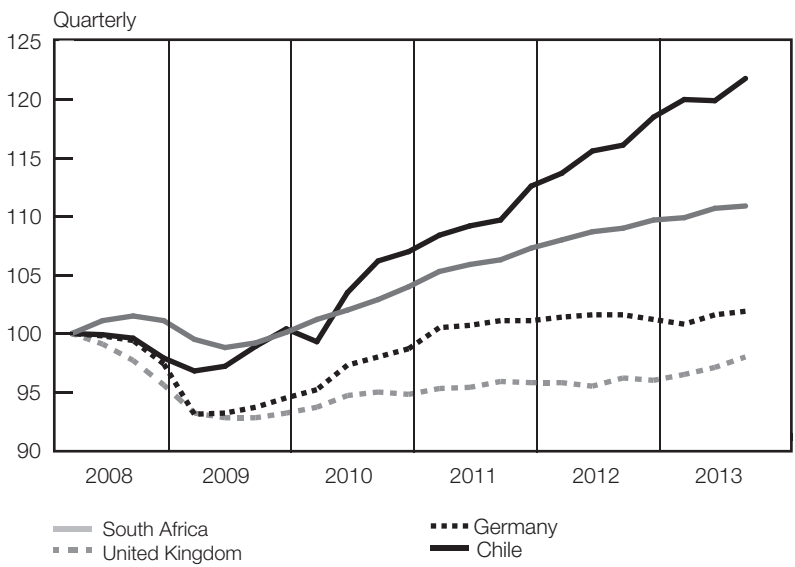
1. Introduction

Unemployment is the defining characteristic of the South African economy. For the past 20 years, the unemployment rate, in its narrow definition, has fluctuated around 25 per cent without any significant and permanent reduction. Unemployment is characterised as largely young, unskilled and African, and its dimension and persistence are a source of uncertainty and instability. The dimension of the problem has generated a large academic and political literature studying its determinants and characteristics (Kingdon 2000, Banerjee et al. 2008). This literature sees the rise of unemployment in South Africa as a combination of structural changes in labour demand with an increase in capital intensity and skills-biased technical progress, and institutional constraints on the labour-supply side, especially downward

rigidities of wages due to bargaining institutions and relatively high reservation wages.

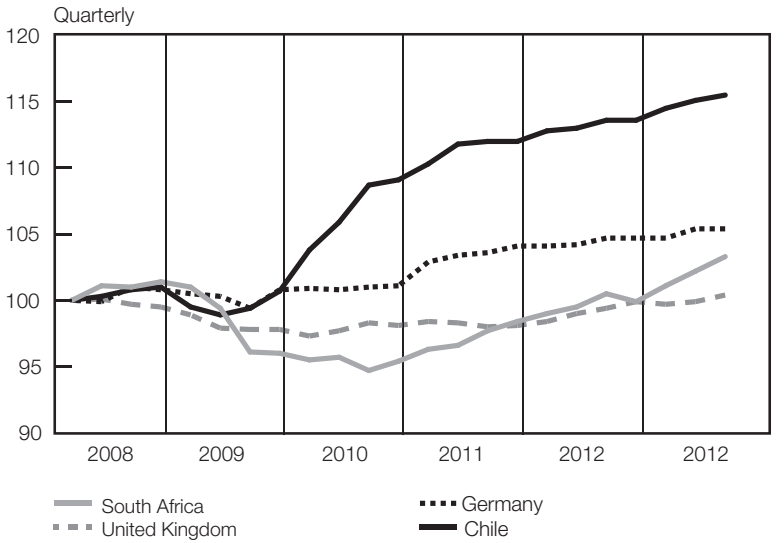
What has been missing from the debate is an analysis of the consequences of these structural characteristics of the labour market at the business cycle frequencies. The South African economy's response to the 2007 international financial crisis has given the strongest evidence yet of the relevance of the labour market in determining the response of the economy to external shocks. To give an indication of how peculiar the response of the South African economy to the financial crisis has been, figures 1 and 2 show the gross domestic product (GDP) and employment response to the financial crisis of Germany, the United Kingdom, South Africa and Chile respectively.

Figure 1: GDP in selected countries, 2008–2013



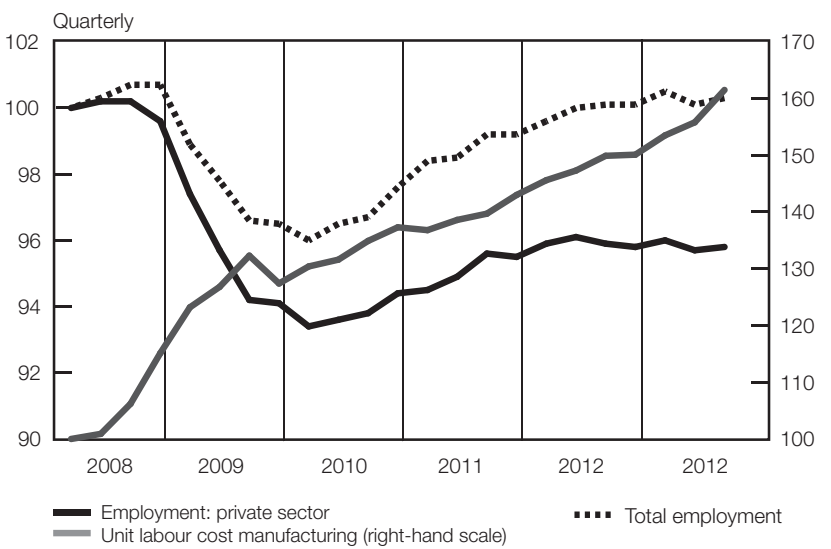
The shaded area represents the United States' recession period. South Africa has the best GDP performance after Chile, showing that the financial crisis had a limited impact on the South African economy. Instead, the employment response has been dramatic and persistent, and much worse that any other country considered.

Figure 2: Employment in selected countries, 2008–2013



The reason of this dismal employment performance can be found in the contemporaneous dynamic of the labour cost, which increased sharply at the beginning of the recession, as shown in Figure 3.

Figure 3: Employment and labour cost in South Africa, 2008–2013



This event highlighted two issues in relation to the South African economy: the first issue is that while unemployment is a large structural phenomenon, there is a large dynamic of job destruction and, to a lesser extent, of job creation that needs to be understood more clearly if we want to dent the long-term structural problem in a reasonable time. This has already been highlighted by the labour market literature, in particular Banerjee et al. (2008) and Kerr et al. (2013) in some preliminary work on the formal economy. The second issue, and the main theme of this paper, is that wages do not respond strongly to labour market conditions, which has important implications for the efficiency of monetary policy and the working of the inflation-targeting regime.

The paper is organised as follows: the next section will give a first evaluation of the responsiveness of wage to macroeconomic conditions using a wage Phillips curve framework recently introduced by Galí (2011) in the context of a microfunded New Keynesian model. Section 3 confirms some of the results of section 2 in an estimation for the South African economy of a prototype dynamic stochastic general equilibrium (DSGE) model with unemployment. It will also be shown in this context how the characteristics of the labour market limit the ability of the monetary policy to control the economy. In section 4 we move to a more normative analysis, framing the conflict between monetary policy objectives and labour market institutions in a strategic setting. The final section concludes and suggests further areas of research.

2. Wages in South Africa

The negative relationship between the rate of change of wages and the unemployment rate has been central to our intuition about the functioning of the economy, at least from the seminal article by William Phillips on 'The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957 (Phillips 1958). Although most of the subsequent work concentrated on the relationship between price inflation and unemployment in a non-accelerating inflation rate of unemployment (NAIRU) setting, recent New Keynesian literature (for example Erceg, Henderson and Levin 2000, Galí 2013, and Galí and Monacelli 2014) has refocused our attention on the nominal wage–unemployment relationship and has shown that monetary policy efficiency depends critically on the responsiveness of wages and prices to changes in aggregate demand. A change in nominal wages affects employment because of its effect on firm marginal cost and, given the monopolistic competitive market structure, on price inflation. The inflationary effect of wage increases induces a contractionary monetary response, which causes a reduction in employment. The cost of adjustment will be higher the

less sensitive wage dynamics are to demand conditions. Consequently, if wages are very responsive to employment conditions, monetary policy can reduce inflationary pressures on the economy by a relatively small contraction in demand. Conversely, if wages are not very responsive to demand conditions, the potential sacrifice ratio of a contractionary monetary policy can be very significant.

Given this premise, our aim is to evaluate the sensitivity of wage determination in South Africa to employment conditions by estimating a wage Phillips curve, as in Galí (2011) who derives a reduced-form Phillips curve relationship from a microfunded model with wage and price rigidities.[1] The reduced form to be estimated is the following:

$$\pi_t^{\omega} = \alpha + \gamma \bar{\pi}_{t-1}^{p} + \psi_0 \hat{u}_t + \psi_1 \hat{u}_{t-1} + \vartheta_t \quad (1)$$

where π_t^{ω} is nominal wage inflation, $\bar{\pi}_{t-1}^{p}$ is the previous period price inflation that proxies for inflation expectations, $\hat{u}_t$ represents deviations of unemployment from the flexible price natural rate and ϑ_t is a zero mean, possibly autocorrelated, error term. Equation (1) is derived assuming that the deviation of unemployment from the flexible price natural rate is well represented by a stationary autoregressive process of order 2 or AR(2) process:

$$\hat{u}_t = \phi_1 \hat{u}_{t-1} + \phi_2 \hat{u}_{t-2} + \varepsilon_t \quad (2)$$

The estimation of this simple system of relationships is made complex by the need to find a correct data representation of π_t^{ω} and $\hat{u}_t$ for South Africa. Labour market data in South Africa are notoriously not very reliable and subjected to extensive changes in definition. We use a large set of different variables and different definitions of labour market conditions. The baseline specification includes the consumer price index (CPI) as a measure of price inflation and two alternative sources of wage data, namely the remuneration in the private sector, excluding non-agricultural sectors, and unit labour costs in manufacturing. Wage inflation is measured as the centered four-quarter difference of the log nominal wage expressed in percentage terms. The same applies for price inflation. The cyclical unemployment measure, as a difference from the mean, is really usable only from the first quarter of 2000 to the first quarter of 2014. To have a longer specification, we need to substitute the unemployment measure with more reliable employment measures, in particular private-sector employment and manufacturing employment. The private-sector employment has gone through a series of revisions and the data are not always comparable through time. Nevertheless, we try to statistically reduce the effect of these distortions. Manufacturing

employment is the most reliable measure, but it is only a proxy for the overall labour market conditions. The employment variables are detrended using the Hodrick–Prescott filter to analyse variable unemployment as its deviation from the steady state value, while the unemployment series is demeaned of the average value of a 25 per cent unemployment rate, which we implicitly assume is the natural rate of unemployment.[2]

Before introducing the regression analysis, it is worth having a quick look at the data to be used in equation (1). The basic hypothesis common with the old Phillips curve specification is that there is a negative relationship between wage inflation and unemployment. In Figure 4 this relationship is displayed for the period 2000–2014. There are two scatter plots of wage inflation and unemployment to check if such a relationship applies in the case of South Africa.

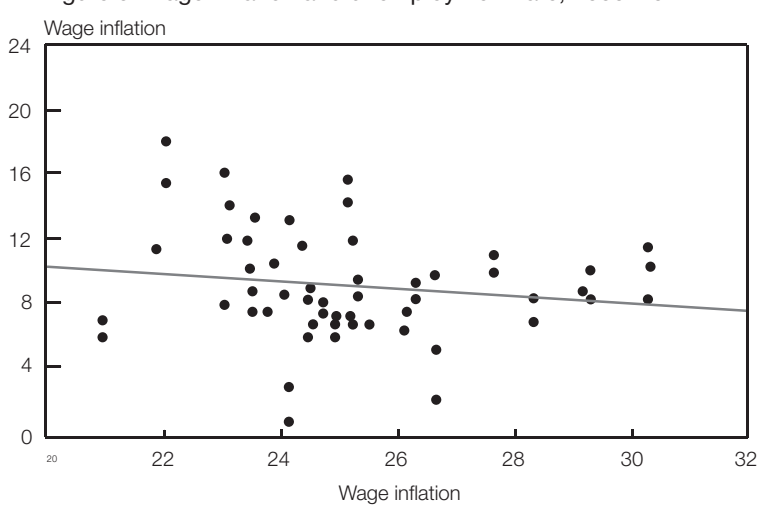
Figure 4: Private-sector wage inflation and unemployment, 2000–2014

The relationship immediately appears to be quite weak. This could be due to the specific definition of unemployment used in South Africa. As argued by Banerjee et al. (2008), many of the changes in the employment rate observed are accounted for by a change in the labour participation rate. Thus, a positive relationship between wage inflation and the employment rate could be more revealing. Figure 5 shows the relationship between wage inflation and manufacturing employment between 1971 and 2014.

Figure 5: Private-sector wage inflation and manufacturing employment, 1971–2014

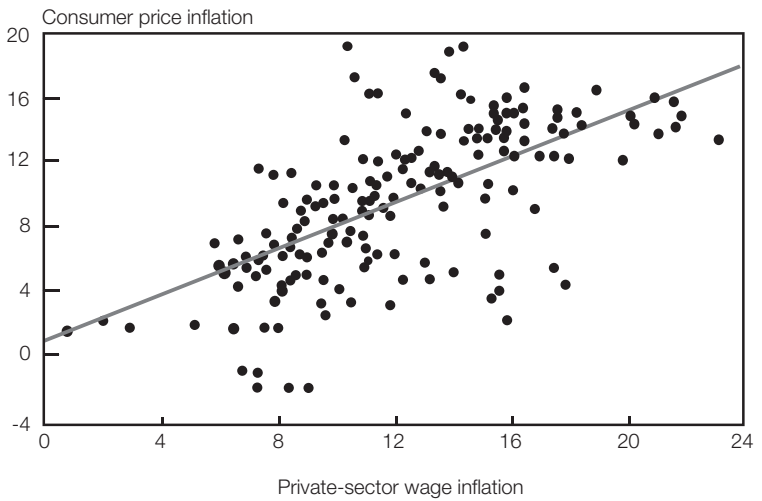
The positive relationship between wage inflation and employment seems much more promising, as is the relationship between wage inflation and total private employment. Less promising is the same relationship once viewed from the point of view of the inflation-targeting period 2000–2014, as shown in Figure 6.

Figure 6: Wage inflation and unemployment rate, 2000–2014



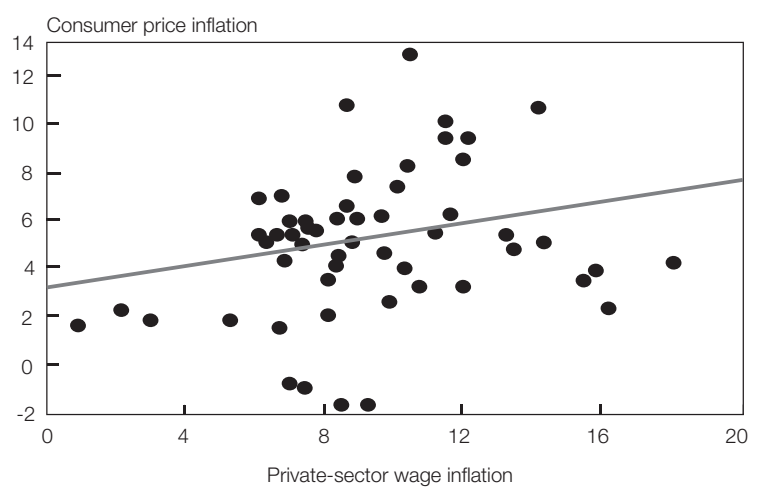
The final relationship in equation (1) is the one between wage inflation and price inflation. Historically, the relationship appears very strong, as shown below.

Figure 7: Consumer price inflation and private-sector wage inflation, 2000–2014



The relationship appears to weaken during the inflation-targeting period, which is to be expected if monetary policy tries to insulate the overall price level from a change in the relative price of labour.

Figure 8: Consumer price inflation and private-sector wage inflation, 2000–2014



Conversely, there seems to be a strong correlation between wage inflation and inflation expectations of trade unions as recorded by the Bureau for Economic Research (BER), a fact that gives some indication that controlling inflation expectations might still be the most direct way to control wage dynamics.

Figure 9: One-year-ahead inflation expectations (trade unions) and private-sector wage inflation, 2000–2014

2.1 Estimation results

The tables that follow report the ordinary least squares (OLS) estimates of several specifications of the New Keynesian Wage Phillips Curve, each specification being a restricted version of equation (1). The standards errors are reported in brackets. In Table 1, columns 1 and 2 report the traditional Phillips curve relationship between employment and wage inflation for the whole sample in column 1 and for the post-1994 subsample in column 2. In columns 3 and 4, the results of introducing past inflation in the specification is reported and, finally, in columns 5 and 6 the full specification of equation (1) is reported. The relationship between wage inflation and employment is clearly weak and getting weaker according to the most recent sample. Nominal wages and inflation have a strong and robust relationship, which is also quantitatively weaker in the second sample.

Table 1: Estimated wage inflation: private-sector wages

	(1)	(2)	(3)	(4)	(5)	(6)
	1970–2014	1994–2014	1970–2014	1994–2014	1970–2014	1994–2014
n_t	0,19***	0,07	0,13**	0,06	0,18**	0,11*
	(0,05)	(0,04)	(0,04)	(0,04)	(0,05)	(0,05)
n_{t-1}					-0,07	-0,06
					(0,05)	(0,05)
π_t			0,55***	0,25*	0,56***	0,27**
			(0,05)	(0,12)	(0,05)	(0,12)

*** denotes significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level.

The result is largely confirmed if a different measure of change of labour cost is used. In Table 2, the nominal unit labour cost inflation is used as a measure of wage changes, which has the advantage of separating the change in wages by contemporaneous changes in productivity. The results are actually more robust, and there is a stronger relationship between labour cost and employment conditions, even though this relationship seems to become weaker in the second sample.

Table 2: Estimated wage inflation: unit labour costs

	(1)	(2)	(3)	(4)	(5)	(6)
	1970–2014	1994–2014	1970–2014	1994–2014	1970–2014	1994–2014
n_t	0,36***	0,23***	0,28**	0,23***	0,39**	0,31***
	(0,07)	(0,05)	(0,05)	(0,05)	(0,07)	(0,07)
n_{t-1}					-0,15**	-0,12***
					(0,06)	(0,07)
π_{t-1}			0,74***	-0,04	0,75***	0,02***
			(0,07)	(0,15)	(0,07)	(0,15)

*** denotes significance at the 1 per cent level, ** at the 5 per cent level and * at the 10 per cent level

If only the inflation-targeting period is considered, we can use the official measure of unemployment to run the canonical Phillips curve relationship. Table 3 presents these results.

Table 3: Estimated wage inflation: private-sector wages

	(1)	(2)	(3)
	2000–2014	2000–2014	2000–2014
u_t	-0,31	-0,33*	-0,06
	(0,20)	(0,19)	(0,34)
u_{t-1}			-0,25
			(0,34)
π_{t-1}		-0,24**	0,23**
		(0,13)	(0,13)

.

The results are consistent with the previous analysis. The relationship between wage inflation and unemployment is significant only when inflation is added to the specification. The insignificance of the third specification is probably due to the fact that the correct specification for the unemployment rate is a stationary AR(1) model and not the assumed AR(2). Using this result, we finally substitute the inflation rate with the observed expected inflation of the trade union as recorded by the BER. Table 4 shows that this specification fits the data much better, highlighting the increasing importance of inflation expectations in the determination of wage inflation under the inflation-targeting regime.

Table 4: Estimated wage inflation

	(1)	(2)	(3)
	$E\pi_t$	$E\pi_{t+1}$	$E\pi_{t+2}$
u_t	-0,37**	-0,35**	-0,37**
	(0,18)	(0,19)	(0,18)
$E\pi$	0,73***	0,72***	0,82***
	(0,23)	(0,26)	(0,29)

2000 Q3–2013 Q4

In all cases, the analysis of the residual shows that wage inflation was particularly high just before and during the financial crisis, moderating only after 2010. Overall, the estimations imply a significant wage rigidity relative to either employment or unemployment conditions, and a certain sensitivity to inflation and inflation expectations. The next step is to verify these results in a structural estimation of a DSGE model with unemployment to link more directly these labour market conditions with the conduct of monetary policy.

3. Wage rigidity and the efficiency of monetary policy

To give further evidence of the characteristics of the South African labour market and to illustrate the relationship between labour market dynamics and monetary policy, this section presents an estimation for South Africa of a DSGE model with price rigidities, wage rigidities and unemployment, first developed by Blanchard and Galí (2010). There has been an increasing volume of research dedicated to developing models with non-Walrasian labour markets. Zanetti (2007) shows that a New Keynesian model with a non-Walrasian labour market can replicate most of the key aspects of the European business cycle. Moreover, the assumption of a non-Walrasian labour market has important implications for monetary policy. In particular, Blanchard and Galí (2010), Faia and Rossi (2013) and many others show that monetary policy should consider unemployment in their targeting variables and that inflation can be a way of reducing the inefficient unemployment fluctuations induced by unions' monopoly power.

Although this literature is certainly relevant for South Africa, at this stage we want only to use this modelling instrument to derive some quantitative evaluation of the level of South African labour market rigidities and to get some intuition of the constraints that these rigidities impose on monetary policy.

The advantage of this approach is that we can analyse directly the relationship between labour market parameters and monetary policy efficiency by relying on a minimum number of aggregate variables. In particular, only four observable variables are used in estimating the model: inflation, output, interest rates and manufacturing employment. In the development of the model, we follow a growing international literature that has introduced a search model of the labour market in the basic New Keynesian framework of monopolistic competition with price.The log-linear relationships of the model are shown below, while the complete derivation can be found in Dadam and Viegi (2014).

The supply function is represented by a Phillips curve relationship where inflation is determined by expected inflation and a past, present and expected unemployment rate, as:

$$\pi_t = \beta E_t\{\pi_{t+1}\} - K_0\hat{U}_t + K_L\hat{u}_{t-1} + K_F E_t\{\hat{u}_{t-1}\} - \lambda\Phi\gamma\hat{\alpha}_t \qquad (3)$$

where π_t is the inflation rate, $\hat{u}_t$ is the deviation of the unemployment rate from the flexible price natural rate of unemployment and $\hat{\alpha}_t$ is a productivity

indicator. The presence of unemployment directly in the Phillips curve, instead of the output gap, is due to the fact that the firm marginal cost is directly dependent on the labour market tightness. The model also derives a proportional relationship between employment $\hat{n}_t$ and unemployment:

$$\hat{u}_t = -(1 - u)\,\hat{n}_t \tag{4}$$

where u is the natural rate of unemployment. Because of the search model background, an important component of the model is the definition of labour market tightness as a function of current and lagged employment:

$$\delta\hat{x}_t = \hat{n}_t - (1 - \delta)\,(1 - x)\hat{n}_{t-1} \tag{5}$$

The demand block of the model comprises an expression for aggregate consumption, function of productivity, employment and labour market tightness:

$$\hat{c}_t = \hat{a}_t + \frac{1 - g}{1 - \delta g}\,\hat{n}_{t-1} + \frac{g(1 - \delta)}{1 - \delta g}\,\hat{n}_{t-1} - \frac{\alpha g}{1 - \delta g}\,\delta x_t$$

and the usual Euler equation for consumption:

$$\hat{c}_t = E_t\{\hat{c}_{t+1}\} - (i_t - E_t\{\pi_{t+1}\} - \rho$$

Finally, a Taylor rule specification defines the conduct of monetary policy and closes the model:

$$i = \rho + \phi_\pi \pi_t + \phi_c c_t + \phi_u u_t$$

3.1 Simulation

Before providing the South Africa estimation of the model, the response of the model to a monetary policy shock is analysed to develop some intuition that will result useful in evaluating the meaning of the estimation results for South Africa. The model implies the following relationship between long-term unemployment u, labour market tightness x, which is defined as the ratio of aggregate hires to unemployment, and an exogenous separation rate δ.

$$u = \frac{\delta(1 - x)}{\delta(1 - x) + x} \tag{6}$$

This relationship can be used to define four typologies of labour markets.

The first type of labour market is characterised by a low level of entry and exit and a low long-term unemployment rate (rigid-low). In this market, flows are low because a low separation rate is coupled with a low level of aggregate hires, but the steady state unemployment is low because aggregate hires are relatively more that the exogenous separation rate. A possible example of this kind of market is central and north Europe, where job security and relatively rigid labour market rules coexist with a low level of structural unemployment. In our simulations we assume the folowing parameterisation for this market: $u = 0{,}05$, $x = 0{,}15$ and $\delta = 0{,}01$.

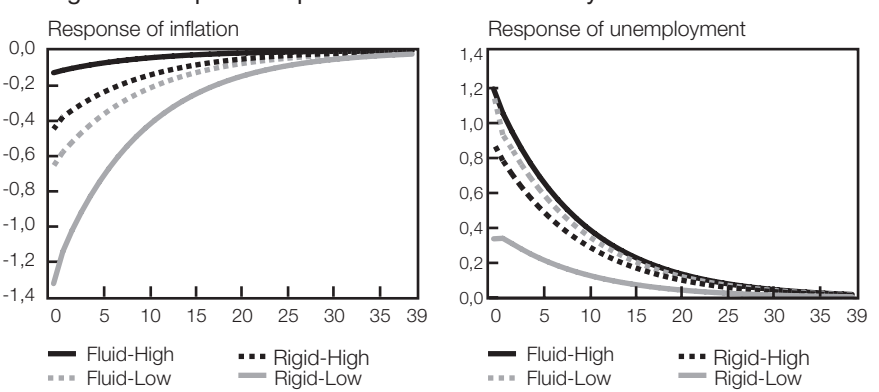
The second type of labour market is still a rigid labour market with a low level of aggregate hires, but with a higher separation rate that produces a high level of structural unemployment (rigid-high). A possible example of this kind of market is the labour market in south Europe, where a rigid labour market generates a low level of job creation and high structural unemployment. In our simulation we assume the following parametrisation for this labour market: $u = 0{,}25$, $x = 0{,}15$ and $\delta = 0{,}075$. This scenario differs from the previous one on the level of steady state unemployment, which we assume in this scenario to be quite high, and also produce large flows of job creation and job destruction, but with a job creation dynamic dominating the determination of a low structural unemployment (fluid-low). The United States is often presented as an example of this kind of labour market. To simulate this market we use the following parametisation: $u = 0{,}05$, $x = 0{,}8$ and $\delta = 0{,}21$.

Finally, the fourth type of labour market is characterised by a high flow of job creation and job destruction, but where job destruction dominates the dynamic, producing a high level of structural unemployment (fluid-high). We see in the analysis that South Africa is a good example of this kind of labour market. The parametisation for this case will be the following: $u = 0{,}25$, $x = 0{,}67$ and $\delta = 0{,}87$.

In each scenario, we simulate a monetary shock on the economy. The shock is an AR(1) processes with an autoregressive coefficient of 0,9. The general effects of the shock are in line with the standard New Keynesian DSGE model (see for instance Galí et al. 2011). What changes about this model are the effects on inflation and unemployment at different levels of labour market rigidity. Therefore, we are only reporting the quantitative effects of a monetary shock on these two variables. We also assume that the central banker uses a simple Taylor rule with elasticity parameters taking the following standard values: $\phi_\pi = 1{,}5$, $\phi_c = 0{,}5$ and $\phi_u = 0$.

Figure 10 summarises the response of inflation (left-hand panel) and unemployment (right-hand panel) to a monetary shock. In all four scenarios, inflation takes a long time to converge to the initial level as the shock dies out. First, let us focus on the two extremes: scenario 1 (rigid-low) and scenario 4 (fluid-high). The monetary authority's instrument has barely any effect on inflation in the fluid-high set-up as inflation drops to 0,2 per cent (the lowest drop). However, this low drop is compensated by a greater effect on unemployment (on the right-hand panel). By contrast, in the rigid-low setting we report a complete opposite result. In scenario 1, the results therefore show that given the low level of a steady state unemployment prevailing in the economy, the monetary authority works hard to stabilise inflation, hence the high response. This decision may come at a cost – a slight increase of about 0,28 per cent in unemployment – given that there is no 'divine coincidence', an expression introduced by Blanchard and Galí (2010) to characterise a situation when stabilising output (inflation) may result in volatile inflation (output). In scenario 4 – arguably the worse scenario – where much has to be done on both unemployment and inflation sides, the central banker is powerless in front of the inflation, whereas only unemployment can be affected. To make things even worse, the choices of the central banker tend to only increase the already high level of steady state unemployment (by 1,2 per cent).

Figure 10: Impulse response functions: monetary shock



3.2 Estimation

Which kind of labour market is South Africa, and thus what is the tradeoff between unemployment and inflation that the South African Reserve Bank faces? To find out, we estimate the model with Bayesian methods. The model is estimated using the following quarterly variables for the period 1994–2014: inflation, output, interest rates and manufacturing employment.

We use the first logarithmic difference of South Africa's CPI as a measure of inflation. Output is captured by real GDP. Employment is measured by the index of employment in the manufacturing sector. We analyse output and employment variables in terms of their deviation from the trends extracted by using the Hodrick–Prescott filter. We focus only on estimating parameters that are related to the labour market, calibrating the other parameters using a previous South African estimation of DSGE or the international literature. Finally, we assume a steady state unemployment rate of 23 per cent. The results are reported in the table below.

Table 5: Estimation results

Parameters		Prior	Prior	Prior	Post	Post
		Mean	Density	Mode	Mean	Standard deviation
Taylor rule weights						
Inflation	ϕ_π	1,5	N	2,16	2,17	0,15
Output gap	ϕ_c	0,125	N	0,13	0,13	0,03
Unemployment	ϕ_u	0	N	-0,013	-0,003	0,02
Structural parameters						
Wage rigidity	γ	0,5	B	0,95	0,86	0,25
Labour market tightness	x	0,5	B	0,66	0,72	0,13
Elasticity of hiring cost.....	α	0,9	B	1	0,91	0,12
Level of hiring cost	B	0,2	B	0,0025	0,16	0,2
Persistence parameters						
Productivity.....	ρ_a	0,8	B	0,98	0,81	0,2
Preferences.....	ρ_d	0,8	B	0,99	0,99	0,2
Labour	ρ_l	0,8	B	0,52	0,85	0,2
Monetary	ρ_m	0,8	B	0,99	0,99	0,2

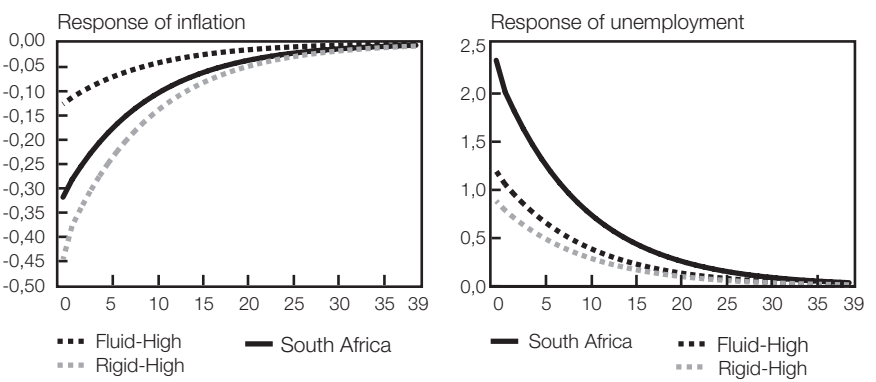
Note: Letters B and N denote 'beta' and 'Normal distributions' respectively

The estimation of the labour market parameters show a picture of a labour market with pervasive wage rigidities and a high level of job distruction only partly compensated by job creation. We estimate the labour market tightness index x at 0,72, implying a separation rate of 0,77. This means that South Africa has a labour market with large flows of job creation and job destruction during the business cycle, with job destruction dominating the dynamics. As shown in the simulations before, this scenario is the one that gives the worst sacrifice ratio to a monetary policy shock.

We also estimate the parameters of the Taylor rule, which indicates the dominance of the inflation objective in determining monetary policy. This just confirms what has been largely found in the literature.

Now that we have parameter estimates, we can recalibrate the model and analyse the effect of a monetary policy shock to evaluate the sensitivity of inflation and output to monetary policy. The impulse response of inflation and the output to a monetary policy shock are represented by the solid black line in Figure 11 below. The model shows a very high real response to monetary policy shock relative to the inflation response. This implies that inflation stabilisation in South Africa requires a large negative employment response.

Figure 11: Impulse responses: monetary policy shock



This result is consistent with our reduced-form estimation in section 2. In fact, if wages are not very responsive to employment conditions, monetary policy can stabilise inflation by inducing large changes in aggregate demand which will induce large changes in employment. The feasibility of this policy will depend critically on the objective function of the central bank and on the strategic interaction between the central bank and the labour market participants.

4. Inflation targeting and monetary policy leadership

Certainly the picture presented does not conform to an institutional model where the central bank has policy leadership relative to labour market participants. This fact has implications for the implementation of the inflation-targeting framework. As illustrated in Demertzis and Viegi (2008), inflation targeting works by providing a focal point to private-sector expectations, which are the final determinant of the economic dynamics. Thus, a credible monetary policy anchors inflation expectations and, in doing so, it constraints wage determination, fiscal policy, credit dynamics, and so forth. For this reason, we spend a lot of time and resources recording inflation expectations and checking if inflation expectations are anchored. The assumption is that the anchoring of expectations is a sufficient signal to predict how wages and prices will be set. In South Africa, we are quite satisfied that inflation expectations, although anchored at the upper bound of the target band, look sufficiently anchored (Kabundi et al. 2014) and we know that the South African Reserve Bank is a credible and independent institution. Nevertheless, this does not necessarily provide leadership in the policy space.

Two further conditions are required: the first condition is that the objective function of the would-be follower must be sensitive to the threat posed by the leader (Acocella et al. 2008). Inflation targeting is an effective framework against excessive wage demands if trade unions are either worried by the employment cost of inflation stabilisation, or worried by inflation itself.

The second condition is that for the central bank to be leader in the policy game “there must be some incentives over and above those arising from the corresponding Nash solution” (Holly and Hughes Hallett 1989: 190). The meaning of this second condition is worth considering more carefully. The leadership of the central bank is guaranteed only if it is incentive-compatible for the trade unions to follow the central bank’s leadership. There must be a gain for the follower relative to the alternative option of just playing a

Nash game. At the same time, this also means that it could be incentive-compatible for the central bank to actually follow the leadership of the trade union, if this provides a better outcome than the alternative Nash solution. But if being a follower is efficient for the central bank, this is not optimal in an inflation- targeting regime because it undermines the whole premise of inflation targeting itself.

To explain these strategic choices, consider a policy game between a central bank, who sets interest rates, and a trade union, who sets nominal wages.[3]

Both variables will have an effect on aggregate employment and inflation. A reduced-form model of the theoretical system analysed earlier would be the following:

$$\hat{n}_t = r_{11} w_t + r_{12} i_t + s_{lt} \tag{7}$$

$$\pi_t = r_{12} w_t + r_{22} i_t + s_{2t} \tag{8}$$

where n_t= employment (as a deviation from its natural rate), π_t= inflation, w_t= the nominal wage, and i_t= the nominal interest rate. The r_{ij} parameters represent the impact or long-run multipliers depending on the interpretation we wish to use. Consequently, we may expect the following sign pattern:

$$r_{11}<0, r_{21}>0 \text{ and } r_{22}, r_{12}< 0. \tag{9}$$

The model estimation gives us an indication that in South Africa the real effects of wages and monetary policy are bigger that their effect on inflation, that is, r_{11} and r_{12} are in absolute value greater than r_{21} and r_{22}. Finally, s_{lt} and s_{2t} are two random shocks (supply side and demand side respectively) with zero means. The time subscripts will be suppressed from now on.

We now introduce two objective functions. For the central bank we use the traditional quadratic specification

$$L_b = \tfrac{1}{2}(n^2 + \delta\pi^2) \tag{10}$$

where n and π are measured as a deviation from some natural or desired outcome and the parameter δ measures the importance which the central bank attaches to its inflation target ($\delta>0$). The other objective function to consider is the one of the trade union. In the literature, there is a large variety of possible trade union objective functions. We depart from the literature in two respects: first, we assume that inflation is not directly a concern for the trade union. Only employment, n enters the objective function in a quadratic form. We also assume that the trade union has linear preferences in nominal wages, expressed in deviation from present wages as:

$$L_U = \tfrac{1}{2}\,[n^2 + \alpha w] \tag{11}$$

The linear expression on w implies a preference for increasing levels of nominal wages, given the starting level for inflation. Importantly, α represents the strength of militancy of the trade union in trying to achieve their highest possible nominal wage. A lower α would indicate a less 'militant' trade union, with lower commitment to wages at any cost in terms of employment. Inflation does not enter directly in the objective function of the trade union and it will be considered only in so far as it affects the monetary policy response.

4.1 Policy equilibria

The policy game illustrated above can be solved either as a non-cooperative Nash game or as two alternative Stackelberg games with the central bank being the leader or the follower in the policy game.

The Nash game

Consider the case of a fully independent central bank. All policies will be determined non-cooperatively and may be represented by a Nash equilibrium. Minimising the loss function L_U, subject to the constraints on n and π, yields an optimal reaction function for the trade union:

$$r_{11}^2 w + (r_{11}^2 r_{12}^2) i = a - (r_{11} s_1) \tag{12}$$

Minimising L_B subject to the same two constraints, yields

$$(r_{11}\, r_{12} + \delta r_{22}\, r_{21}) w + (r_{12}^2 + \delta r_{22}^2) i = -(r_{12} s_1 + \delta r_{22} s_2) \tag{13}$$

for the central bank. Solving these two reaction functions together gives the Nash equilibrium

$$[w^* i^*] = \frac{1}{|A|} \begin{bmatrix} r_{12}^2 + \delta r_{22}^2 & -r_{11}\, r_{12} \\ -(r_{11}^2\, r_{12} + \delta r_{22}\, r_{21}) & r_{11}^2 \end{bmatrix} \begin{bmatrix} a - (r_{11} s_1) \\ -(r_{12} s_1 + \delta r_{22} s_2) \end{bmatrix} \tag{14}$$

where

$$|A| = \delta r_{11}^2 r_{11}^2 - \delta r_{22}\, r_{21}\, r_{11}\, r_{12}$$

It is easy to check that $|A| > 0$, given the assumed sign patters. This solution reveals that even in the absence of shocks there is a conflict between monetary policy and trade union behaviour.

The trade union preferences impose a constant growth of nominal wages, equal to

$$a\frac{r_{12}^2 + \delta r_{22}^2}{|A|}$$

The nominal wage growth is a negative function of the level of commitment of the central bank to the inflation target δ.

The nominal wage growth is a positive function of the elasticity of employment to interest rates. The higher the elasticity (in absolute value) the higher the nominal wage growth because the intervention of monetary policy reduces the negative employment impact of increasing wages.

The nominal wage growth is a non-linear function of the elasticity of inflation to interest rates: at a low level of effectiveness of monetary policy in controlling inflation, nominal wage growth is faster.

Monetary policy responds to a permanent nominal wage growth with a permanently higher nominal interest rate, equal to $a\frac{-(r_{11}r_{12} + \delta r_{22}r_{21})}{|A|}$ which is positive if $|r_{11}\ r_{12}| < |\delta r_{22}\ r_{21}|$, that is, if the central bank is committed to inflation targeting (higher δ) and the nominal effect of policies is greater than its real effect. Commitment to an inflation target is not enough.

The policy equlibria with bank leadership

The Stackelberg solution with the central bank leading is necessarily a Pareto improvement over the Nash solution that we get from an independent central bank facing a trade union. We can demonstrate that directly from the non-cooperative solution with a fixed degree of inflation targeting δ. Since the trade union is the follower, it will always pick its wage demand along its optimal reaction curve, given whatever monetary policy the central bank may choose. Thus, it maintains the same reaction function as before:

$$r_{11}^2 w + (r_{11}r_{12})i = a - (r_{11}s_1) \qquad (15)$$

Conversely, the central bank, knowing that the trade union will always pick w to stay on its reaction function, will pick an interest-rate policy at the point where one of its indifference contours touches that reaction function. In a sequential game, it means that the trade union moves first, setting the nominal wage given the policy of the central bank, and the central bank decides the instrument after wages are determined.

This will give the following combination of wages and the interest rate:

$$w^{bl} = \frac{-r_{11}\, r_{12}}{(r_{11}\, r_{12} - r_{12}\, r_{21})\, r_{11}^2} \quad \alpha > 0$$

$$i^{bl} = -\frac{r_{21}}{(r_{22}\, r_{11} - r_{21}\, r_{12})\, r_{11}} \quad \alpha > 0$$

The policy equilibria with trade union leadership

A final scenario to consider is the inverse situation, where the trade union is the Stackelberg leader in the policy game, so that it chooses the nominal wage on the monetary policy reaction function

$$(r_{11}\, r_{12} + \delta r_{22}\, r_{21})\, w + (r_{12}^2 + \delta r_{22}^2)\, i = -(r_{12} s_1 + \delta r_{22} s_2) \tag{16}$$

This game form produces the following equilibrium wages and interest rate:

$$w^{bf} = \frac{(r_{22}^2 + \delta r_{12}^2)^2}{(r_{11}\, r_{22} - r_{12}\, r_{21})^2 r_{22}^2} \alpha > 0$$

$$i^{bf} = -\frac{(r_{22}^2 + \delta r_{12}^2)(r_{21}\, r_{22} + \delta r_{11}\, r_{12})}{(r_{11}\, r_{22} - r_{12}\, r_{21})^2 r_{22}^2} \alpha £ 0$$

When the central bank is the follower, the direction of the reaction of monetary policy to an increase in wages will depend critically on the sensitivity of employment and inflation to the policy instruments. If $|r_{11}\, r_{12}| < |\delta r_{22}\, r_{21}|$, that is, if the effect of the policy instruments on inflation is hi gher than the effect on employment, the interest rate will be positive in response to a higher wage rate. Conversely, if $|r_{11}\, r_{12}| < |\delta r_{22}\, r_{21}|$, monetary policy will operate an expansionary monetary policy in reaction to a growth in nominal wages to reduce the significant real impact of a reduction in employment induced by an increase in nominal wages.

4.2 When does inflation targeting help?

Hughes Hallett and Viegi (2002) demostrate that we can analyse the effect of inflation targeting on the policy equilibrium by analysing the effect of changes in the preference parameter δ which represents the commitment of monetary policy to its inflation objective. A strong commitment to inflation targeting reduces wage growth in the Nash game, while the solution with the central

bank as the leader is invariant to the commitment to the inflation target. Conversely, a higher value of δ increases wage growth in the case where the central bank is the follower. This case is particularly interesting because it shows that a commitment to inflation targeting can be counterproductive if the central bank is not a leader in the policy game and the trade union is not particularly worried by the negative employment effect of wage increases. A sufficient condition for the central bank to acquire leadership is for the trade union to internalise the inflation objective of the central bank. It is therefore the objective function of the trade union that is critical in determining the quality of the policy solution.

5. Conclusion

In conclusion, this paper has given a first contribution in understanding the relationship between monetary policy and the labour market in South Africa. In particular, we have presented three results:

- Wages do not respond strongly to demand conditions, indicating large wage rigidities, low elasticity of substitutions and large wage mark-ups.
- This wage formation induces a very penalising sacrifice ratio for monetary policy, with a low level of price elasticity to interest rates and a high level of employment elasticity.
- Commitment to inflation targeting can affect wage dynamics through inflation expectations, but it might result in higher real wages and lower employment if the central bank does not assume leadership in the policy game. To do so, the trade unions' objective function is important.

Notes

[1] The complete derivation of the model can be found in Galí (2011). The model is also useful in thinking about the determinants of long-term unemployment in a search model structure, where a high level of structural unemployment is linked to a low elasticity of substitutions between jobs and a consequent high mark-up on wages.

[2] Data sources are the South African Reserve Bank, International Monetary Fund and the Saint Louis Federal Reserve Bank database.

[3] There is a long tradition of using a game-theoretic framework to understand the political economy of a trade union–monetary policy interaction, going back to the work of Calmfors and Driffill (1988). We are convinced that this literature is still very relevant in the case of South Africa where labour market institutions and corporate economic structure closely resemble structures typically found in continental Europe,

which were the main focus of this literature. See also Hersoug (1985), Layard, Nickell, and Jackman (1991) and Cukierman and Lippi (1999), among many others.

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Speculative flows, exchange-rate volatility and monetary policy: the South African experience*

Shakill Hassan †

Abstract

Capital flows driven by carry trades can be destabilising and may reduce the effectiveness of monetary policy. This paper presents evidence on the volatility of the South African exchange rate, its relationship to capital flows and the currency carry trade, and on the channels through which carry inflows erode the effectiveness and independence of monetary policy. I emphasise the need to distinguish short- and long-term currency volatility, note the benefits from a moderate degree of short-term volatility as well as the scope for foreign-exchange reserve accumulation (and other prudential tools), and argue that low and stable inflation serves a counter-speculative role by allowing low nominal interest rates which reduce the currency's speculative appeal while allowing for positive real interest rates. The empirical relationship between interest differentials and currency volatility implies that such a policy is also likely to reduce currency volatility.

Keywords: carry trade, capital flows, currency volatility, monetary policy independence, inflation targeting.

* Prepared for and presented at the Conference on Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate held at the South African Reserve Bank in Pretoria on 30 and 31 October 2014. A previous version of this paper was presented at the 17th World Congress of the International Economic Association (United Nations DESA special policy sessions) in Jordan from 6 to 10 June 2014; with thanks to Vivek Arora, Rashad Cassim, Jinho Choi (discussant), Seeraj Mohamed (discussant) António Ocampo (discussant), Hamid Rashid, Joseph Stiglitz, Lars Svensson, John Taylor, John Williams, and conference participants for helpful comments; and to Merissa Paul for research assistance. I am entirely responsible for any errors, of course. The views expressed herein are those of the author, and do not necessarily reflect the views of the South African Reserve Bank.

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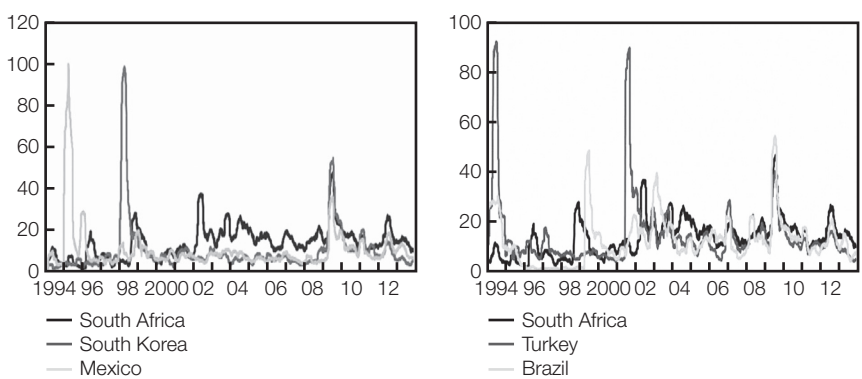
1. Introduction

The South African currency (the rand) is volatile. The left-hand panel in Figure 1 shows the three-month historical volatility (standard deviation, annualised) of the rand per United States (US) dollar exchange rate from 1993. Since the early 2000s, rand volatility has consistently exceeded that of the Mexican and South Korean currencies, and moved very closely with that of the Brazilian and Turkish currencies.

One of the immediate determinants of the rand exchange-rate movements is the volume of portfolio capital flowing to and from the country. Of particular concern is the increasing volume of portfolio debt inflows, which are notoriously volatile and primarily driven by global factors (risk and liquidity) and the long-term economic benefits, of which remain elusive (see the appendix).

Figure 1: Three-month exchange-rate volatility



Source: Bloomberg

Debt inflows into relatively high-interest economies (emerging and advanced) are at least partly, and often largely, driven by the currency carry trade – a class of currency speculation strategies designed to profit from a favourable interest-rate differential when the high-interest currency does not depreciate substantially (as to erode the interest 'carry') relative to the low-interest currency. The evidence is that in the short term and, on average, it does not. If it appreciates, as it often does, the speculator gains on both the exchange rate and the yield differential.[1]

The interaction between currency speculation and monetary policy can be destabilising and lead to policy ineffectiveness, especially in inflation-targeting regimes. In brief, the mechanism is as follows: Debt inflows tend to be expansionary, either by reducing yields or by fuelling credit extension, or both. The expansionary impetus can cause the economy to 'overheat'. The associated increase in the inflation forecast, if beyond target, requires the central bank to tighten the monetary stance. But increasing the policy rate raises market rates, at least across short- and medium-term maturities, which increases the yield differential and attracts further carry inflows, generating a 'vicious cycle'. The erosion in the effectiveness of monetary policy in containing inflation follows from the tension between the (intended) contractionary effect on demand from an increase in the policy rate and the expansionary effect of more inflows due to the same rate increase.

This feedback loop leads to an accumulation of debt inflows and exchange-rate appreciation. If the currency is misaligned (and overvalued), the central bank may be impelled to intervene in the currency market to mitigate possible losses in export competitiveness. Sterilised purchases of foreign currency, funded by the issuance of domestic currency securities, both raises the appetite (by exerting upward pressure on yields) and feeds (by increasing the supply of bonds) carry traders. Moreover, if the intervention succeeds in halting exchange-rate appreciation, the stability of the exchange rate reduces exchange-rate risk, and traders may anticipate eventual appreciation once sterilised intervention becomes too costly. Again, the policy response (in the currency market) attracts further inflows.

Capital moves in slowly (due to the time needed to raise capital and/or the opportunity cost of holding 'standby capital') so target currencies appreciate gradually, which attracts momentum trading, in turn fuelling further appreciation.[2] The further this process goes, the greater the degree of currency misalignment and the greater the eventual abrupt fall in the value of the currency when the carry trade unwinds and capital inflows reverse.[3] The process leads to unstable currency dynamics: the 'up the stairs, down the elevator' pattern in exchange-rate behaviour.

Note that central to the preceding argument is the effect of debt inflows on credit – the main channel through which inflows cause overheating. In the absence of such a causal effect, the precise channel through which inflows induced by the currency's carry appeal are destabilising is not clear. Note also that it is not entirely clear what form of currency volatility is induced by the instability caused by carry trades: high-frequency short-lived oscillations or short-term stability coupled with sporadic large adjustments.

Outline of the paper

The remainder of the paper is organised as follows: I start with a brief discussion of indirect indications of rand-targeting carry activity, the rand's carry appeal, and the effect of short-term volatility on the carry trade. At the monthly frequency, the relationship between carry trade returns and portfolio debt inflows seems quite strong when the Japanese yen is used as the funding currency. The same applies for the relationship between carry trade returns and rand-swaps turnover.

From a policymaker's viewpoint, it is useful to distinguish long-term currency volatility from short-term volatility. The latter matters for currency speculators – it encourages derivatives traders and discourages carry traders, for example. But there is no evidence of, nor compelling theoretic arguments for, a negative relationship between high-frequency short-term nominal exchange-rate volatility and measures of economic welfare. Indeed, I argue that a moderate level of short-term nominal exchange-rate volatility has some benefits. There is, however, substantial international evidence showing a negative relationship between long-term real exchange-rate misalignment (and its volatility) and economic growth. The section on exchange-rate volatility is organised into two subsections reflecting this distinction.

The first subsection shows the high-frequency effect of non-resident inflows on the currency, namely the relationship between bond inflows and exchange-rate movements. The second section turns to long-term volatility. It draws on evidence showing that long-run low-frequency rand volatility is generally not 'excessive' once we use a defensible benchmark for normal volatility. At a lower frequency and considering long-term statistics, the relationship between capital-flow levels and exchange-rate volatility is weak. There appears to be a strong relationship, however, between the variability (second moment) of net purchases of domestic securities by non-residents and long-run currency volatility. Gross outflows (net purchases of foreign securities by residents) tend to move in the opposite direction, so although of lower magnitude (and subject to regulatory quantitative limits) these gross outflows help reduce the volatility caused by gross inflow variability.

Section 4 turns to the effects of carry-driven inflows on monetary policy, especially the effectiveness in an inflation-targeting framework and the scope for independence from monetary conditions in global financial centres. I argue that US and global monetary conditions restrict the policy scope domestically – but do not determine it – and that the effect of capital inflows on credit growth in South Africa is weak. Section 5 is a discussion on capital

controls and the potential benefits of allowing a moderate degree of currency volatility. Section 6 contains concluding remarks, noting the scope for currency-market intervention to build reserves which help buffer the currency against sudden and large movements in capital, discusses macroprudential tools, and presents a counter-speculative case for low inflation.

2. The rand as a carry trade target

Carry trade flows are fungible. There is no exact information on the extent of targeting on any specific currency. There are numerous ways to implement the trade, such as through over-the-counter (OTC) derivative contracts (which, in turn, give rise to hedging trades by counter-parties); participants include unregulated non-bank financial institutions (especially hedge funds and commodity trading advisors); and target currencies that are heavily traded offshore. Moreover, the scale of positioning on any currency will vary over time. Evidence on the extent of rand targeting is therefore indirect and merely indicative.

The carry-to-risk ratio, defined as the ratio of the interest-rate differential to expected exchange-rate volatility, is a standard measure of a currency's carry appeal. Periods of high correlation between foreign-exchange turnover and the carry-to-risk ratio suggests that turnover is likely to be related to carry trade implementation. Galati, Heath and McGuire (2007) report a low-frequency correlation of 0,36 for the rand – the third highest after the Norwegian krone and the Australian dollar.[4]

The graphs in Figure 2 contrast the Bloomberg carry index (short yen, long rand, three-month trade horizon) with, first, monthly net bond inflows and, second, the swaps (dominant) component of rand foreign-exchange turnover (US dollars, millions). The correlation between yen-funded rand-targeting carry returns and net purchases of South African bonds is approximately 0,5 (503); the correlation with currency-swap turnover is approximately 0,6.

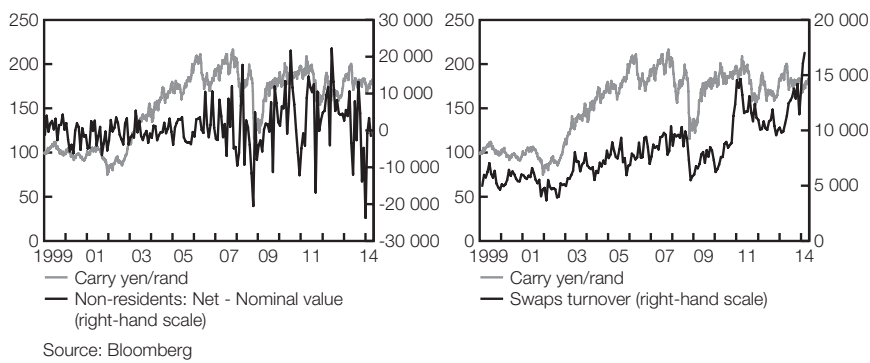
These observations suggest that the return from Japanese yen-funded rand-targeting carry might be an important driver of net purchases of South African bonds and of rand-swap turnover, suggesting carry implementation through a combination of spot and derivative transactions.

Attractiveness of rand-targeting

Currency speculators targeting the rand and other high-interest currencies through the carry trade were exposed to very large losses between 2007

and 2008. The appeal of the rand as a carry target, as well as that of other emerging-market currencies, was firmly restored from 2009. The annualised average return from targeting the rand through Japanese yen-funded speculation, using the forward currency market and trading at the weekly frequency between January and December 2010 was approximately 323 (before transaction costs), with a ratio of mean return to volatility of 1,89.[5] This large return-to-volatility figure is close to the historic average performance of the rand as a (yen-funded) carry trade target over the past decade. The high returns from multi-target international carry trade portfolio strategies are well documented.[6]

Figure 2: Carry returns, bond inflows and currency-swap turnover



Source: Bloomberg

Hassan and Smith (2011) and Hassan (2014) show that the average cumulative returns from Japanese yen-funded rand-targeting speculation through the forward market are volatile but high, though highly sensitive to the trade initiation date, and with a particularly attractive risk-return profile after crashes in the rand.[7]

Interest differentials and currency volatility

Carry returns depend positively on the interest differential and negatively on exchange-rate volatility-depreciation of the target currency erodes carry returns. Low exchange-rate volatility, coupled by a favourable interest differential (and an undervalued target currency), induces currency carry speculation.[8]

This observation is important in understanding to what extent high domestic interest rates drive bond portfolio flows. To the extent that such inflows are

driven by the carry trade, the interest differential (domestic versus funding currency) only drives inflows when volatility is low. The rand's attractiveness depends on volatility being low (and its covariance contribution to the mean-variance profile of carry trade portfolios).

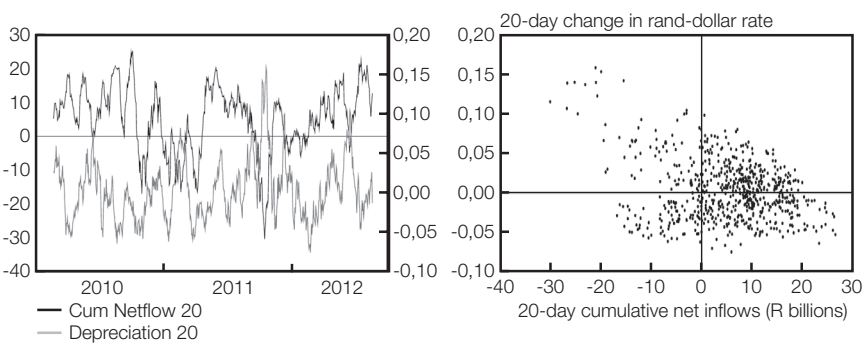
3. Capital flows and exchange-rate volatility

3.1.1 Short-term volatility

3.1.2 Portfolio flows and exchange-rate behaviour

Portfolio inflows reflect foreign demand for domestic securities and naturally have an effect on exchange-rate levels. High-frequency (daily) cumulative net purchases of domestic securities (stocks and bonds) by non-residents are negatively associated with rand depreciation (i.e. positively associated with the dollar value of the rand). This is immediately apparent for the recent past for cumulative net inflows over twenty days (from the first left-hand panel in Figure 3) and confirmed by the scatter plot as well as simple regression analysis.[9]

Figure 3: Twenty-day cumulative net inflows and rand depreciation



Source: JSE, South African Reserve Bank and author's own calculations

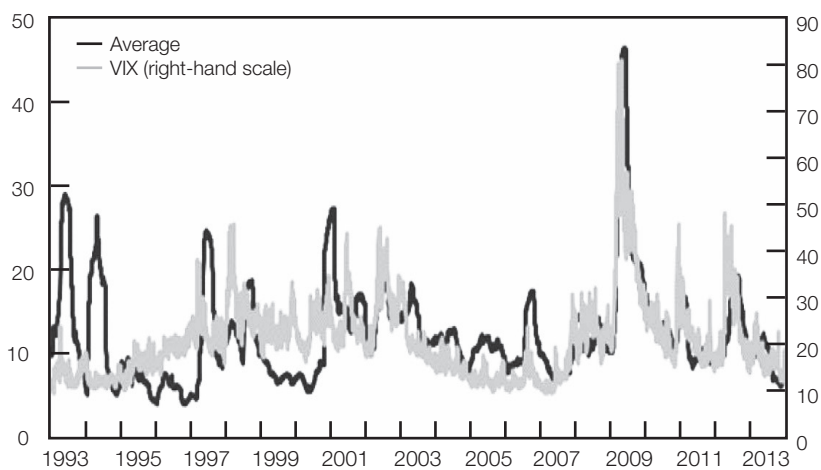
The relationship is strong for large (positive or negative) flows. For net purchases above R20 billion accumulated over 20 days, there is no single event (day) of currency depreciation over the same 20-day period (between January 2010 and August 2012) – the currency always appreciates, though not necessarily by the same magnitude. Conversely, for negative inflows,

each day recording cumulative net sales over the preceding 20 days above R20 billion is associated with rand depreciation over the same 20-day period.

The relationship is indeterminate for smaller net flows, with a wide range of currency movements consistent with any given level of portfolio flows, including net flows close to zero. When inflows are very large, they represent a significant share of rand turnover and become a dominant determinant of the direction of rand movements. When not, the range of currency outcomes associated with either inflows or outflows is wide: 'anything goes'.

Figure 4 shows how the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) has driven short-term currency volatility (average of Brazilian, Mexican, South African, South Korean and Turkish currencies' volatilities) since the 2007 US sub-prime crisis.

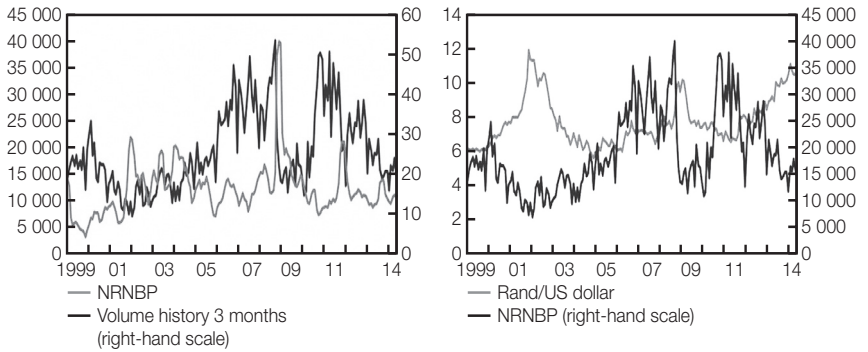
Figure 4: Cross-country average foreign-exchange volatility and VIX



In this note we are particularly interested in bond flows, which are affected by currency speculation strategies based on the carry trade. Although bond inflows affect the value of the currency, as expected, the historical relationship between bond inflows and currency *volatility* (the second moment) seems weak.

The relationship between capital flows and rand volatility requires accounting for foreign-initiated transactions as well as domestically initiated transactions. Data on the latter are available at a lower frequency and this relationship is discussed below.

Figure 5: Bond inflow (levels) have little effect on the second moment



Source: JSE Limited and South African Reserve Bank

3.2 Long-term volatility

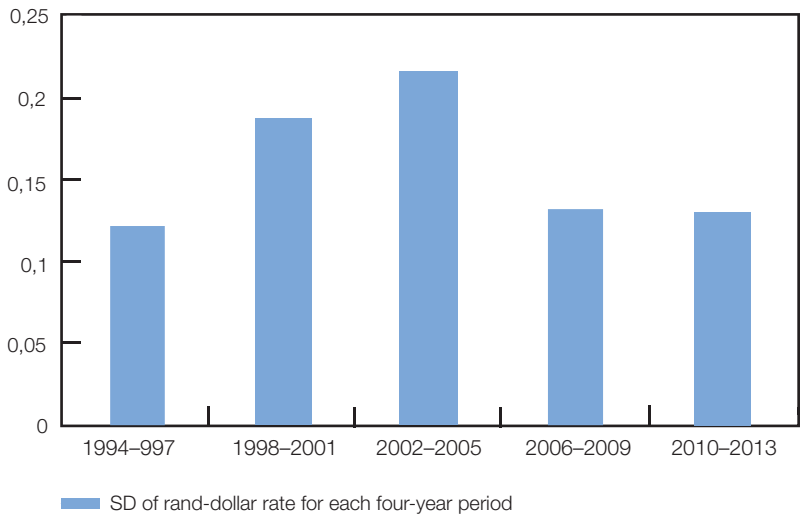
3.2.1 Evolution in South Africa

Figure 6 shows the evolution of the rand per dollar exchange rate. There is an upward shift in the long-run average level, which coincides with the adoption of a flexible exchange-rate regime and inflation targeting as the monetary policy framework.

Figure 6: Rand per US dollar

Figure 7 shows the standard deviation of the exchange rate over four-year intervals as a measure of medium- to long-run volatility. There is a marked increase between 1994 and the early 2000s. Examining the quarterly series shows that long-run volatility peaks at nearly 30 per cent in 2003, but has been on a declining trend since then, interrupted by the global financial crisis in 2007–2008.

Figure 7: Rand volatility over four-year intervals



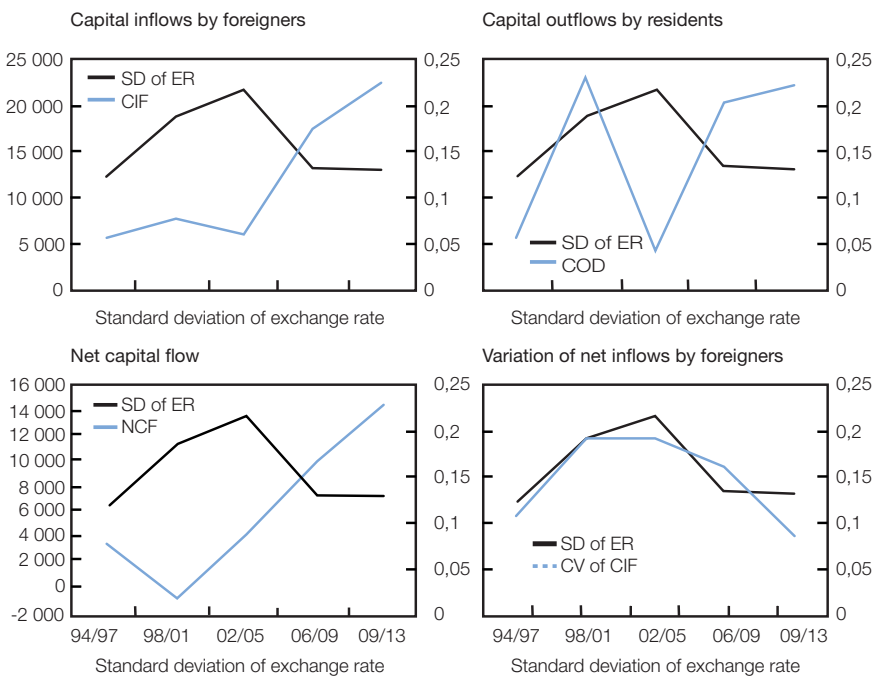
The last two bars show that long-run volatility is down to pre-inflation- targeting levels, despite less intervention in the currency market, less restrictions on capital movements and far larger capital flows, as shown below. But it remains high.

3.2.2 Have larger capital flows led to more volatility?

No low-frequency relationship is evident between low-frequency long-term means (i.e. averages taken over four-year intervals of quarterly data) of portfolio flows and long-term exchange-rate volatility (standard deviation of quarterly observations over the same four-year periods). This applies to net capital inflows by non-resident or foreign agents (capital inflows by foreigners, or CIF), top left-hand panel in Figure 8), net capital outflows by domestic agents (COD), top right-hand panel), and net capital flows (i.e. the difference between CIF and COD, bottom left-hand panel).

The closest visual relationship between measures of portfolio flows and of the long-run volatility of the nominal exchange rate at low frequency is with the volatility (measured by the coefficient of variation)[10] of gross inflows (net capital inflows by non-residents) – this is shown in the fourth panel in Figure 8. The relationship between the variability in net capital flows (CIF minus COD) and exchange-rate volatility is much weaker. Note the implication: restrictions on the level of capital inflows may have no effect on the long-term volatility of the exchange rate if they do not reduce the volatility of flows.

Figure 8: Capital flow mean levels, coefficient of variation, currency volatility

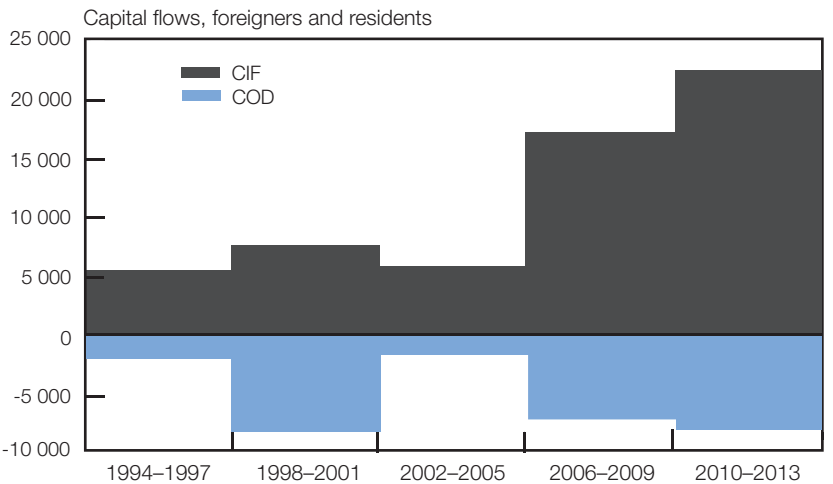


Sources: South African Reserve Bank and author's calculations

CIF and COD may be driven by different factors. Periods of outflows or lower inflows by non-residents might be associated with reduced outflows or retrenchments by residents. In South Africa, regulations restrict foreign holdings by domestic agents to 25 per cent of investment assets. Large outflows cause the currency to depreciate, which pushes the rand value of foreign holdings up, beyond the regulatory limit for any agent initially at or near the limit. Such agents are obliged to retrench the portion above the limit, acting as a partial buffer. Domestic agents have, however, one year to

retrench in order to obey the regulatory limit so CIF and COD transactions, even when associated, can be asynchronous. The evolution of CIF and COD (four-year quarterly averages) is shown in Figure 9. COD flows tend to partly buffer the volatility generated by CIF volatility.

Figure 9: Capital inflows by foreigners and outflows by residents (net)



3.2.3 Is the rand excessively volatile?

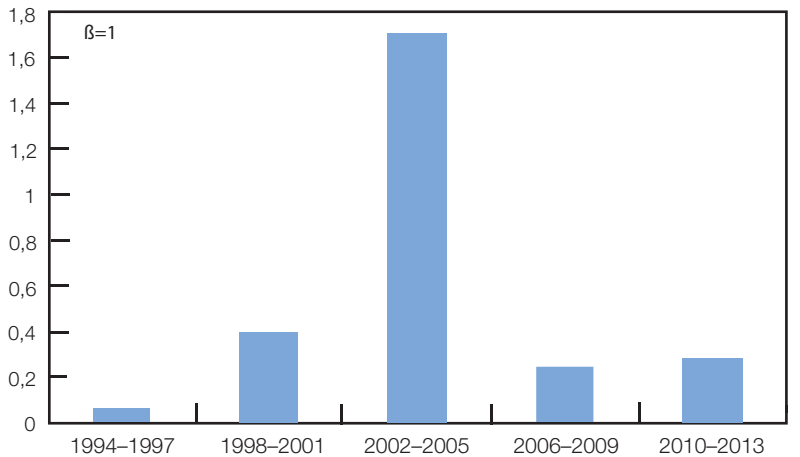
The preceding observations do not tell us whether the rand is 'excessively volatile'. Any such claim requires a benchmark for normal volatility. Standard exchange-rate models imply upper bounds for the 'fundamentally justified' long-run variance of the exchange rate, determined by the change in monetary fundamentals (growth, money and inflation differentials), and the discount factor which translates the expected future path of fundamentals to the current value of the currency.

If, or when, the variance of the currency exceeds this bound, the currency can be regarded as 'excessively volatile' in a meaningful manner. The methods used to compute the upper variance bound are presented and discussed in detail in Amod and Hassan (2014).

Figure 10 shows (highly) excessive volatility in the early 2000s (when the currency crashed). For the other four-year blocks, long-run volatility is not excessive. Note, however, that short-term volatility may often have been

very high. The economic costs of long-run real exchange-rate volatility and misalignment are well established; those associated with short-term high-frequency movements in the exchange rate are not, however – this issue is discussed further below.

Figure 10: Is the rand excessively volatile?



The empirical performance, in terms of out-of-sample forecasting ability, of monetary exchange-rate models is notoriously weak at short- to medium-term horizons. Variance bounds based on such models are not applicable at such horizons.

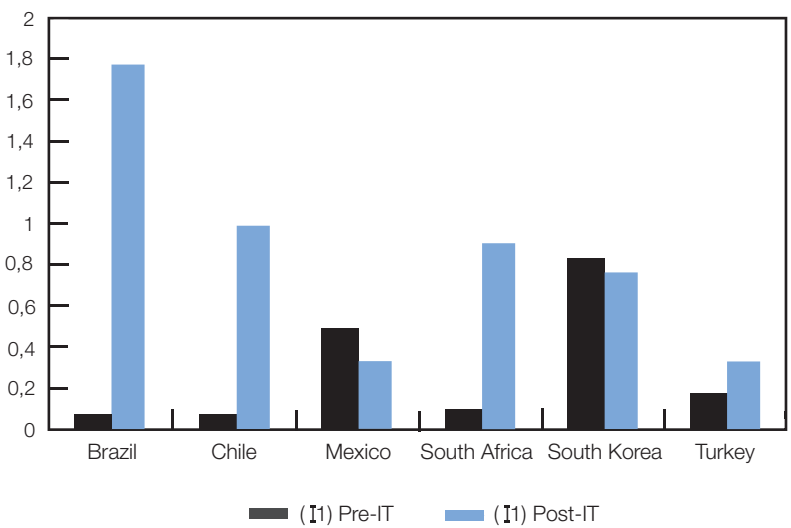
3.2.4 Remark: do macro fundamentals matter?

The most important insight of classic exchange-rate models is that of the exchange rate as an asset price responsive to changes in expectations of future macro fundamentals (domestic and international). Despite their poor out-of-sample forecasting performance, currency analysts and the financial press routinely attribute movements in currencies to changes in fundamentals. In Hassan and Paul (2014), rand movements are analysed at the per (half) second frequency during a statement by the monetary authority as an illustration of how the currency responds at a very high frequency to information on macro fundamentals (growth and inflation), but its movements may appear inconsistent with fundamentals at lower frequencies.

3.2.5 Has inflation targeting led to excess volatility?

Amod and Hassan (2014) compare the observed long-run variance of the exchange rate to the respective variance bound for a set of floating emerging currencies, for which Gagnon and Hinterschweiger (2011) document the highest long-term volatilities. The main finding is summarised in Figure 11, which shows, for each country, the ratio of the long-term variance of the exchange rate (deviations from fundamentals) to the maximum long-run variance justified by the variability of the respective country's fundamentals, before and after the adoption of inflation targeting. The bound is clearly breached only for Brazil in the period after the adoption of inflation targeting. It increases substantially for Chile and South Africa, but stays below one.

Figure 11: Variance ratios, pre- and post-inflation targeting



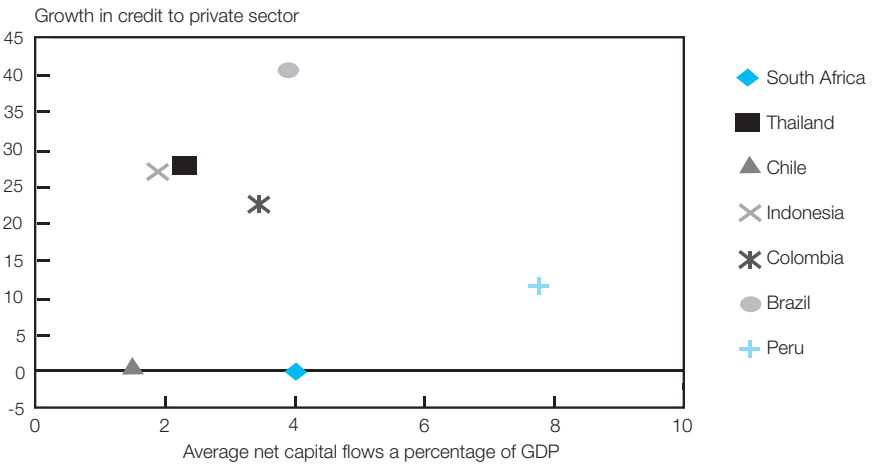
4. Capital flows and monetary policy effectiveness

4.1 Capital flows and credit growth

Capital inflow surges reduce the effectiveness of monetary policy by stimulating excessive credit growth. This causal link seems to be weak for South Africa compared to other emerging economies (e.g. Brazil and Turkey) as shown in Figure 12. This channel plays a central role in the modern case for capital controls (e.g. Ostry (2011) and Rey (2014)). If inflows do not cause

credit booms and domestic overheating (in turn causing pressure to raise interest rates and attracting more inflows), the constraints imposed on monetary policy and the threat to financial stability are limited.

Figure 12: Domestic credit growth and capital flows, averages for 2009–2012



There are two likely reasons, in addition to possible institutional peculiarities, behind different credit responses to capital inflows.[11] First, reliance on non-core funding from abroad (to finance domestic credit extension) depends on the availability of domestic retail and wholesale funding.[12] South African banks have access to a large deposit base and, above all, ample access to domestic non-core liabilities – large and liquid domestic bond and money markets in which banks are very active. The threshold level of credit growth which triggers the need for non-core funding from abroad is therefore relatively high. Second, the expansionary effect of inflows is likely to be an increasing function of the degree of currency-market intervention.[13] Purchases of foreign currency may help in halting exchange-rate overvaluation and the associated loss of export competitiveness, but it accentuates the carry cycle. Observe that Brazil and Turkey intervened significantly in response to inflow surges and experienced exceptional growth in cross-border credit. These are economies where the relationship between capital flows and domestic credit growth is strong. South Africa has allowed more exchange-rate flexibility since the adoption of inflation targeting in 2000, and experienced comparatively lower direct cross-border credit flows. The relationship between capital inflows and credit growth seems quite weak for South Africa.[14]

4.2 Bond yields and monetary autonomy

I estimate the following regression equation (following Obstfeld 2014) to examine the extent to which global capital flows, which are largely driven by monetary conditions in the US, constrain the scope for independent monetary policy in carry target economies,

$$\Delta i_t = \alpha + \beta \Delta i_t^{\omega} + \gamma^1 x_t + \varepsilon_t \quad (1)$$

where t is the time subscript, i is the interest rate in the domestic e onomy, i^{ω} is the 'world' interest rate for the same term to maturity, and x is a vector of domestic variables that monetary policy responds to. Δ converts the variable to its one-period change. All variables are measured in log differences to avoid spurious regressions. Monetary conditions in the US represent global conditions. The equation is estimated using three-month and ten-year interest rates. For the results in Table 1, the components of x are simply the changes in the domestic rates of inflation and economic growth.

The larger the estimated value of parameter β, the greater the dependence on US monetary conditions, with total loss of monetary policy independence if $\beta = 1$. Instead, we find that for short-term interest rates, β = and not statistically significant; while γ is statistically significant. For long-term yields, however, β is far larger though strictly lower than 1. Obstfeld (2014) finds, on average, higher monetary policy dependence on US monetary conditions in advanced economies than in emerging economies. Sweden is an advanced economy which is also a common carry target, and I performed the same exercise for Swedish rates. The short-term rate is not systematically tied to US monetary policy and responds significantly to domestic conditions, but long yields are more tightly dependent on US long yields than South Africa's.

Table 1: Simple test of monetary independence

	Parameter	3-month yield	10-year yield
South Africa	$\hat{\beta}$	±0	0,6
Sweden.....	$\hat{\beta}$	±0	0,7

This finding is inconsistent with the view that global capital does not "interfere in any substantial way with the ability of domestic monetary policy to maintain control over dynamics of inflation" (Woodford (2010), written before the 2007 crisis). The high dependence of domestic long rates on US long rates shows that it does. But it is also not consistent with the view that "independent monetary policies are possible if and only if the capital account is managed",

as argued by Rey (2014). This, in turn, is evinced by the lack of a systematic dependence of (South African on US) interest rates towards the short end of the yield curve when we control for domestic factors which affect the policy stance. US and global monetary conditions significantly restrict the policy scope domestically, but do not determine it.

5. Discussion

5.1 Capital controls

There are situations where capital controls and other forms of capital-account regulation are desirable – see for example Stiglitz (2010), International Monetary Fund (2012) and Rey (2014) for comprehensive discussions. As observed in the extensive *Pardee Center Task Force Report*, "(...) the design and monitoring of such regulations is essential for their effectiveness" (Gallagher, Griffith-Jones and Ocampo 2012: 2). The design of capital-flow regulation in South Africa (and the desirability of prudence before adopting measures that may encourage corruption) beyond existing restrictions on outflows (by residents) needs to address facts about the South African economy which limit the threat to financial stability due to capital-flow volatility and/or limit the effectiveness of standard capital-account regulation measures.

First, the critical causal link between inflows and credit growth is historically weak compared to, for example, Brazil and Turkey. If inflows do not cause credit booms and domestic overheating (in turn causing pressure to raise interest rates and attracting more inflows), the constraints imposed on monetary policy and the threat to financial stability are limited.

Second, the threat to financial stability is weakened further (though not eliminated) by the fact that government and private-sector firms borrow mainly in domestic currency in South Africa and issue securities (to a domestic and international clientele) locally. The comparatively low degree of foreign-exchange indebtedness means that sudden stops in inflows, and the associated currency depreciation, need not cause sudden unhedged increases in the rand value of domestic liabilities.

Third, it is estimated that approximately three-quarters of total rand trading is offshore. There is also a secondary market for South African treasuries offshore. Domestically imposed capital-account restrictions might move rand-trading further offshore. Moreover, the derivatives market, especially for

foreign-exchange and interest-rate products traded OTC, is substantial (see tables in the appendix.) These can, and normally are, used to circumvent capital-flow management restrictions.

Take, for example, taxes on portfolio debt inflows (and later on certain derivatives) implemented in 2009 in Brazil. The speculative carry trade is one of the main drivers of portfolio debt flows, as noted in the report. The payoff from borrowing in low-yield currencies to invest in high-yield currencies can be replicated by trading forward currency contracts (the 'forward bias' trade) – that is, without access to the bond markets of either

the funding or the target currency. Speculators can use the OTC derivatives market, domestically and offshore, to circumvent any taxes on bond inflows. Long-term bond investors might not do so, but passive long-term investment is beneficial. It is impossible to know exactly how effective the Brazilian taxes have been, and I do not wish to claim that they were ineffective because we cannot know what the situation would have been without them. But the Brazilian real reached a 12-year high in 2011, and perhaps not coincidentally OTC turnover in Brazilian real foreign-exchange derivatives increased five-fold between 2007 and 2010.[15] OTC foreign-exchange derivatives turnover in South Africa was about twice the Brazilian turnover in 2010.

Without addressing the issues above, neither the need for further capital controls in South Africa nor their appropriate design are entirely clear. The case for more reserve accumulation and prudential measures targeting the channels through which capital flows can be destabilising (e.g. adjustable capital buffers, credit market regulations and domestic currency borrowing incentives) seems more compelling.

5.2 Benefits of moderate short-term exchange-rate volatility

5.2.1 Or 'I love the smell of volatility in the morning'

In economies with reasonably developed financial systems, which is the case in South Africa, short-term volatility can be hedged.[16] Less evidently, a moderate degree of short-term volatility has non-trivial benefits.

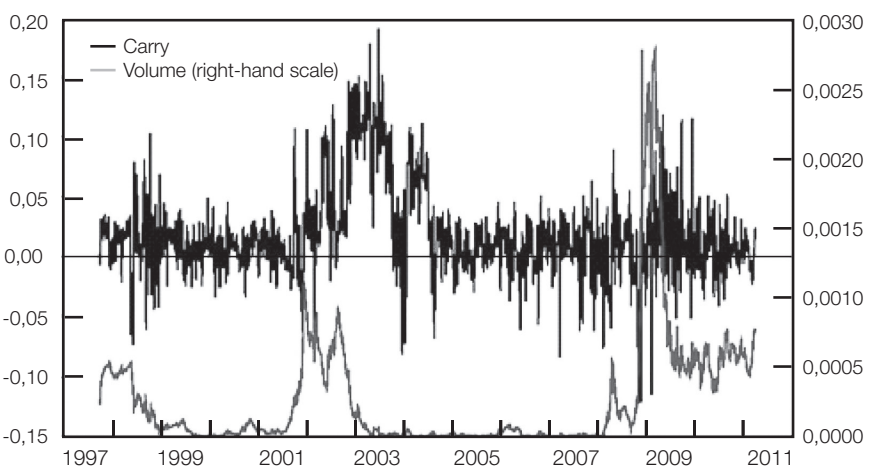
5.2.2 Volatility reduces attractiveness (and increases the cost) of carry trades

Rising volatility discourages carry trade speculators from targeting the currency. Carry trades benefit from high interest differentials (or large forward

discounts or premiums) and either target currency appreciation relative to the funding currency or low volatility in the rate of exchange between the target and funding currencies. Periods of high volatility in the currency and financial markets generally (domestic or international, usually reflected in the VIX index) are empirically associated with capital-flow reversals, away from high-interest or target currencies like the rand and into low-interest or funding currencies. Such reversals lead to carry trade losses for speculators who maintain long positions in high-interest currencies, and short positions in low-interest currencies.[17]

There is substantial international evidence of a strong and systematic inverse relationship between exchange-rate volatility and carry trade returns.[18] Observations on the rand indicate consistency with the international evidence. Peaks in exchange-rate volatility coincide with sharp carry trade losses, and the period producing the largest and most persistent gains to the rand-targeting speculator (circa 2002–2003) is accompanied by a sharp decrease in *short-term* exchange-rate volatility (see Figure 13, from Hassan and Smith 2011).

Figure 13: Rand carry returns and conditional exchange-rate volatility



In addition, carry traders can buy currency options to hedge the exchange-rate exposure component (i.e. buy protection against unfavourable exchange-rate movements). When volatility decreases, the price of these options, and hence the cost of hedging against unfavourable exchange-rate

movements, decreases, making the carry trade more attractive for a given yield differential.

Conclusion: attempts to reduce *high-frequency/short-term* exchange-rate volatility (which could be desirable on other grounds) will not be counter-speculative. On the contrary: options-hedged targeting becomes cheaper; and un-hedged targeting becomes less risky. Both forms of carry trades become more attractive.

5.2.3 Volatility induces caution: disincentive to currency mismatch

Capital-flow reversals led to severe contractions in economic output in South East Asia in the aftermath of the 1997 crisis. Private-sector firms had accumulated large foreign-currency liabilities, but earned revenue mainly in domestic currency. Currency mismatch in corporate balance sheets generates a high degree of financial vulnerably and a 'fear of floating' by the authorities (in anticipation of distress in the event of a large depreciation). When currencies crashed in 1997, firms found it difficult to meet foreign-currency obligations and net worth reduced, in turn reducing the ability to refinance. The IMF-led response then (criticised at the time by Furman and Stiglitz (1998) and Krugman (1999)), which involved the severe tightening of monetary policy, aggravated the problem by also raising the cost of domestic currency funding.

The accumulation of un-hedged foreign-currency liabilities in economies where borrowers face high interest rates on domestic currency debt is very tempting and can be perfectly rational if the probability of exchange-rate depreciation over the term of the loan is low. The East Asian economies most affected by the 1997 crisis were characterised by attractive interest spreads, yet lower exchange-rate volatility between 1991 and 1997 than the Japanese and German currencies (see Eichengreen and Hausmann 1999).

Volatility induces caution before assuming large foreign-currency exposures. Given the high interest-rate differentials offered by carry target economies, low currency volatility increases the attractiveness of foreign-currency liabilities by reducing the probability of a large adverse movement in the currency.

5.2.4 Volatility helps maintain the scope for independent monetary policy

Volatility may increase the scope for independent monetary policy. If the currency of an emerging economy becomes consistently as stable as that of low-interest advanced economies, its yields will have to converge with the latter. The same applies, with greater force, to carry target advanced economies (e.g. Australia, Canada, Norway and Sweden) due to similar risk premiums to lower-interest advanced economies. Exchange-rate volatility prevents perfect substitutability between domestic and foreign assets, which helps maintain scope for independent monetary policy despite the fluidity of international capital – a point made in Eichengreen, Tobin and Wyplosz (1995).[19]

Consider the standard link between domestic and foreign interest rates, exchange-rate movements, and risk,

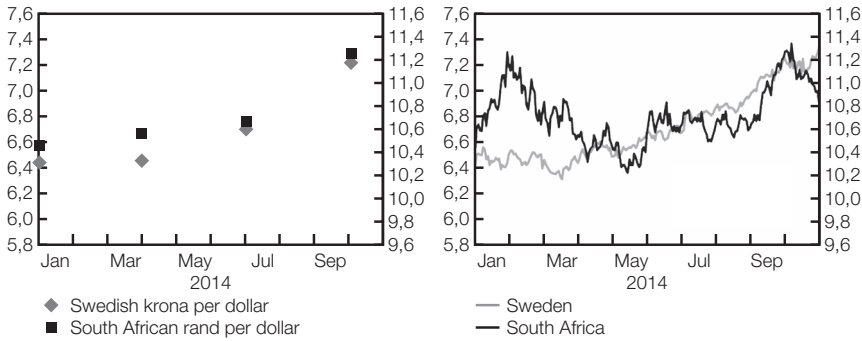
$$i_t = i_t^{\omega} + \mathrm{E}_t\,(e_t + 1 - e_t) + \zeta, \qquad (2)$$

where e represents the exchange rate and ζ the currency risk premium. If volatility is zero, there is no uncertainty about the exchange-rate path and no risk premium, so it $i_t = i_t^{\omega}\ (e_t + 1 - e_t)$. That is, domestic yields become deterministically tied to yields in the global financial centre.

5.2.5 Short volatility can reduce long-term misalignment and volatility

High frequency but temporary up and down movements in the currency can help prevent the exchange rate from deviating too far and/or for too long from intrinsic value (i.e. it may help prevent large and/or prolonged misalignment), thereby reducing the magnitude of crashes when there is an eventual correction. In this sense, some short-term volatility can help reduce the long-term instability which is detrimental to economic growth.[20] Consider the graphs in Figure 14 for illustration. The quarterly movements in the rand and the Swedish krona were remarkably similar for 2014. At this frequency, the krona was the more volatile of the two currencies (with about twice the coefficient of variation). Yet, the daily movements in the rand were far more erratic, and the variation within each quarter far higher.

Figure 14: Swedish krona and South African rand: quarterly and daily



Sources: Datastream and author's calculations

6. Concluding remarks: policy options

6.1 Scope for more aggressive reserve accumulation

There is no contradiction between pursuing a flexible inflation-targeting framework and adopting a degree of foreign-exchange market intervention required to minimise long-run real exchange-rate instability and misalignment – see for example Fisher (2010), International Monetary Fund (2012), and Ostry, Ghosh and Chamon (2012).

Foreign-exchange reserves, which are costly to accumulate in high-interest countries, are quite large in some emerging economies (see Gallagher, Griffith-Jones and Ocampo 2012). But this is not the case for South Africa, where reserves pale in comparison to numerous other emerging economies. There is still ample scope to accumulate reserves to absorb large inflows when the exchange rate is highly likely to be overvalued and be contributing to a loss of competitiveness. There is an interest cost to reserve accumulation and valuation losses when the rand appreciates, but valuation gains when the rand depreciates.

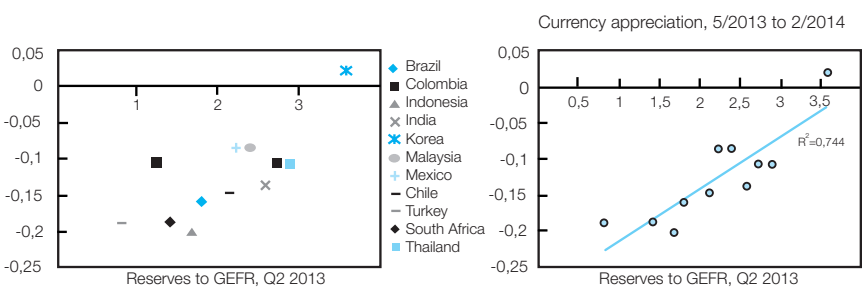
As an indication of the space left for further reserve accumulation and the likely benefits in buffering the currency against sudden large movements in capital, consider exchange-rate behaviour in response to tapering (talk and action) by the US Federal Reserve between 2013 and 2014. The graphs in Figure 15 show, along the vertical axis, currency appreciation (negative numbers denote depreciation) between 1 May 2013 and 1 February 2014. Along the horizontal axis is the ratio of foreign-exchange reserves to a measure of the gross external financing requirement (the sum of the current-account deficit

to short-term debt) for the first half of 2013. There is a very strong relationship between a country's ratio of reserves to external financing requirement and the extent of the sell-off of its currency over this period. South Africa ranks quite poorly. Reducing its vulnerability requires moving it in the northeastern direction, thereby reducing the deficits and/or increasing reserves. Of the three variables that constitute this indicator of external vulnerability, one is amenable to 'engineering', and that is the stock of foreign-exchange reserves.

6.2 Role of macroprudential tools

Since excessive credit growth is the main channel through which capital inflows lead to instability, there is little doubt about the desirability of designing appropriate prudential tools aimed directly at this channel – see International Monetary Fund (2012), Rey (2014), and Stiglitz and Greenwald (2003) for a discussion of the centrality of credit that predates the 2007 crisis. But the merits of monitoring the credit channel and preventing excessive leverage and credit growth apply irrespective of the economy's exposure to capital-flow volatility.

Figure 15: Exchange-rate appreciation and reserves to GEFR



Sources: BIS, IMF, World Bank and author's calculations

In addition, South Africa retains restrictions on capital outflows by residents. This tool could be made more effective by varying (judiciously and infrequently) the quantitative limits depending on the size and direction of capital flows, thereby relaxing the limit in response to excessive inflows and contracting the limit in response to excessive outflows.[21]

6.2 The counter-speculative case for low inflation

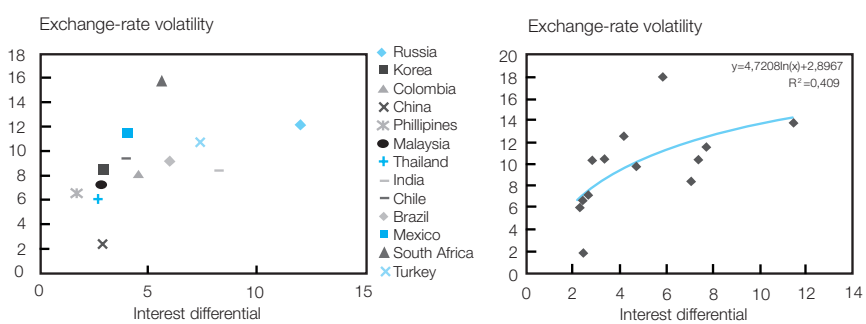
Suppose the tentative evidence of a weak relationship between capital inflows and credit growth is sample-specific (which may well be) or take the standpoint of the 'religious economist', uninterested in evidence and ardently

convinced that international capital flows, especially debt hot money, are always and necessarily bad.

A natural long-term solution is then to aim at low and stable inflation so that nominal interest rates can stay low, thus reducing the currency's speculative appeal, while allowing for positive real interest rates, which are necessary (but not sufficient) to stimulate saving and investment.[22] Lower carry-driven debt and credit inflows would mean less scope for destabilising portfolio debt inflows and for excessive credit growth while the monetary authority tries to restrict demand. The associated increase in the ratio of equity liabilities to total liabilities would also help reduce exposure to financial instability.

Figure 16 shows a positive relationship between nominal interest-rate differentials and nominal exchange-rate volatility (three-month horizons).[23] It suggests, tentatively, that if the low nominal rate corresponds to a low interest-rate differential relative to funding currencies, such a policy will help reduce exchange-rate volatility.

Figure 16: Average three-month volatility and interest-rate differentials



In Plantin and Shin (2014), the interest differential is a coordination device, turning carry trade positions into strategic complements for speculators, that is, high yields help coordinate low-interest capital supply.[24] Their analysis implies that all policy responses designed to repel carry trades "amount to sufficiently reducing the official rate in response to carry trade activity..." and "... a decrease in the official rate is the appropriate response when foreign speculative inflows bid up domestic asset prices". Stiglitz (2012) advocates the same interest-rate response in conjuction with raising reserve requirements (and capital inflow restrictions). Such a policy response is likely to be less of a threat to macroeconomic stability in a low-inflation environment.

Table A1: Foreign-exchange turnover, 2013*

Rank	Currency	Forwards	Foreign-exchange swaps	Options	Total**
3	Japanese yen	1 231	612	374	70
5	Australian dollar	462	196	182	61
6	Swiss franc	275	84	216	21
7	Canadian dollar	244	93	65	73
8	Mexican peso	135	57	32	76
10	New Zealand dollar	105	39	12	89
16	Turkish lira	70	16	27	61
17	Brazilian real	64	19	48	25
18	South Korean won	60	19	21	65
19	South African rand	59	11	17	71
20	Indian rupee	53	15	31	42

*Daily averages in April 2013, billions of US dollars, net-net basis (adjusted for double-counting).
** Including 'currency swap' as a separate category to 'foreign exchange' swaps.

Source: Bank for International Settlements, Hassan (2013)

Table A2: Foreign-exchange derivatives turnover, 2013*

Rank	Currency	Forwards	Foreign-exchange swaps	Options	Total**
3	Japanese yen	123	332	153	619
5	Australian dollar	50	183	27	266
6	Swiss franc	27	149	14	191
7	Canadian dollar	36	101	12	151
8	Mexican peso	14	58	6	79
10	New Zealand dollar	11	50	3	66
16	Turkish lira	10	39	3	54
17	Brazilian real	34	1	11	48
18	South Korean won	24	16	4	45
19	South African rand	7	31	2	40
20	Indian rupee	24	10	3	38

*Daily averages in April 2013, billions of US dollars, net-net basis (adjusted for double-counting).
** Including 'currency swap' as a separate category to 'foreign exchange' swaps.

Source: Bank for International Settlements, Hassan (2013)

Notes

1 The profitability of carry trades is evidence that uncovered interest-rate parity does not hold in the short- to medium term. The simplest way to implement the carry trade is to borrow in the low-interest currency (the 'funding currency'), buy the high-interest currency (the 'target currency) in the spot market, deposit the proceeds or buy fixed- income securities denominated in the target currency, and finally convert the terminal payoff back into the funding currency – facing the exchange-rate risk. This is the conventional (textbook) understanding of the carry trade. But it can also be implemented through the derivatives market, for example, by selling the currency forward when it is at a significant forward premium or using currency options to hedge the exchange-rate risk component.

2 The existence and magnitude of carry returns are likely to be due to a combination of reasons, including compensation for crash risk (e.g. Brunnermeier, Nagel and Pedersen 2009), infrequent portfolio adjustments (Bachetta and Van Wincoop 2010), and the interaction between carry trades and monetary policy (Plantin and Shin 2014).

3 Gagnon and Chaboud (2007) document the exchange-rate effects of unwinding carry trades.

4 More tentatively, rand foreign-exchange derivative transactions (especially swaps) far outweigh spot transactions, and the former are often linked to non-resident activity in the domestic bond market. (See the appendix, and Hassan and Smith 2011). The evidence from Turkey suggests that hedge funds and investment banks implementing carry trades are the main swap counterparties. As of June 2010, portfolio fixed-income flows to South Africa were primarily intermediated through a set of financial centres comprising Luxembourg, Jersey, Cayman, British Virgin Islands, Bermuda, Bahamas and Liechtenstein (International Monetary Fund 2011) – jurisdictions where hedge funds (and off balance-sheet structured investment vehicles until recently) are typically domiciled. Interestingly, the largest net flows of yen between 2002 and 2007 were from Japan to the Caribbean financial centres, according to Bank for International Settlements data (see Galati, Heath and McGuire 2007).

5 The ratio of mean return (in excess of a risk-free rate when applicable) to the standard deviation of returns, commonly known as the Sharpe ratio, is a widely used (albeit imperfect) measure of 'reward-for-risk'. The average Sharpe ratio for buy-and-hold investment in the JSE Limited is around 0,5 and anything above 1 is generally regarded as highly attractive.

6 See Burnside, Eichenbaum and Rebelo (2007, 2008), Brunnermeier, Nagel and Pedersen (2009), and Lustig and Verdelhan (2009). Carry trade payoffs are uncorrelated with stock market returns and cannot be easily explained by standard risk factors. (See Burnside 2011).

7 Note that the payoffs from rand-targeting vary and are, of course, often negative. The documented average returns from rand-targeting are strongly

influenced by the extraordinarily high gains in the period following the 2001 rand crisis.

8 These inflows in turn tend to lead to currency crashes.

9 Net inflows (non-resident purchases of bonds and equities) are measured in billions of rand; rand depreciation is measured in log change so, for example, 0,05 corresponds to 5 per cent depreciation, -0,05 corresponds to 5 per cent appreciation, over n days (in this figure n = 20).

10 The coefficient of variation is the ratio of the standard deviation to the mean. The adjustment of the standard deviation is due to the mean level of total gross flows increasing significantly over the sample.

11 These are tentative thoughts, based on current work in progress.

12 See Hahm, Shin and Shin (2013) on the role of non-core liabilities (sources of funding other than retail deposits) in financial intermediation.

13 See Magud, Reinhart and Vesperoni (2014) for empirical evidence.

14 The Bank for International Settlement's figure for direct cross-border credit to the banking sector (all instruments, amounts outstanding, billions of US dollars) to South Africa between 2009 and 2012 averages approximately 35. The amount for Turkey is between 150 and 200, and for Brazil, close to 300.

15 See Bank for International Settlements (2012).

16 Access to hedging instruments by small and medium enterprises (SMEs) is perhaps more limited, however. For all firms, hedging long-term exchange-rate risk is complicated if not impossible. But in the long term, exchange rates are influenced by macroeconomic stability.

17 A long (respectively, short) position in an asset reflects the expectation of an increase (respectively, decrease) in the price of the asset.

18 See Clarida, Davis, and Pedersen (2009), and Brunnermeier, Nagel, and Pedersen (2009).

19 See also Obstfeld (2014).

20 See for example Eichengreen (2008), Aghion, Bacchetta, Ranciere and Rogoff (2009), and Guzman, Ocampo and Stiglitz (2014).

21 See the interview with Raghuram Rajan on varying foreign-exchange limits as a macroprudential tool, in Jeffery (2014).

22 Note that in interpreting ‘low inflation’, the target band for inflation in South Africa is from 3 to 6 percentage points.

23 See also Alvarez, Atkeson and Kehoe (2007).

24 Of course, in practice, coordination devices might be somewhat more prosaic – see "Traders' forex chatroom banter exposed", *Financial Times*, 12 November 2014.

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Abbreviations

ABS	asset-backed security
ABX	asset-backed securities index
AC	additional criteria
ACCOSCA	African Confederation of Co-operative Savings and Credit Associations
AD	aggregated demand
ADLA	Authorised Dealer with Limited Authority
AEDO	authenticated early debit order
AEI	American Enterprise Institute
AFI	Alliance for Financial Inclusion
AFRITAC	Africa Regional Technical Assistance Center
AFS	annual financial statements
AGR	augmented Guidotti ratio
AIRB	advanced internal ratings-based
ALCO	Asset and Liability Committee
ALM	asset and liability management
Alsi	All-Share Index
AltX	alternative exchange
AMA	advanced measurement approach
AMCP	African Monetary Co-operation Programme
AML	anti-money laundering
AML/CFT	anti-money laundering and combating the financing of terrorism
API	administered price index
ARIMA	Autoregressive Integrated Moving Average
ARM	adjustable-rate mortgage
AS	aggregated supply
ASA	alternative standardised approach
BCBS	Basel Committee on Banking Supervision
BCI	Business Confidence Index
BCM	business continuity management
BCP	business continuity planning
BEE	black economic empowerment
BER	Bureau for Economic Research [Stellenbosch University]
BESA	Bond Exchange of South Africa
BIA	basic indicator approach
BIC 12	binary identification code (12 digits)
BIC 8	binary identification code (8 digits)
BIS	Bank for International Settlements
BME	Bond Market Exchange
BMI	Business Monitor International
BMR	Bureau of Market Research
BoP	balance of payments
BOTSA	Bank of Taiwan, South Africa Branch
BRIC	Brazil, Russia, India and Asia
BRICS	Brazil, Russia, India, Asia and South Africa
CAMEL	Capital Adequacy, Asset Quality, Management, Earnings and Liquidity
CAR	capital-adequacy ratio
CBFET	cross-border foreign-exchange transactions
CBL	concurrent batch list

CCI	Consumer Confidence Index
CDS	credit default swap
CEBS	Committee of European Banking Supervisors
CLI	composite leading indicator
CLS	continuous linked settlement
CMA	common monetary area
CMG	Capital Monitoring Group
CMIRR	Capital Markets Infrastructure Risk Ratings
COBIT	Control Objectives for Information and Related Technology
COICOP	classification of individual consumption by purpose
COO	chief operating officer
CP	Core Principle
CPA	Consumer Protection Act
CPD	Corporation for Public Deposits
CPEPR	Centre for Economic Policy Research
CPI	consumer price index
CPIX	consumer price index excluding mortgage interest cost
CRA	credit rating agency
CRB	Commodity Research Bureau
CREFSA	Centre for Research into Economics and Finance in Southern Africa
DSGE	dynamic stochastic general equilibrium
EBA	European Banking Authority
ECB	European Central Bank
EFSF	European Financial Stability Facility
EFT	electronic funds transfer
EIA	Energy Information Administration
ELA	emergency lending assistance
EMBI	Emerging Markets Bond Index
EME	emerging-market economy
ETF	exchange-traded fund
ETN	exchange-traded note
ETP	exchange-traded product
EU	European Union
EUI	Economic Intelligence Unit
FDI	foreign direct investment
FDIC	Federal Deposit Insurance Corporation
Fed	United States Federal Reserve
FIC	Financial Intelligence Centre
FICA	Financial Intelligence Centre Act
FRA	forward rate agreement
FSB	Financial Stability Board
FSB	Financial Services Board
FSC	Financial Stability Committee
FSF	Financial Stability Forum
FSI	Financial Stability Institute
FSI	financial soundness indicator
FX	foreign exchange
FX NOP	net open foreign currency position
G-20	Group of Twenty
G-30	Group of Thirty
G-7	Group of Seven
GDP	gross domestic product
GFECRA	Gold and Foreign Exchange Contingency Reserve Account

GNDI	gross national disposable income
GPFI	Global Partnership for Financial Inclusion
GR	Guidotti ratio
IFRSs	International Financial Reporting Standards
IIF	Institute of International Finance
ILO	International Labour Organization
IMF	International Monetary Fund
IRB	internal ratings-based
IRBA	Independent Regulatory Board of Auditors
IT	inflation targeting
Jibar	Johannesburg Interbank Agreed Rate
JSE	JSE Limited
LCR	liquidity coverage ratio
LIBOR	London Interbank Offered Rate
LTV	loan-to-value
M3	broadly defined money supply
MPC	Monetary Policy Committee
MPF	Monetary Policy Forum
MPR	Monetary Policy Review
MTEF	medium-term expenditure framework
MV	market value
NCA	National Credit Act
NCD	negotiable certificate of deposit
NII	net interest income
NKP	national key point
NOFP	net open foreign currency position
NOP	net open position
NPI	non-profit institution
NPISH	non-profit institution serving households
NPL	non-performing loan
NPS	National Payment System
NSFR	net stable funding ratio
NSII	network systemic importance index
NT	National Treasury
OECD	Organisation of Economic Co-operation and Development
OIS	overnight indexed swap rate
OLS	ordinary least squares
OPEC	Organization of the Petroleum Exporting Countries
PC	principal component
PC1	first principal component
PC2	second principal component
PCA	principal component analysis
PD	probability of default
PN	promissory note
PoD	probability of default
PPI	producer price index
PSBR	public-sector borrowing requirement
QE	quantitative easing
QES	Quarterly Employment Statistics
QFII	Qualified Foreign Institutional Investors
QLFS	Quarterly Labour Force Survey
QPM	quarterly projection model
RBS	Royal Bank of Scotland

repo	repurchase
Resmanco	Reserves Management Committee
RMFSE	root mean squared forecast error
RO	representative office
ROA	return on assets
ROAC	Regulatory and Oversight Advisory Committee
ROE	return on equity
RTGS	Real Time Gross Settlement
RTL	real-time line
RWA	risk-weighted asset
S&P	Standard & Poor's
SA	South Africa
SA	Società Anonima [Italy]
SABN	South African Bank Note Company (RF) Proprietary Limited
Sabor	South African Benchmark Overnight Rate on Deposits
SADC	Southern African Development Community
SADCBA	SADC Banking Association
SAFE	State Administration of Foreign Exchange
SAFEX	South African Futures Exchange
SAMEX	SAMOS Front End System
SAMOS	South African Multiple Option Settlement
SARB	South African Reserve Bank
SARBCIC	South African Reserve Bank Captive Insurance Company Limited
SARS	South African Revenue Service
SDR	special drawing right
SME	small and medium enterprise
SNA	System of National Accounts
SPV	special-purpose vehicle
SSA	sub-Saharan Africa
SSBS	SADC Subcommittee of Banking Supervisors
SSF	single stock future
Stats SA	Statistics South Africa
STC	secondary tax on companies
Strate	Strate Limited
Strate	Share Transactions Totally Electronic
sVaR	stressed value at risk
SWF	sovereign wealth fund
SWIFT	Society for Worldwide Interbank Financial Telecommunications
TBTF	too big to fail
TOT	terms of trade
TSA	the standardised approach [for operational risk]
UIF	Unemployment Insurance Fund
UK	United Kingdom
UN	United Nations
Unisa	University of South Africa
US	United States
VaR	value at risk
VAR	Vector Auto Regression
VAT	value-added tax
VIX®	Volatility Index
WEF	World Economic Forum
WEO	World Economic Outlook
WTO	World Trade Organisation

YTD	year to date
ZAPS	South African Payment Stream
ZAR	South African rand