

Optimal Monetary Policy Framework for South Africa*

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1 Introduction

Monetary policy debates in South Africa have continued unabated for some time. Whilst some constituencies call for inflation-targeting to remain, others propose a change in the mandate to either a competitive currency framework or to target real variables such as employment and output. This essay, through the use of theoretical and empirical analysis, proposes that whilst inflation-targeting is an optimal framework for emerging-economies such as South Africa, various refinements are needed to deal with supply-shock and terms-of-trade shocks such as those experienced in 2007-2008.

2 Importance of stable and relatively low inflation

2.1 Stylised costs

Cagan's seminal study (Cagan, 1956) on the dynamics of seven hyperinflation episodes in Europe emphasised the destructive influence of severe inflation on real money balances, results that are consistent with the monetary proposition of the superneutrality of money. The literature emphasises the following inflation-induced welfare costs: shoe-leather (economising on real balances), payment changes, increased adoption of barter, wage payments in kind, increasing transfers of productive assets to mitigate these costs and supply-side distortions due to bracket-creep of a partially-indexed taxation system (Bailey, 1956; Mishkin, 1998; Smal, 1998).

2.2 Growth implications

Various studies have considered the long-run growth implications of various levels of inflation. Fischer (1993) deduces that a 1% rise in inflation reduces growth by 0.1-0.5%. Barro (1995) similarly finds a negative relation between inflation and long-run economic growth: a 10% increase in the average rate of inflation reduces real GDP growth per capita by approximately 0.3%. After 30 years of compounding, this reduces the level of real GDP by 4-7%.

Hodge (2005) applies these empirical studies to purely South African data. In the short-run, a negative trend between deviations of output growth (from its Hodrick-Prescott trend) and changes in the inflation rate are found. That is, when a negative output gap exists, a one-off increase in inflation will likely push real output towards its trend. In the long-run, however, a significant linearly negative relationship exists between inflation and growth. Crucially, Hodge's results are not biased by extreme inflation observations - a concern raised by Bruno & Easterly (1998). Thus, whilst high inflation may lead to temporary real output gains, the eventual outcome of continuously higher inflation is reduced long-run growth, acceleratory inflation and the associated welfare costs.

2.3 Inflation and the poor

Considerable research suggests that high inflation leads to greater inequality. Bulir (2001) finds a significant Kuzenets-type non-linear relation between income inequality and economic development in a cross-country analysis. Easterly & Fischer (2001) uses a dataset comprising 38 countries and 32869 households to conclude with two primary findings. Firstly, using a probit model, the very poor are 10.5% more likely to mention inflation as a top national concern than the rich and this difference is significant at 5% significance. Secondly, using data for 42 developing nations over 1981-1993, an OLS regression is estimated to determine the relation between inflation and poverty rate, controlling for growth. The inflation tax rate is found to have a significant positive effect on an increase in poverty as reported in table 1.

	growth	inflation tax	<i>Adj.R</i> ²
coefficient	-5.33	62.55	0.48
t-statistic	-3.70*	2.03*	

¹dependent variable is % change of households below the country-specific constructed poverty line

²*indicates significance at 5%

Table 1: Easterly & Fischer: OLS regression results for inflation-poverty relation

2.4 The case for moderate, stable inflation

The discussion above emphasises the costs and long-run negative growth and inequality implications of high monetary-induced inflation. Consequently, the optimal inflation rate is either price stability (zero inflation rate) or some positive, moderate rate. Initially, Friedman's Full Liquidity Proposition stated that in a perfectly-competitive economy, prices should fall at the real interest rate in an optimal setting. Sinclair (2003) postulates that the presence of market imperfections justify a small positive inflation rate. The behavioural school support this view. According to Aklerlof *et al.* (2001), incorporating expectations as they are used as opposed to how they are formed results in an unconventional long-run Phillips curve given by fig. 1. As illustrated, the optimal inflation rate is some positive, moderate rate.

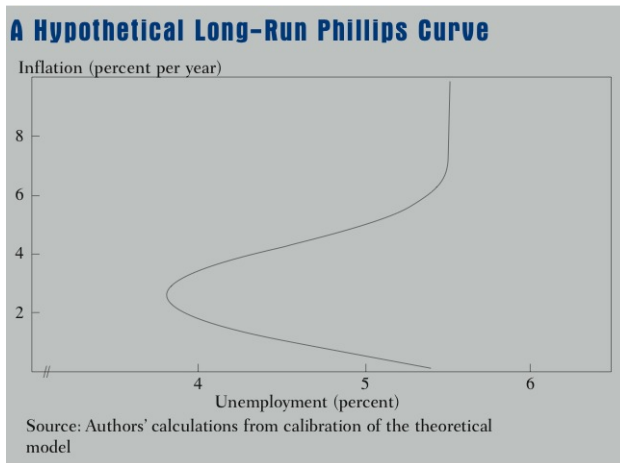


Figure 1: Behavioural Hypothetical Phillips Curve. Akerlof et al (2001)

3 Monetary Policy and Employment: Phillips Curve Retrospective

Some critiques of inflation targeting advocate targeting real variables instead (see Epstein (2008)). This section provides theoretical and South African empirical evidence suggesting the impossibility of such a framework over the long-run.

3.1 Theoretical Considerations

The original Phillips curve postulated a negative relation between nominal wage changes and the level of unemployment, based on empirical findings (Phillips, 1958):

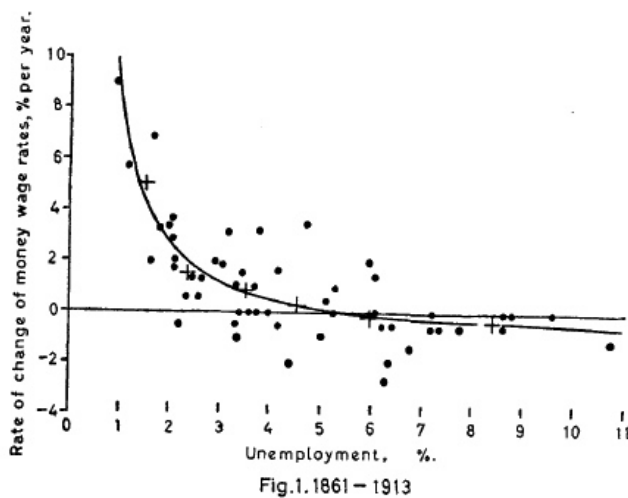


Figure 2: Original Phillips Curve. *Phillips (1958)*

Friedman and Phelps emphasised real wages and incorporated inflation expectations. The key insight is that irrespective of the formation of inflation expectations, there is no *steady-state* (long-run) tradeoff between inflation and unemployment.¹ Hence, irrespective of monetary policy, there exists one unique level of unemployment (and output) across all steady-states. These are the natural rates. Monetary policy seeking, over the long-run, to achieve a level of unemployment lower than the natural rate will continuously accelerate inflation with no employment gain when steady-state equilibria re-attains. Monetary neutrality pertains in the long-run.

Lucas' theory extends the monetary neutrality theory and emphasises monetary misperceptions as the necessary condition to permit a tradeoff (Lucas, 1972). Thus, correct monetary perceptions is (logically) *sufficient* to conclude that a tradeoff *does not exist*. Therefore, monetary policy can only sustain, over the long-term, an employment target systematically different to the natural rate if authorities are able to constantly generate monetary surprises. This is akin to assuming that under continuous surprise monetary expansions, agents form systematically biased expectations to permit continuous misperceptions. This assumes agents accept costly forecasting errors, an unlikely condition. An analogy can be drawn with the following:

"You can fool some of the people all of the time, and all of the people some of the time,
but you can not fool all of the people all of the time."

Abraham Lincoln

3.2 South African Phillips Curve Experience

Several empirical studies conclude that South African data displays trends postulated above: a short-run Phillips curve trade-off but no such long-run relation. du Plessis (2006) accounts for both nominal rigidities and rational decision-theory by estimating a New Keynesian Phillips Curve (NKPC) given by eq. (1) and its estimatable form eq. (2). The variable ϕ is used as a proxy for business cycle (i.e. output gap) effects. Using quarterly data between 1975-2003, du Plessis uses a Generalised Methods of Moments technique with an inverse Newey-West covariance matrix as weighting matrix to ensure consistent estimates. The open-economy, hybrid regression yields estimates shown in table 2. The coefficient of the variable ϕ is both significant and of the correct sign to imply a Phillips tradeoff.

$$\pi_t = \beta\pi_t^e + \lambda\phi_t \quad (1)$$

$$\pi_t = \beta\pi_{t+1} + \lambda\phi_t + \epsilon_t \quad (2)$$

¹Friedman-Phelps' theory does not preclude the possibility of a short-run Phillips curve tradeoff

	π_{t+1}	ϕ_t
coefficient	1	0.031
standard error	not reported	0.015

Table 2: Du Plessis NKPC Results

Hodge (2009) finds a short-run relationship between inflation and growth. The estimated general-to-specific, unit root-adjusted OLS model is described by eq. (3). Inflation is an I(1) series and thus included in first-difference form. Using data from 1970-2000, the results reported in table 3 are obtained. Inflation and short-run growth are positively and significantly related implying a short-run *tradeoff* between inflation and unemployment.

$$\pi_t = \alpha + \beta\pi_{t-3} + \gamma g_{t-1} + \eta m_t + \epsilon_t \quad (3)$$

	π_{t-3}	short-run growth g_{t-1}	m_t
coefficient	-0.31	0.26	0.18
t-statistic	-2.32*	2.07*	3.74*

¹* indicates significance at 5%

Table 3: Hodge Inflation Short-Run Growth Results

Fedderke & Schaling (2005) find a similar short-run relation using a VECM albeit through an indirect transmission mechanism: the output gap directly significantly affects (only) unit labour costs which are found to then significantly affect price inflation.

4 Contemporary Comparison of Monetary Policy Frameworks

The discussions above illustrate the overwhelming international and South African theoretical and empirical evidence that a) there are significant welfare and growth costs associated with high and volatile inflation and b) monetary policy cannot and thus, should not attempt to, affect real variables such as output and employment in the medium- to long-term. Given this, the optimal framework is one that maintains moderate inflation whilst not propagating excessive short-run volatility. There are three principal frameworks.

Firstly, whilst central banks can target a growth path for a monetary aggregate based on Friedman's idea of a k% growth rule, this framework has lost popularity as a result of the breakdown in the quantity theory of money equation due to a volatile velocity of money component.

Secondly, an exchange-rate peg can be adopted either in the form of a fixed- or crawling-peg. In either case, the primary advantage is that a strong nominal anchor exists which minimises central bank discretion and hence, does not allow for a time-inconsistent approach as outlined by (Kydland

& Prescott, 1977). However, this framework suffers major drawbacks. For illustrative purposes, a regime aiming to control the currency to enhance competitiveness of domestic goods will result in the following: loss of monetary policy autonomy or maintenance of independence through persistent costly sterilisation (as experienced in Stals' era), exposing the domestic economy to speculative attacks and associated economic uncertainty, elimination of discretionary domestic policy and lastly, the inevitable higher imported inflation that will result meaning a purely transitory competitive advantage.²

The third, and final, approach is inflation targeting which involves an explicit nominal anchor in the form of an inflation target. It involves an institutional commitment to low inflation as discussed by Mishkin (1998). It forces monetary policy to concentrate primarily on long-term objectives over which it has control (such as inflation and promoting economic stability) as opposed to those that it cannot affect (long-run employment and output). It has two key advantages in comparison to exchange-rate targeting: it allows for an independent policy and for 'constrained discretion' as emphasised by Ben Bernanke on various occasions.

5 Inflation Targeting Performance

Inflation targeting is a relatively new framework, pioneered by New Zealand in 1990. Ball & Sheridan (2003) studied the effects of inflation targeting in 20 OECD developed countries and found that inflation targeting had no effect (positive or negative) on macroeconomic performance. Whilst this may be due to relatively superior ex-ante monetary policy in developed countries, the key question is: are these results similar for emerging market economies?

5.1 Inflation Targeting and Emerging Market Economies

Goncalves & Salles (2008) apply the Ball and Sheridan estimation technique to a group of 36 emerging market economies, 13 of which adopted inflation targeting. On average, inflation-targeters experienced a fall in inflation of 11.4% from pre- to post-targeting. Over a similar time-horizon, non-targeting emerging economies experienced only a 6.5% fall. To control for the possibility of mean-reversion, the authors estimate a "difs-in-difs" regression, given by:³

$$\Delta x^i = c + \beta x^i + \alpha D + \epsilon \quad (4)$$

where Δx^i is the change in the value of an economic variable x , x^i is the initial value of an economic variable x and D is a dummy variable equal to 1 when the country is an inflation-targeter.

In each regression estimated, the key value is the coefficient and significance of the dummy variable. Both the inflation and output growth volatility regressions yield negative coefficients,

²On the other hand, monetary policy should aim to prevent an overvalued or volatile currency (Frankel *et al.*, 2006). We discuss these considerations in section 6.

³see Appendix for variable descriptions

significant at roughly 5% for the dummy variable suggesting that inflation targeters experience a significant ex-post fall in both inflation and output growth volatility vis-a-vis non-targeters.

Mishkin (1998) compares the relative outcomes of inflation-targeting between thirteen emerging and eight developed economies. He compares these two groups to a control group of 13 non-targeting advanced economies. His findings lend credence to the view that emerging economies benefit significantly from inflation targeting. In particular, emerging economies experience sizeable disinflation (from a mean of 18.6% to 6.0%), reduced output growth volatility and reduced output gap volatility.

Mishkin uses a monetary policy efficiency frontier (Taylor Curve) to display the effective trade-off faced by the policymaker. According to Mishkin, the position of the frontier indicates susceptibility to shocks: the closer the frontier to the origin, the less susceptible the economy is to shocks. The attainable region is to the north-east and movements of the actual position of the economy towards the frontier imply enhanced policy efficiency as shown in fig. 3.

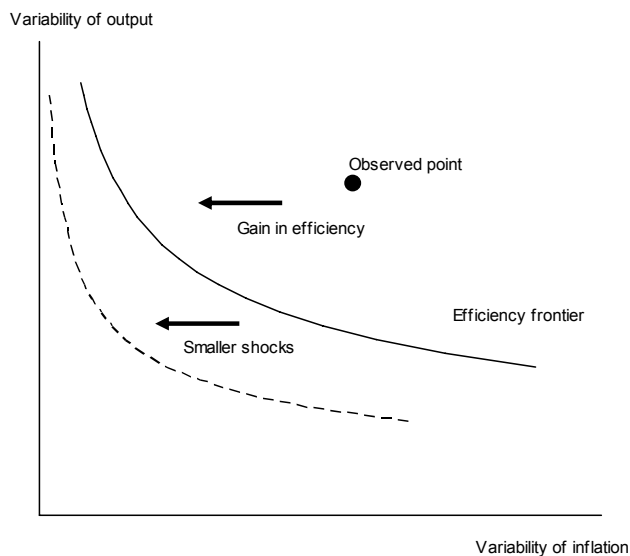


Figure 3: Taylor Curve (*Mishkin, 1998*)

Mishkin's overall finding is that emerging economy inflation targeters experience significant efficiency gains, more so than developed economies. The asymmetric nature of gains is illustrated in fig. 4.

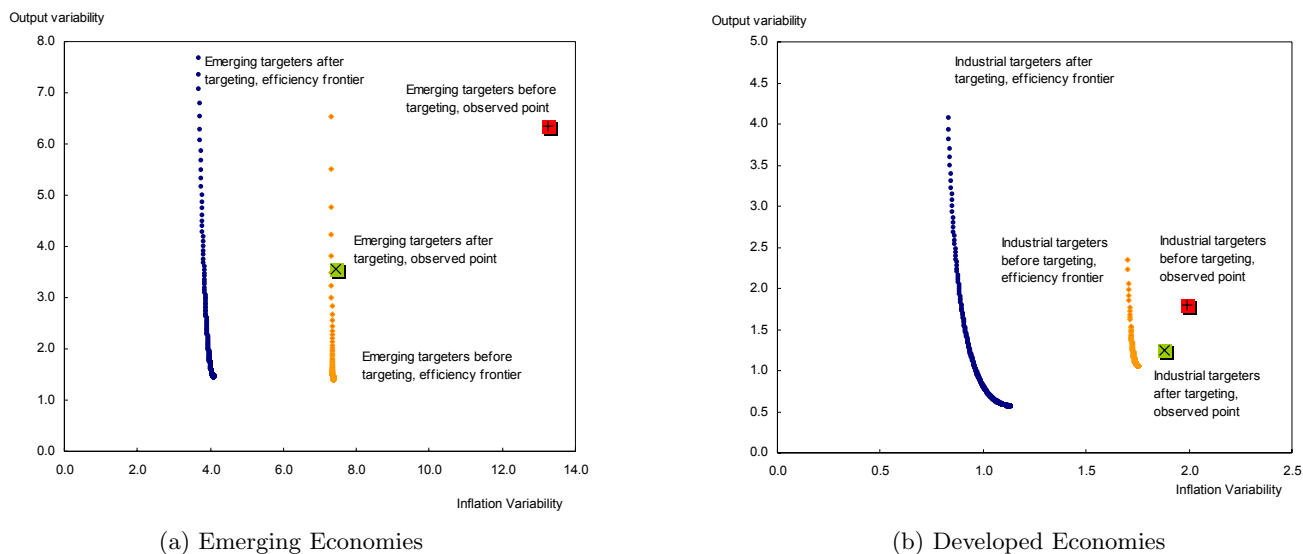


Figure 4: Asymmetric Taylor Curves (*Mishkin, 1998*)

5.2 Inflation Targeting in South Africa

The results above suggest that inflation-targeting has produced beneficial macroeconomic outcomes for emerging economies. The empirical evidence presented in this section indicates that these results hold for South Africa, in particular.

As outlined by van der Merwe (2004), the policy framework previously adopted was highly eclectic, with a range of indicators adopted. With no explicit nominal anchor, monetary policy was highly opaque, non-transparent with relatively diminished Bank accountability. Inflation targeting was adopted in 2000 and the constitutional mandate of the South African Reserve Bank (the Bank) is:

“to protect the value of the currency in the interest of balanced and sustainable economic growth in the Republic.”

Aron & Muellbauer (2007) investigate the effect of inflation targeting on South Africa’s macroeconomic performance. Aron & Muellbauer find significant evidence that inflation targeting has coincided with improved transparency, credibility and predictability of policymaking. In particular, monetary policy transparency in South Africa has improved using the Geraats index, on par with Australia. Whilst the authors call for more transparency, the Bank should be mindful of the possibility of being overly-transparent, as warned by Mishkin (2004). Aron & Muellbauer find that inflation expectations for various agents (households, trade unions, businesses and analysts) have remained within target range even during the exchange rate shocks of 2001-2002 implying well-anchored expectations. Similarly, Reid (2009) finds that significant market adjustment of short-term interest rates occurs *prior* to any repo-rate change. This implies a well-communicated

monetary policy strategy and relatively insignificant asymmetric information between the Bank and economic agents, unlike during previous frameworks.

Inflation targeting has coincided with improved macroeconomic indicators in South Africa. Figure 5 shows that headline inflation has been within the target band of 3-6% for a longer period of time during inflation targeting than before. On average, headline inflation and inflation volatility is lower implying reduced economic uncertainty, a more stable macroeconomic environment and overall welfare gains as outlined in section 2. Rangasamy presents evidence that CPI persistence, as measured by the coefficient of a univariate AR(1) process is found to fall from 0.98 in the period 1981-2000 to 0.83 between 2000 and 2008. Reduced persistence is beneficial as it indicates that inflation expectations are increasingly well-anchored.

Figure 6 illustrates that real growth has been relatively more robust and consistent during the inflation targeting period. The real GDP growth statistic has spent a considerably amount of time within the 3-6% range which was not the case pre-2000. As with inflation, mean real growth and real growth volatility have fared better over the last decade. This is the case even though inflation targeting has coincided with the Great Recession of 2008-09.

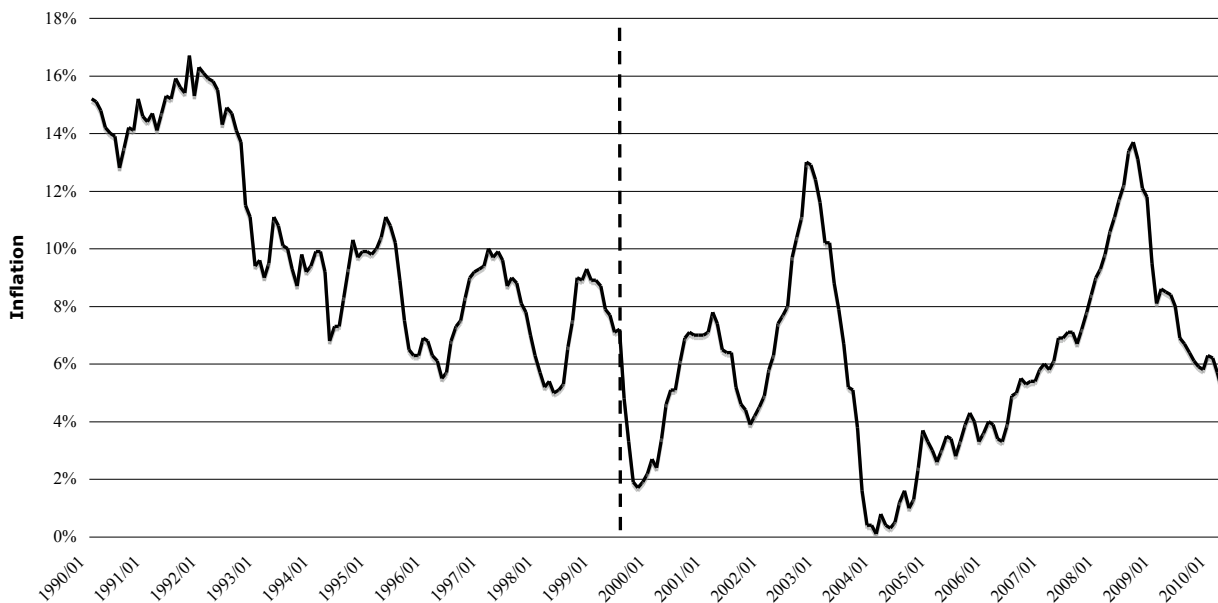


Figure 5: Headline CPI, All Urban Areas. *Data Source: Statistics South Africa. Series P0141*

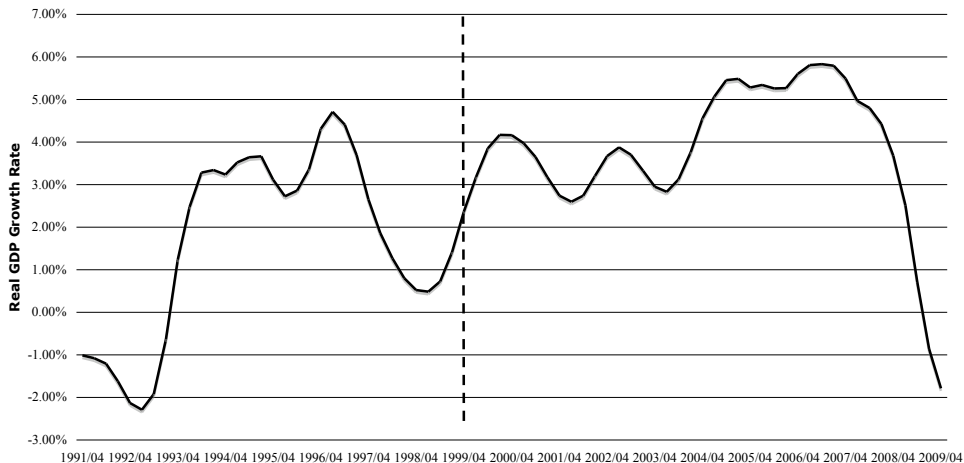


Figure 6: Real GDP Growth based on Quarterly Figures. *Data Source: South African Reserve Bank. Series KBP6006D*

6 Supply-Shocks and Inflation Targeting

Even though inflation targeting has produced tangible benefits to emerging economies including South Africa, sceptics remain. Whilst some criticisms and alternate recommendations are counter-theoretical (section 3), there are some valid concerns regarding the framework. Such issues were recently exposed during the 2007 oil crisis and 2008 Great Recession.

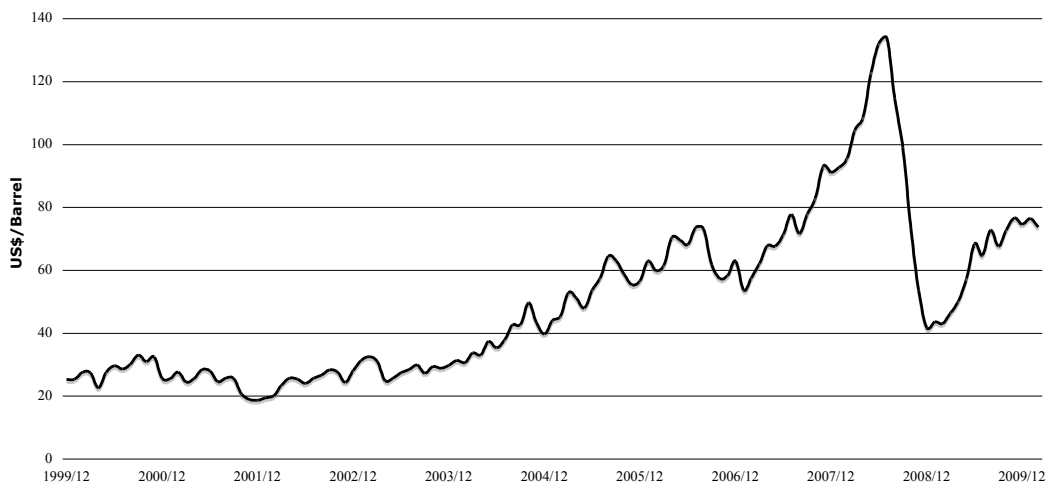


Figure 7: Brent Crude Oil Price since 2000 & recent Oil Spike. *Data Source: South African Reserve Bank Data*

6.1 Supply-Shock Challenges

The 2007 supply-shocks posed a significant challenge to monetary policy (see fig. 7). Whilst monetary policy can and should react to contain *demand*-induced inflation and smooth the business cycle, monetary policy reaction to supply-shocks will be procyclical. The supply-shock itself is likely to reduce real output in the short-run and a contractionary response is likely to exacerbate this. In order for monetary policy to be effective in containing inflation arising from supply-shocks, interest rates need to be aggressively increased (Stiglitz, 2008). This is clearly an impossible option yet the question remains: if monetary policy is such a blunt tool, why respond to such shocks at all? Is this optimal? This is particularly pertinent to inflation targeters who have displayed a greater tendency to react to such shocks (Cuevas & Topak, 2008).

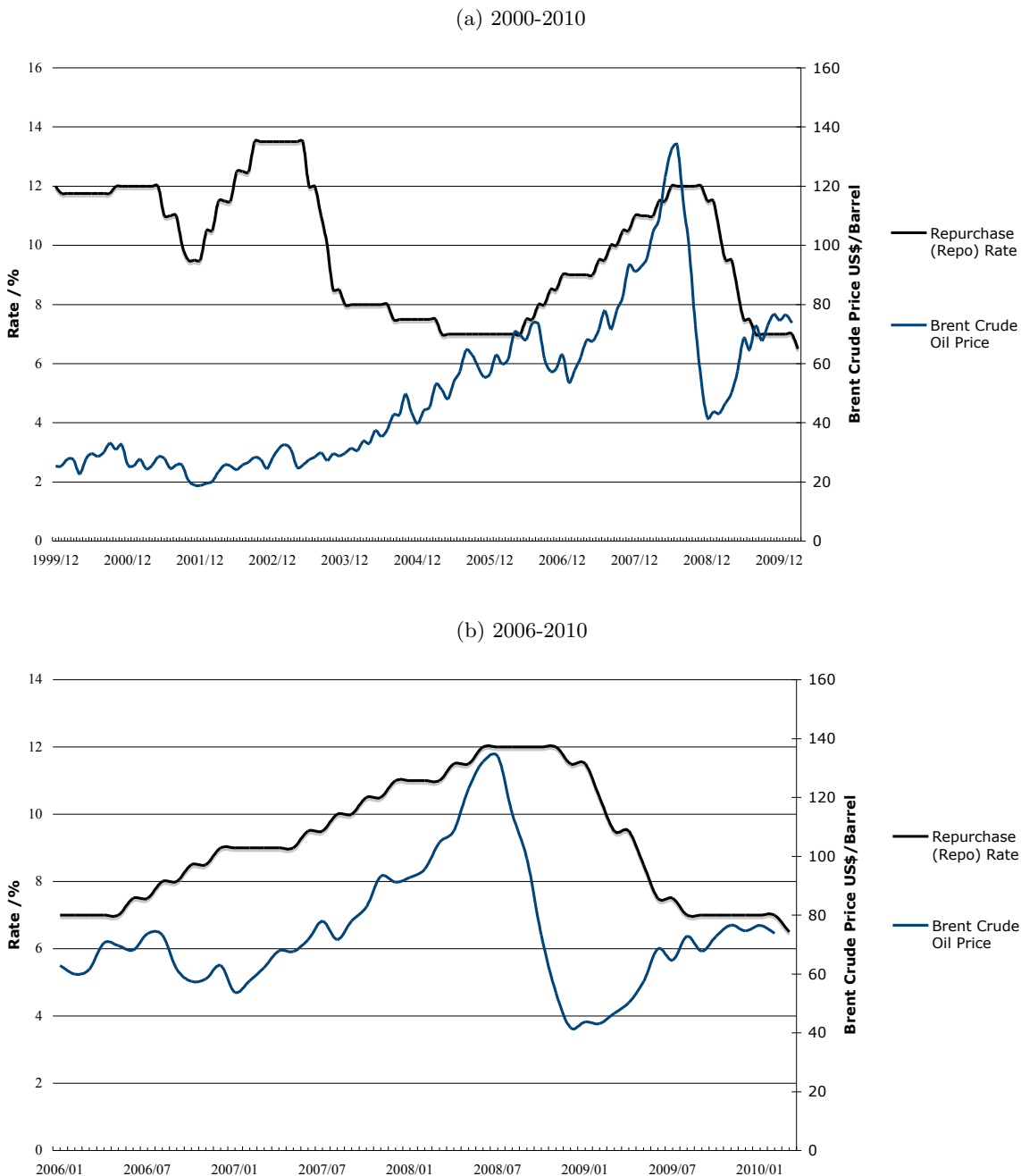
Taylor (1996) advocates maintenance of price stability as the ultimate objective even in the presence of shocks and a short-run Phillips trade-off. Bernanke *et al.* (1997) reach a different conclusion. They use a VAR model to analyse the effects of oil shocks and monetary policy responses. Their key finding is that a significant part of the *effect* of oil shocks on the economy result not directly from changes in oil prices but from the consequent monetary tightening. The policy implication is that monetary responses to such shocks produce excessive short-run real output volatility. In addition, raising rates in response to relative price shocks is likely to be costly with overall limited monetary policy induced effects on inflation (Bank for International Settlements, 2010). The existence of a short-run trade-off between inflation and output volatility translates into an optimal policy response of no monetary reaction (Aoki, 2001; Frankel *et al.*, 2006; Kamps & Pierdzioch, 2002). The Bank's recent responses to supply-shocks are inconsistent with this proposed optimal strategy. Figure 8 illustrates that monetary policy has become increasingly responsive to movements in the oil price. Figure 9 indicates that the repo rate is more correlated to headline CPI than to trend core. This implies that the Bank is also reacting to first-round effects. This is a finding confirmed by Cuevas & Topak (2008). Using an instrument-variable approach to estimating Taylor-rule equations for various inflation-targeters, Cuevas & Topak show that the Bank reacts significantly (at 5%) to such effects. This is clearly not optimal.

Monetary policy should not react to supply-shocks which it has no control over. Monetary policy reaction to such shocks is a blunt tool to curbing inflation and inflation expectations whilst exacerbating short-run output and employment volatility. Rather, inflation expectations are anchored by a credible policy over time; that is, a policy controlling demand-induced inflation and effectively communicating this to economic agents. Long-term commitment to such a policy will maintain anchored expectations even during volatile periods. The primary issue is thus to effectively refine the current South African inflation targeting framework to ensure that there is no monetary policy reaction to supply-shocks whilst maintaining credibility.

6.2 Refining Inflation Targeting: Proposal to Target Export Price Index (EPI)

As previously outlined, there is significant theoretical and empirical evidence to suggest that an inflation targeting framework is optimal for emerging economies and South Africa in particular.

Figure 8: Repurchase Rate and Brent Crude Oil Price. *Data Source: South African Reserve Bank Data*



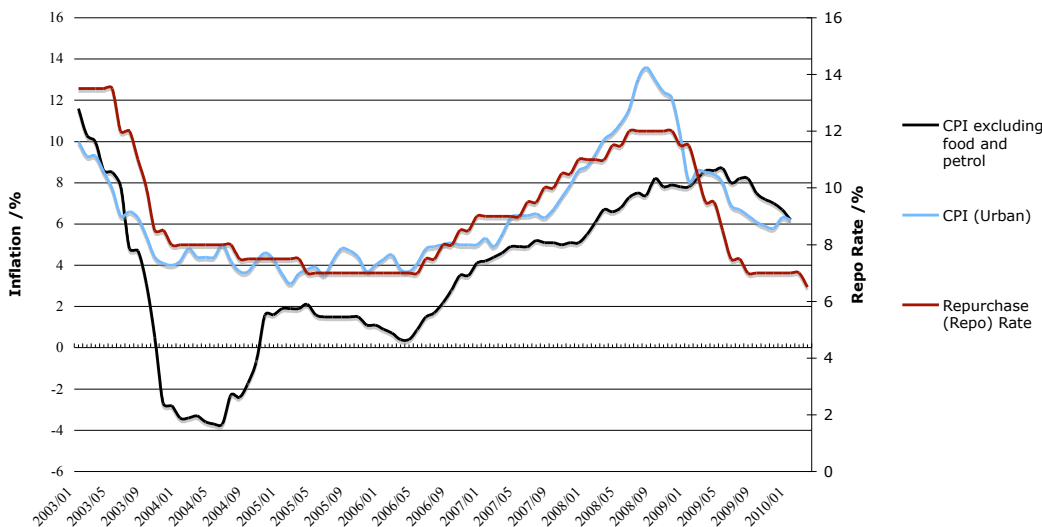


Figure 9: Headline and Core Inflation Measures vs Repurchase rate. *Data Source: South African Reserve Bank Data*

However, the current framework requires refinements to treatment of supply-shocks. This is particularly pertinent to relatively small, open economies such as South Africa that are susceptible to exogenous shocks and suffer relatively high terms-of-trade volatility - see fig. 10.

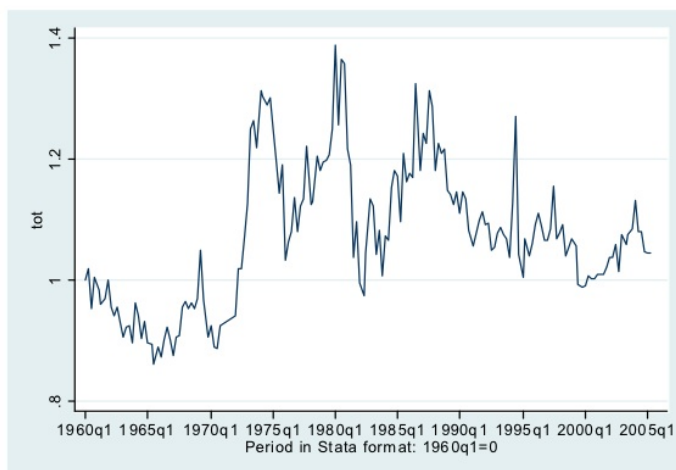


Figure 10: South Africa Terms of Trade (*Frankel et al., 2006*)

The standard academic prescription to the treatment of supply-shock challenges is to either effectively abandon the target range and communicate the reasons or adopt a different inflation measure to CPI. Ad-hoc use of the former, especially to the extent evidenced in South Africa, results in both deficient transparency and credibility; undermining the exact reasons of public announcement of a nominal target. Rather, the optimal treatment is to target explicitly an inflation measure

that i) monetary authorities have influence over and ii) is consistent with overall macroeconomic policies in the interest of balanced and sustainable growth.

The usual inflation measure targeted is either CPI or core inflation. Whilst CPI captures all items in a typical household basket, core inflation removes volatile items such as food and oil. Aoki (2001) and Kamps & Pierdzioch (2002) suggest that core inflation is preferable to CPI as a measure to target. This is because core is a closer approximation to underlying trend inflation and reduces the trade-off between inflation and output volatilities. Whilst core inflation is preferred to CPI, both measures are not optimal to exchange rate policy considerations, in particular to terms-of-trade shocks. The proposal below is to inflation target an export price index (EPI) on the basis that it is robust to terms-of-trade shocks, produces optimal exchange rate responses to such shocks and does not exacerbate volatility whilst allowing for a strong nominal anchor.

To illustrate, an optimal exchange rate response to an increase in the relative price of an imported good is for the Rand to depreciate equiproportionately to the US\$ and vice versa for an exported good.⁴ A CPI target will result in policy responses that mix these up, as outlined by Frankel (2005). For example, an increase in the price of an import (e.g. oil) reflects in higher CPI and, as described above, is associated with monetary tightening in inflation targeting regimes - fig. 11. The higher interest rates, *ceteris paribus*, are likely to yield an *appreciation* of the Rand. Hence, conventional inflation targeting responses to import price shocks are likely to yield i) excessive output and employment volatility *and* ii) unnecessary Rand volatility and overvaluation leading to uncertainty and an overall weaker export sector. Given South Africa's ambitions of export-led growth, this appears to be an inconsistent strategy. The above argument extends to any imported good. Whilst core inflation measures are robust to oil price shocks, they are not robust to relative price shocks of other imported goods which are still included in the measure.

An optimal measure thus excludes all goods and services that South Africa net imports. Further, an optimal measure includes export prices to ensure that a decrease in the relative price of an export on the world market results in an optimal outcome: depreciation of the Rand. Hence, we propose targeting an index that excludes imports and includes exports. Such a measure may be termed an Export Price Index (EPI). Our proposal to the Bank and National Treasury is to shift to an EPI-targeter as opposed to a CPI-targeter. The implementation of this framework would be similar: constructing an EPI and choosing a target band (say $x - y\%$), communicating this strategy and reasons for doing so, monitoring changes in EPI at Bank meetings and using the repurchase rate (repo) to keep the target within band.

This proposal is similar to Frankel's of pegging the export price (PEP) or pegging the export price index (PEPI) - (Frankel, 2005; Frankel *et al.*, 2006). Frankel believes that such policies allow for advantages both fixed and floating exchange rate systems by providing a strong nominal anchor and automatic adjustment to terms-of-trade shocks respectively. The subtle difference with our proposal is that Frankel believes in *pegging the index* as opposed to targeting a band for changes

⁴This follows from the established negative causal relation between terms-of-trade volatility on one hand and growth and welfare on the other (Bleaney & Greenaway, 2001; Lutz, 1994; Mendoza, 1997)

in the index. The difference is akin to targeting a price level vs targeting a band for the rate of inflation.

	Correlation
Australia	0.493
Canada	0.249
Korea	0.359
New Zealand	0.836
Norway	0.546
Singapore	0.639
South Africa	0.846
Sweden	0.745
Switzerland	0.850
Thailand	0.299
United Kingdom	0.525

Source: International Financial Statistics, IMF.

Figure 11: Correlations of changes in exchange rate and change in US\$ price of imports (1970-2003) (*Frankel, 2005*)

7 Asset Price Considerations

The recent financial crisis has brought asset price considerations to the forefront of policy debates. A key issue is related to the identification of bubbles, as discussed in Brunnermeier (2001). Some critiques of inflation targeting postulate that sole focus on inflation leads to ignoring asset bubble issues. Whilst research in this area is still in its infancy and remains dynamic, an evolving view is that monetary policy was not the proximate cause that led to the US housing bubble and rather, inadequate regulation and supervision pitfalls (Bernanke, 2010; Svensson, 2010). Instead, the recent crisis highlights the need for improved supervisory and regulation implementation combined with a macroprudential-based policy framework to co-ordinate financial stability and reduce systematic risk (Guma, 2010; Svensson, 2010).

8 Conclusion

This essay discussed alternative monetary policy frameworks for South Africa and concluded that inflation targeting is superior to competing frameworks, both theoretically and empirically. The importance of moderate inflation, arguments against targeting real variables and supply-shock challenges were discussed. The proposal to the Bank and National Treasury is to remain an inflation targeter but instead transform from a CPI-targeter to an EPI-targeter. This is likely to yield the following benefits: i) robustness to terms-of-trade shocks (minimisation of unnecessary short-run real output and employment volatility) through explicit targeting an inflation measure that monetary policy can wholly influence and ii) optimal exchange rate responses to such shocks in the interests of balanced, sustainable economic growth and consistency with broader macroeconomic policy. These benefits will accrue whilst maintaining a strong nominal anchor to ensure moderate inflation and anchored expectations.

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