

Transparency, Credibility and Predictability of Monetary Policy under Inflation Targeting in South Africa

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Abstract: The adoption of inflation targeting in 2000 aimed to enhance the transparency and effectiveness of monetary policy in South Africa. Quantitative indexes reveal a strong rise in the transparency of monetary policy between 1994 and 2007. Inflation and interest rate expectations data, forward interest rate data and estimates of an interest rate policy rule, are used to explore the credibility and predictability of monetary policy since adopting inflation targeting. The evidence points to the new monetary policy framework being well-entrenched in financial markets' expectations as early as 2001. Only small declines in interest rate forecast errors arise thereafter, controlling for macroeconomic volatility.

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1. Introduction

Central bank transparency increased in many countries during the 1990s and in the new millennium, with the adoption of inflation targeting and an increase in the regular release of information. This paper documents the increased monetary policy transparency of the South African Reserve Bank after adopting inflation targeting in 2000, by means of calculated indices and in an international comparative perspective. It is widely believed that increased transparency brings economic benefits by reducing private sector uncertainty, raising the level of investment and the quality of decision making. Bernanke *et al.* (1999) argue in favour of this proposition while acknowledging the difficulties of interpreting the data. The unresolved debates about the ‘great moderation’ - the reduction in macroeconomic volatility in the industrial economies since the early 1980s (Bernanke, 2004) - reflect these difficulties. For example, in a cross-country study, Ball and Sheridan (2005) argue that the adoption of inflation targeting has had insignificant effects on reducing inflation.

In the context of South Africa, the growth rate has improved since 2002, while macroeconomic volatility has concomitantly declined: however, we do not seek here formally to establish a link. As in Swanson (2006), our aim is more modest: we use evidence from data on private sector expectations of inflation and interest rates, and data on forward market interest rate agreements and interest rate reaction functions to demonstrate the credibility and predictability of monetary policy in South Africa since 2000. Inflation expectations have become anchored in the target range, and a stable model can be found for the Reserve Bank’s policy rate after, but not before, 1999. Econometric analysis of interest rate expectations data and forward interest rate data provides further evidence. The change in the Reserve Bank’s repurchase interest rate (repo rate) is well forecast by the change in the forward rate interest agreement (FRA)¹ from the day after each

¹ A Forward Rate Agreement (FRA) is an agreement between two parties to set future borrowing rates in advance.

Monetary Policy Committee (MPC) meeting to the day before the next meeting. We define the forecast errors as the residuals in a regression of changes in the repo rate on changes in the FRAs. Like Swanson (2006), we show that these forecast errors increase with the recent momentum of repo rate changes and with the magnitude of macroeconomic surprises. Controlling for these effects, we show that the trend decline in the absolute value of forecast errors since formal inflation targeting began was small and statistically insignificant. This is consistent with a rapid transition to credibility of the new framework as reflected in the forward markets.

The outline of the paper is as follows. Section 2 of the paper documents the shift in transparency of the Reserve Bank between 1994 and 2004 using differently weighted versions of the Geraats central bank transparency index, and compares these indices with those for Australia, New Zealand and the UK in 2002 (Eiffinger and Geraats 2006). In Section 3, the predictability of repo rate changes is assessed using data from the forward rate agreements of market traders. In particular, we analyse influences on the absolute size of forecast errors for the repo rate changes. Section 3 also examines the predictability of repo rate changes by market analysts, using Reuters' survey data on analysts' forecasts of the end of quarter prime rate, and shows how the absolute size of the forecast errors and the cross-section dispersion of forecasts have changed since 2000. Further evidence is considered from estimated interest rate rules comparing the inflation targeting regime with earlier periods. Section 4 examines survey data on inflation expectations from a number of categories of participant to see how these have evolved relative to the inflation target. Section 5 draws conclusions.

2. How transparent is the South African Reserve Bank?

The last decade has seen a trend towards governments granting independence to central banks, and requiring accountability for their actions. Improved accountability has been facilitated by a parallel trend towards greater transparency and openness of central banks. This enhanced

transparency to the public may also serve to protect the independence of central banks (Blinder et al. 2001). Recent economic thinking suggests that greater transparency of policy may also influence the *effectiveness* of monetary policy. Anchoring agents' inflationary expectations around a credible target facilitates a more moderate approach to shocks by the central bank as agents will discount short-term volatility.² By increasing the predictability of interest rate policy, market interest rate volatility is reduced, lowering uncertainty in the economy.

Consequently, central banks that have adopted inflation targeting have placed a premium on transparent monetary policy - defined as the disclosure of information about monetary policy. Theoretical and empirical evidence on central bank transparency has been comprehensively surveyed by Geraats (2002). Eijffinger and Geraats (2006) outline a framework to assess the different channels of transparency, organised by political, economic, procedural, policy and operational aspects of central banking. Objective information³ disclosure by central banks was used to score the five channels, creating a total transparency index, and was applied to nine OECD countries⁴. Their method encompasses and improves on approaches in the earlier literature (e.g., Bini-Smaghi and Gros 2001).

Central bank transparency in developing and emerging market countries has not previously been explored in this manner. We report the Geraats central bank transparency index for the Reserve Bank under Governor Mboweni in 2004 and under Governor Stals in early 1994 after the democratic elections of April, 2004⁵, to show how transparency has changed with the adoption and development of the inflation targeting system. The results are shown in Table 1.

² As Woodford (2000) explains, "...forward-looking behavior implies that more desirable responses of the target variables (inflation and output) to a shock can be achieved if it can be arranged for private-sector expectations about the future paths of the target variables to adjust in the right way in response to the shock."

³ The measures capture *behaviour*, and hence are not subject to the criticism of the literature on *de jure* measures of central bank independence that are based on statutes.

⁴ There are three questions for each of the five aspects of transparency, with equal weight and a maximum score of one. Scores were assigned by surveying available information on websites and in published government and central bank documents. The five sub-indexes, each based on the respective three questions, were summed to obtain an overall index.

⁵ Governor Stals began his tenure on 8 August, 1989; and Governor Mboweni on 7 August, 1999.

Sources for the South African scores are given in Appendix 1, together with the survey questions from Eijffinger and Geraats (2006). This facilitates comparison with transparency indices calculated in 2002 for mature systems in Australia, New Zealand and the UK (Eijffinger and Geraats 2006), also shown in Table 1. The table also presents differently weighted indices as compared with the Geraats weights of 1 for all components in the index.

[TABLE 1 ABOUT HERE]

Central bank transparency in South Africa has improved greatly under inflation targeting, from a score of 5 in 1994, to 10 in 2007 (out of a possible 15). The score for the Reserve Bank will improve further as the institutional design of the system matures. The scores are based on available information, and can be verified.

The Bank of England and Reserve Bank of New Zealand offer benchmarks for high transparency in targeting systems with accumulated experience. The Reserve Bank of Australia's score is on a par with that of the South African Reserve Bank. *Political* transparency gains the full score for the Reserve Bank. *Economic* (with the recent publication of the macro-econometric model⁶), *policy* and *operational* transparency gain 2 out of 3 respectively. The score is lowest at 1 out of a possible 3 for the specific category of *procedural* transparency.

While the categorization of transparency above is systematic and objective, the *weighting* given to the different categories is subjective, and may also depend on the state of development of the economy. With the equal weighting of Eijffinger-Geraats, we find transparency (and hence accountability⁷) could be improved by: publishing more detailed economic forecasts and annual

⁶ Note that while the publication of the model is one of the Eijffinger-Geraats' criteria for transparency, they give no benchmark to evaluate whether publication is adequate e.g., to replicate the model.

⁷ The Reserve Bank Act (1989) required the publication of monthly statements of assets and liabilities and submission of an annual report to Parliament, and, periodically, for the Governor to appear before the Standing Committee on Finance. This continues (the parliamentary assessment is now televised), but there is now more detailed information by which to hold the SARB accountable.

evaluations of forecast errors; publishing (non-attributed) minutes of MPC meetings; giving a more detailed assessment of future economic conditions in the MPC's monetary policy statement; and explicit future policy inclinations in MPC statements. The last of these remains controversial, since it may reduce flexibility in responding to new information. Currently forecasts are based on the constant interest rate assumption. Scenarios with a forecast interest path, as pioneered in New Zealand, may meet the objective of enhancing predictability of future interest rate policy (Svensson 2001; Svensson et al. 2002). However, Goodhart (2005) argues that if an MPC's non-constant forecast were to be published, it might be regarded by the public as more of a *commitment* than a uncertain forecast; and it might influence the private sector's forecasts by more than its own uncertainty warranted (see also Morris and Shin 2004).

We present two other possible weightings in Table 1, one suggested by Mr. Plenderleith, formerly of the MPC of the Reserve Bank and member of the inaugural MPC of the Bank of England, and the other derived by us from a different weighting system used by Mahadeva and Sterne (2000). The normalized scores show that South Africa's relative transparency improves under both with the adoption of inflation targeting.

3. Market anticipation of interest-rate decisions

Proper communication by the central bank about the factors that explain policy should improve the predictability of monetary policy. More predictable interest rates signal that the central bank's policy rule is well understood, and there is little asymmetric information between central bank and the private sector. If the volatility of market rates is thereby lowered, this reduces uncertainty in financial markets and the real economy, encouraging investment. Repurchase interest rate decisions made by the MPC are shown in Table 2, together with the changes in the market prime overdraft rate.

[TABLE 2 ABOUT HERE]

Predictability by market traders

One previous study, Ballim and Moolman (2005), has addressed the transparency and potency of monetary policy in South Africa, using the technique of Cook and Hahn (1990), Dale (1993), Radecki and Reinhart (1994) and Roley and Sellon (1995). These papers examine the impact of changes in the policy target (the Federal Funds target rate in the case of the US and bank rate in the case of the UK) on the spectrum of interest rates around the day of the policy announcement. Ballim and Moolman aim to examine the ‘extent of monetary policy transparency as measured by the anticipatory nature the market’s response to policy actions and the force that policy has on all interest rates in the financial system’. They use daily data on forward rate interest agreements (FRAs) at various horizons and on bond yields to demonstrate, like Roley and Sellon (1995), that there is significant movement in market rates in anticipation of policy action rather than on the day of the repo rate announcement or the day after. The following regression was run:

$$\Delta R_{i,t} = \alpha_i + \beta_i \Delta r_t + e_{i,t} \quad (1)$$

where α_i is the estimated constant and β_i is the estimated coefficient in regression i , Δr_t represents the change in Reserve Bank’s repo rate, and e_i is the error term. Three regressions were run in their study for each rate. In the first, $\Delta R_{1,t}$ is the change in market interest rate (measured from FRA or long bond data) from the day following the previous MPC meeting at time $t-1$ to the day preceding the current meeting at time t , denoted “*between meetings*”. In the second, $\Delta R_{2,t}$ is the change in the closing market interest rate on the day preceding the current MPC meeting to the close on the meeting day, at time t , denoted “*on the day*”. In the third, $\Delta R_{3,t}$ is the change in the

closing market interest rate on the day of the current MPC meeting to the close on the following day, at time t , denoted “*day after*”. Results were reported for a range of 3-monthly FRA agreements and for long bond yields. Most of the movement in market rates occurred in anticipation of policy action, rather than on the day of the event or the day after. Ballim and Moolman interpret these findings on anticipations as evidence of monetary policy transparency.

However, this approach, while suggestive, does not rigorously measure the interest rate forecasting errors of the private sector, nor address the question of whether and why they might have declined, for example because of greater transparency of monetary policy or lower macroeconomic volatility. A more focused approach is to model the forecasting errors of the policy rate, defined as the deviation between the policy rate and the private sector forecast of the policy rate. Swanson (2006) applies this method in analysing the effect of changes in the transparency and operating procedures of Federal Open Market Committee (FOMC) on the size of forecast errors from the Federal Funds Futures Market in the US. He notes the decline in the absolute forecast errors after 1988, and particularly since 1994, the date after which information on the Federal Funds target rate and rationale for policy action began to be regularly released.

In Swanson’s theoretical framework, the policy rate depends on the state of the economy. The absolute size (or standard error) of the private sector’s ex-ante forecast of the Federal funds rate could decline for two reasons. The first is that the private sectors’ understanding of the policy rule linking the funds rate to the state of the economy could have improved. This could be due to gradual learning about the policy function or to greater transparency, i.e. the release of more information about the goals and conduct of policy. The second reason for a decline in forecast errors could be the result of improved private sector forecasts of the economy.⁸ Swanson, however, provides evidence that there has been no improvement over the period in private sector forecasts of US macroeconomic variables.

⁸ It may also be the case that a reduction in the scale of policy mistakes could account for an improvement in private sector forecasts of policy.

He attributes a temporary upturn in errors in forecasts of the fund rate around 2001-02 partly to greater macroeconomic uncertainty, reflected, for example, in the greater dispersion in macro forecasts and in a rise in the implied volatility from option trading in the Eurodollar market. It is also induced by the momentum of recent interest rate changes: when interest rates have changed substantially in the previous meetings, the absolute size of interest rate forecasting errors appears to be higher. Gradual private sector learning about the policy reaction function is indicated in his empirical model by significant negative time trends.

Following a similar procedure, we test for the impact on market forecasts of the repo rate of macro-volatility, momentum of recent interest changes and learning since the adoption of inflation targeting, using the end-of-day FRA contract data. Results are reported for 3-monthly FRA agreements, in 3-months' time, called the 3x6 FRA; in two months' time, called the 2x5 FRA; and in one month's time, called the 1x4 FRA. We define the "between meetings" forecasting error as the residual obtained by regressing the change in the repo rate since the previous meeting, on the change in the relevant FRA rate from the day after the previous meeting to the day before the current meeting. The coefficients on the change in the relevant FRA rates in the "between meetings" regressions (not shown) are all close to unity, with t-ratios of 7 or more and an R-squared of at least 0.5, suggesting that the forward market's forecasts are unbiased and capture most of the change in the repo rate between MPC meetings. The "on the day" forecasting error is defined as the change in the relevant FRA rate from the close on the day preceding the repo rate announcement, to the close on the day of the announcement itself. This one-day change will also depend on other macroeconomic news on that day, but should be dominated by news on the repo rate decision and this is why we take it as a proxy for on-the-day surprise.

Figure 1 plots the absolute values of these forecasting errors, showing substantially smaller volatility for the "on the day" forecasting errors. In the eleven MPC meetings between January, 2000 and June, 2001 there was only one change in the repo rate, from 11.75 to 12 percent in September, 2000, which had no effect on the prime rate at which banks lend to their

best customers. The repo rate cut to 11 percent in June, 2001 was not well anticipated in April, 2001, resulting in a substantial forecast error at observation 12 in Figure 1. Another obvious outlier occurs at observation 14 in September, 2001 after the 9/11 attacks in New York, a time of rapid interest rate changes abroad and great global uncertainty.⁹ It is notable how small the forecast errors are in the period of Rand volatility from November, 2001. For the “on the day” forecasting errors, a surprise 50 basis points rate cut in August, 2004, at meeting 30, resulted in a large outlier.¹⁰

[FIGURE 1 ABOUT HERE]

We now relate the absolute size of the forecast errors¹¹ to macroeconomic volatility, test for Swanson’s momentum effect of recent interest rate changes, and explore whether any downward trend is discernible which could be associated with the improving acceptance by the market of the new monetary policy framework in South Africa. We generate the macro-surprises from a monthly VAR in log changes of five variables: the consumer price index, CPI; the producer price index, PPI; the end-of-month US Dollar-Rand exchange rate, XRATE; the industrial production index, IPI; and the end-of-month Dollar gold price, PGOLD. The maximum lag is 6 months, and parsimonious forms of these equations were found with data running from 1980 to 2005¹².

⁹ The meeting on 4th September had involved a technical change in operating procedures to narrow the spread (*Monetary Policy Review*, Reserve Bank, October 2001, p. 20).

¹⁰ A comment by the Governor of the Reserve Bank to the effect that ‘the party is over’ at the previous MPC meeting was misinterpreted by the markets not to expect a further repo rate cut.

¹¹ In some contexts (Shortland and Stasavage, 2004) the special econometric issues associated with discrete variate time series need to be taken into account. However, in our case, the discreteness of the repo rate is not relevant. Our first dependent variable, the “between meetings” forecasting error, is effectively the *difference* between the change in the repo rate and the market forecast of that change (using the relevant FRA rate). The market knows the repo rate is discrete, but the FRA rates are continuous variables. So the difference between the two changes should be a continuous random variable. Our second dependent variable, the “on the day” forecasting error, being based on a one-day change in the relevant FRA rate, is continuous.

¹² To avoid overfitting, the PCGETS software (Hendry and Krolzig, 2001) was used to find parsimonious specifications. This software (version 2.01c) runs a range of tests, including tests for parameter stability,

These results satisfy basic economic plausibility: the gold price, the exchange rate and industrial production are driven only by their own lags; CPI has no effects outside the CPI equation, which is driven by PPI and the exchange rate, as well as its own lags; and PPI is driven by its own lags and the exchange rate. The residuals from these equations are taken as estimates of macro-surprises. Note that these residuals *collectively* represent macroeconomic surprises: since no identifying restrictions were applied to the VAR, strictly speaking the individual residuals do not have a structural economic interpretation.

We then define the macro-surprises that correspond to the dates of the MPC meetings. In doing so we take into account the lagged publication dates for data on the CPI and PPI (usually on the last trading day of the month, for the previous month's indices) and on the IPI (usually in the first week of the month, for the index two months earlier).¹³ For example, for a mid-September meeting, the most recent month's surprises are defined as the August values for XRATE and PGOLD, and the July values for PPI, CPI and IPI. Absolute values are taken of these five variables, which, with two further lags on each, yield fifteen macro-volatility indicators. The absolute values of the repo forecasting errors (defined earlier) are then regressed on a constant, a trend, on the interest rate 'momentum' (defined by the absolute value of the repo change at the previous MPC meeting), and on the fifteen absolute values of the macro-surprises. The equations are run both with and without dummies for "9/11" and for the June, 2001 meeting discussed above. Our priors are to find positive coefficients for the macro volatility indicators and we sequentially eliminate the negative signed and the insignificant indicators to find parsimonious representations.¹⁴

residual autocorrelation and heteroscedasticity. We employed the 'conservative' setting, which incurs a low risk of including an irrelevant variable and results in very parsimonious models.

¹³ We do not employ real-time data for industrial production. But for the other four variables in the VAR, the issue does not arise as these data are not revised. The one exception to this was a revision of a few quarters of CPI data in 2003 due to an error (see Aron and Muellbauer, 2007).

¹⁴ The PCGETS software was used to check that no superior reductions to parsimonious models existed.

The results are shown in Table 3(a). The “between meetings” absolute forecasting errors for all three FRA contracts considered depend on the volatility of shocks in CPI, the exchange rate, the gold price and industrial production.¹⁵ The CPI effect is particularly important, which is plausible, given the inflation targeting framework. The momentum effect usually has a significant positive role. The trend effects representing learning, though always negative as expected, are not significant, with t-ratios of around -1. While the fit and minor details of lag structure and significance differ between specifications with and without the dummies, the broad conclusions as summarized above are the same.

[TABLE 3 ABOUT HERE]

The regression results for the “on the day” absolute forecasting errors are shown in Table 3 (b). The regressions suggest that the “on the day” absolute forecasting error depends on volatility in recent months in the exchange rate, the gold price and industrial production. There are differences from the “between meetings” regressions: CPI volatility is typically insignificant (with t-ratios around 1.2); the trend was found to be completely insignificant; and while the momentum effect is positive in all three cases, it is significant at the 5 percent level only for the 3x6 FRA. The dummies for “9/11” and for the June, 2001 meeting are always significant, but the estimated coefficients are robust to their exclusion.

In summary, the size of both the “between meetings” and the “on the day” forecasting error increases with recent macro volatility for all three FRA contracts. The momentum effect is confirmed for both the “between meetings” regressions and the “on the day” regressions. While

¹⁵ In principle there could be a risk premium in a FRA type contract between private parties which will vary over the business cycle (Piazzesi and Swanson, 2006). We are abstracting from this point in interpreting the result of the three FRA contracts over slightly different maturities in Tables 3a and 3b. The effects of omission, however, would likely be more pronounced if we had considered longer maturity instruments.

there is a hint of an effect for a downward trend in the regressions for the “between meetings” absolute forecasting errors, the downward trend is completely absent for the “on the day” errors.

One factor contributing to the differences in the two sets of results could be that the “on the day” forecasting error reflects macroeconomic news on the day as well as news reflected in the repo rate announcement. The standard errors of the daily change in the FRA rates for days of MPC meetings between 2000 and mid-2006 are around 2.7 times as large as the standard errors on non-meeting days. This suggests that normal daily volatility accounts for a far from negligible 37 percent of the volatility of the “on the day” forecasting errors, and news associated with the repo rate announcement around 63 percent. The absolute values of lagged macro shocks will be partly explaining the normal daily volatility not associated with repo rate announcements. This might explain why CPI shocks are less relevant than in the model for “between meetings” errors.

Predictability by market analysts

Another source of data on interest rate predictability is a monthly survey carried out by Reuters, which began in 2000, of analysts at the major banks and funds in South Africa.¹⁶ One, two and three month ahead forecasts of the end of quarter prime rate are compared to the realised prime and repo rates in Figure 2. This shows, for each quarter, how the expectations of the end of quarter interest rate compared with the actual outcome, and how they evolved over three months, in the light both of repo rate decisions and economic news. The top graph shows the mean forecasts for the end of each quarter, while the graph beneath shows the analysts’ mean prediction errors.¹⁷

¹⁶ The Reuters data are unfortunately somewhat noisy being based on a small sample of analysts (maximum about 27, but with participation varying from 40 to 60 percent). The Reuters survey form is issued to participating banks on first Tuesday of every month and the results are published two days later on the Thursday. In the last month of the quarter the forecast is for the end of the next quarter and beyond. For the other two months of the quarter it is for the end of the current quarter and beyond.

¹⁷ Note that in a *discrete* probability distribution, as followed by the repo rate, the mean and the mode (an alternative measure of “central tendency”) will hardly ever coincide. We prefer the mean as a more robust measure of central tendency, for example, in the case of bimodal distributions.

[FIGURE 2 ABOUT HERE]

The predictions have a maximum error of about 1.25 percent (and usually far less).¹⁸ The prediction errors have been greater for South Africa than for comparable surveys in some other targeting countries such as Australia, New Zealand, Norway and the UK (Bernhardsen and Kloster 2002, p. 55). However, this is mainly due to the larger size of repo rate adjustment, reflecting a higher and more volatile inflation rate in South Africa.

The new monetary framework appeared to be well-integrated in interest rate expectations by the end of 2001. Between the 1st September and 31st December, 2001, the Rand depreciated by 42 percent against the US Dollar (daily data). The Reuters survey reveals that the prime rate at the end of March, 2002 was around 1.25 percent higher than expected in the December, 2001 survey; 0.8 percent higher than expected in the January, 2002 survey¹⁹; and around 0.2 percent higher than expected in the February, 2002 survey. The implication is that the MPC raised rates *more sharply* than the market expected (positive errors), mainly because of unexpected inflation rises between December and March. However, had the market expected interest rates to respond to the exchange rate as in the 1996-98 period under Governor Stals, there would have been large negative forecasting errors.

Indeed, as seen in Figure 3, from mid-2001 onwards, there is discernible downward trend in the absolute value of the three-month ahead prime rate forecasting error (defined as the difference between the realized prime rate and its surveyed mean forecast three months earlier). Econometric analysis suggests a positive relationship with the absolute values of recent surprises as defined above for the PPI, gold price and exchange rate, together with a negative trend effect.

¹⁸ Due to a technical adjustment in the repo rate on 4 September, 2001 (Table 2), the blip in the graph will overstate any surprise.

¹⁹ This forecast took into account new information from a special MPC meeting in January, 2002, when the repo rate was raised to 10.5 percent (Table 2).

The coefficient on the trend becomes significant at the 5 percent level for samples beginning in 2001Q2, but not for samples beginning earlier. However, given that the representativeness of the Reuters sample varies considerably from quarter to quarter, we do not wish to over-emphasise this evidence.

The cross-section spread of forecasts from the Blue Chip Survey is an indicator of uncertainty used by Swanson (2006) in a similar context for US data. The Reuters data are less robust. Nevertheless, a rather crude proxy for the spread is given by the maximum minus the minimum forecast divided by the median forecast, and this also shows a declining trend, as revealed in the lower graph of Figure 3. However, an econometric investigation similar to those reported in Table 3 finds little correlation with the absolute values of recent macroeconomic surprises.

[FIGURE 3 ABOUT HERE]

Evidence from interest rate reaction functions

Unfortunately, the contrast with the period before inflation targeting is hard to make. The Reuters data only begin in 2000. Moreover, interest rate announcements did not occur on pre-specified days before 2000, and interest rate decisions were not announced when there was no change (Appendix, section 4), so the above analysis based on daily data on Forward Rate Agreements is not possible before 2000.

Exploring the behaviour of interest rate reaction functions offers a way of contrasting the monetary policy regimes, using available data on the prime interest rate as a close proxy for the repo rate²⁰. We find stable monthly models for the prime rate from 1999 to 2006, and unstable models for the periods 1990-1998 or 1994-1998. In these models, we explain the prime rate by

²⁰ The correlation coefficient between the IMF series for the central bank's discount rate (from 1998, the repo rate) and the prime rate is 0.98 from 1990 to 2006.

the prime rate of three months earlier, and a set of regressors including log changes in the exchange rate, the Dollar gold price, CPI, WPI and industrial production. We also include an output gap measure based on industrial production, using the HP filter to detrend log industrial production. The reason for conditioning on the prime rate of three months earlier is that meetings at which policy rates are set tend to be at frequencies between 6 to 12 weeks, so that this model takes into account information arriving in the relevant time interval.

[TABLE 4 ABOUT HERE]

General to specific model selection was used to obtain the results shown in Table 4.²¹ The unrestricted model includes monthly changes for the two most recent months for which information would have been available to interest rate setters, 3-month changes with lags up to 6 months, and 12 month changes. This allows a model to be selected as a parsimonious representation of behaviour with longer lags than often considered in the context of monthly data (albeit restricted to 3-month or 12-month changes). Indeed, for 1999-2006, the prime rate depends on its own 3 month lag, on the most recently available information on annual wholesale price inflation, on the consumer price inflation rate in the previous quarter²², and on the 3-month change in the log dollar gold price. The negative sign on the gold price suggests that higher gold prices appreciate the Rand (a commodity currency), which reduces inflation. It is surprising that changes in the exchange rate are not significant over this period, despite econometric evidence that they help to forecast inflation over a 12 month horizon on this dataset. This is partly explained by the fact that exchange rate changes feed into the highly significant wholesale price inflation rate, which, in turn helps forecast consumer price inflation. Nevertheless, it appears as if

²¹ In common with most studies estimating Taylor Rules, we are neglecting the discreteness of official interest rate changes. For a recent exception see Gerlach (2007).

²² Note that the prime rate is in percentage points while inflation is effectively in percentage points/100, which accounts for apparently large coefficients.

the MPC was signalling a move away from the exchange rate targeting that was a feature of the previous opaque monetary policy regime (particularly during 1994-98).

Prime rate equations for the 1990-1998 and 1994-1998 periods show only a relatively weak response to inflation, but a strong response to exchange rate changes (Table 4). However, there is a jump in the exchange rate coefficient in 1996, and again in 1998, suggesting that a constant policy rule was not being followed in the period. By contrast with the post-1998 period, the CHOW tests indicate considerable parameter instability for both the earlier periods. The equation standard errors are more than twice those for the prime rate model in the post-1998 period, even though exchange rate and gold price volatility were higher in the second period. Clearly, 1999 marks the beginning of a new regime, made explicit by the formal adoption of inflation targeting in 2000, in which interest rates have become far easier to predict .

4. Monetary policy credibility and inflation expectations

If economic agents believe that the central bank will achieve its inflation target, their inflation expectations are more likely to be *anchored* around the inflation target, and price and wage setting will be far less responsive to *temporary* fluctuations in inflation, creating stability. The cost of expectations not being anchored to the target is that a more aggressive monetary policy may be required to gain credibility for the central bank in its price stabilising goal.

In principle, examining the evolution of inflation expectations before and after the adoption of inflation targeting could reveal whether there has been convergence to the target - or equivalently, whether monetary policy is credible to agents. If expectations with the *same* forecast horizon enter the target range over time, this is a necessary condition for convergence, but it is not sufficient. It could be a lucky accident e.g., if expectations were purely backward-looking and inflation fell due to globally lower inflation, or if a terms of trade shock appreciated the currency.

We examine the new survey of inflation expectations²³ from the Bureau of Economic Research (Kershoff 2000). The survey asks households, trade unions, businesses and financial analysts what their expectations are of average CPIX and of average CPI inflation in the forthcoming calendar year and for the year thereafter. A “reference rate” is given to the participants on the survey form, which will influence the survey responses (Kershoff 2000, p. 12).²⁴ Participants are asked for their expectations for the current and following calendar years, and thus the expectations horizon *shortens* for each consecutive quarterly survey in the year.

We achieve a constant horizon²⁵ by examining expectations for the *same* quarter for each year. Two graphs are shown for CPIX inflation expectations one year ahead, surveyed in the third quarter of each year (Figure 4).²⁶ The top graph shows the *expected inflation* of three different types of agents²⁷ as well as the average over them. Expectations have come within the target range, and the different agents’ expectations have converged on the analysts’ arguably better-informed view. This is encouraging evidence for monetary policy credibility.

[FIGURE 4 ABOUT HERE]

Further encouragement comes from the graph below which shows these expectations minus the relevant reference rate, a simple proxy for the backward-looking element of expectations²⁸. Values of less than zero on this graph indicate successful reduction of inflation expectations,

²³ There are no inflation expectations surveys available before targeting began. The monthly Reuters survey, which presents analysts’ inflation expectations at various ranges ahead, also begins only in 2000.

²⁴ For instance, surveys in 2004 give the average rate of inflation for 2003 and an average for 1999-2003.

²⁵ Other analyses of the trends of these expectations (Wesso and Kock 2003; and the SARB’s *Monetary Policy Review*) have not explicitly tried to control for this factor.

²⁶ In order to utilise all the information in this short data set, we have chosen the *third* quarter in Figure 4 because it is the first quarter used in the survey in its first year, 2000 and is also available in 2005.

²⁷ The BER *household* expectations data (not considered here) for a 12-month ahead view of CPI inflation are problematic e.g., because of widespread illiteracy, see Kershoff (2000). The data suggest households’ inflation expectations substantially exceed those of the analysts and indeed, recorded CPI inflation.

²⁸ This does not in fact sufficiently correct for recent information. For instance, in the third quarter of 2004, while the reference rate of average inflation in 2003 will have a bearing on the inflation expectation, so too will more recent information e.g., the June, 2003 to June, 2004 annual inflation rate. This is especially likely to be the case for the well-informed agents (e.g. the analysts).

since expected inflation falls below previously experienced inflation. Ultimately, if inflation targeting is successful in bringing down inflation expectations, we expect small oscillations around zero. Thus, successful convergence to credible policy would be seen in negative values for a period, followed by a rise towards zero. This indeed is what we find, most of all for the analysts. The average value of the expected inflation shift for the analysts was strongly negative between 2000 and 2004, both for the one-year and the two-year ahead horizons (the latter are not shown). Analysts were convinced that inflation would decline, despite the set-back in 2002 following the Rand crisis

For trade unions and the business sector, the deviation of expected inflation from the reference rate becomes negative only in 2003-4 suggesting confidence in the new monetary policy regime took longer to develop. By 2005, one can argue that full convergence had been achieved for all observers, though analysts (and others) apparently thought the low reference rate of 4.3 percent was not sustainable a year ahead in the light of new information.

[FIGURE 5 ABOUT HERE]

Another way of gauging inflation expectations is by looking at the spread between index-linked bonds and other domestic bonds of a similar maturity structure (Figure 5). However, interpretation of these trends in terms solely of credibility is problematic. The yield differential is a function of the expected inflation rate over the horizon, but also reflects inflation risk premia and liquidity risk premia. With the maturity period constantly decreasing, such risks will fall, reducing the spread. Further, a high demand for a small issue of bonds will affect the perceived liquidity of the bond and drive down the yield. In Figure 5, the break-even rates shown are largely within the target from early 2003 (we have not attempted to make adjustments for the above risk premia). If there is a sharp change over a *short* period this would be indicative of changed expectations - assuming little change in the perceived liquidity of the bonds. However, for longer

periods, little can be deduced about increased credibility of monetary policy, unless an adjustment is made for maturity and shifts in liquidity. Further, expectations may be largely backward-looking, so that spreads may fall in the target range simply because of exogenous events. A final difficulty is that in South Africa the CPI (which includes short-term interest rates) rather than the targeted index, CPIX, is used for index-linking bonds.

5. Conclusion

This paper has used publicly available information on monetary policy decision making, and data on inflation and interest rate expectations and forward interest contract agreements, to demonstrate the improved transparency, credibility and predictability of monetary policy in South Africa since the adoption of inflation targeting in 2000.

There has been a substantial improvement in central bank transparency since 1994 in SA, largely as a result of the adoption of inflation targeting in 2000. Eiffinger and Geraats (2006) weight all categories equally, and with this weighting the SARB's transparency has improved from a score of 5 in 1994, to 10 in 2007 (out of a possible 15). However, the overall outcome is robust to the application of different weighting systems on the various categories (Table 1). Transparency is superior to Australia's as measured by Eiffinger and Geraats (2006), and, on Mr. Plenderleith's weighting, just below the experienced targeters, New Zealand and the UK. There is scope for further improvements as the system develops, for instance through the publishing of an annual analysis of forecast errors.

Survey data on inflation expectations has demonstrated the increased credibility of inflation targeting, with expectations coming into the target range, despite the exchange rate shock of 2001-02. Financial analysts' expectations were the first to respond, while trades unions and businesses have been slower in following. For the analysts, the difference between the expected inflation rate and the historical rate was initially negative, as inflation expectations

declined relative to past experience, and then tended to zero, with both inflation and inflation expectations stabilising at similar, lower levels. For business and the trades unions, the difference between the expected inflation rate and the historical rate has fluctuated around zero, consistent with their taking the historical rate as a guide to the future rate, or being slow learners following the analysts.²⁹

The predictability of interest rates under inflation targeting was assessed for market traders by regression analysis using data from Forward Rate Agreements, and for market analysts, using Reuters' monthly survey data on prime rate forecasts. The anticipation by the forward market of the Reserve Bank's repo rate change at the next MPC meeting is reflected in the relatively small residuals obtained from regressing the repo rate changes on the changes in the FRA data from the day after the previous meeting to the day before the current meeting. Repo rate changes have been well anticipated from the very beginning of explicit inflation targeting in 2000. Indeed, one of the remarkable features of the new regime concerns the muted impact of the large Rand depreciation at the end of 2001 on interest rate expectations, and on interest rates. Thus, the absolute values of these residuals, which we interpret as the market's repo rate forecasting errors, showed an insignificant downward trend from 2000, only weakly consistent with further learning about the operation of the new system.

This remained true when controlling for recent macroeconomic volatility and the recent volatility of the repo rate. Macroeconomic volatility was measured from the residuals of a parsimonious five-equation VAR in difference for the logs of the consumer price index, wholesale price index, the exchange rate, the Dollar gold price and industrial production. The absolute values of residuals for the consumer price index, the exchange rate, gold price and industrial production are significantly related to the size of absolute forecast errors. The "on the day" forecast errors are measured from the change in the FRA rates between the close on the day

²⁹ Carroll (2003) provides empirical evidence that expectations of US households respond with a lag to the forecasts of professionals. The same may be true of businesses and unions in South Africa.

before the MPC repo rate announcement and the close after the announcement. Their (smaller) absolute values are also related to recent macro economic volatility, but controlling for this, no trend decline is discernible.

Other evidence on the market's adaptive learning about the inflation targeting framework comes from monthly Reuters survey data of analysts, on their prime rate forecasts for the end of each quarter. Absolute values of these errors and the spread between maximum and minimum forecasts, scaled by the median, both show a (just significant) declining trend, but only from the second quarter of 2001. Thus, the evidence consistent with the market continuing to learn about the interest rate rule is mixed. Overall, the evidence is consistent with a rapid transition, so that the new inflation targeting framework was largely embodied in expectations by 2001.

We also show, from an analysis of monthly data on the prime rate (as a proxy for the repo rate), that the interest rate rule has been stable since 1999, and consistent with inflation targeting, though not immensely forward-looking. Exchange rate changes in the last 12 months surprisingly have no direct effect on the prime in the interest rate rule (given lagged information on inflation), yet they clearly do help predict the inflation rate twelve months ahead. One interpretation is that to counter the apparent exchange rate targeting that the Bank followed in 1996-98, monetary policy has, in the short term been deliberately under-responsive to the exchange rate after 2000. Before 1999, it is impossible to find a stable interest rate rule linking the interest rate to rates of change in the consumer price index, the wholesale price index, the exchange rate and gold prices, and lags in the output gap – policy was opaque and highly variable.³⁰

The evidence from all sources: expectations from forward market data and from the Reuters survey of expectations of bank economists, the empirical response of short term interest rates to macroeconomic data, and survey data on inflation expectations, is consistent with a rapid

³⁰ Our earlier extended Taylor Rule model for South Africa (Aron and Muellbauer, 2002), estimated on data up to 1997, suggests that money growth mattered for a time, as did foreign interest rates, and domestic credit market liberalisation, which contributed to a rise in real market rates. These complexities would have made practical forecasting of short term rates difficult, and even this model breaks down in 1998.

acceptance by financial market participants of the inflation targeting framework. Even though other economic agents have been slower to respond, there is little doubt that by 2004, the implications of new framework had been generally absorbed. It is plausible that the improved growth performance of the economy since 2002 is linked with the reduced interest rate and inflation volatility under the new framework, though this is hard to establish rigorously.

References

- Aron, J. and J. Muellbauer. (2007). "Review of Monetary Policy in South Africa since 1994." In Aron, J. and G. Kingdon. (Guest Editors), Special issue on South African Economic Policy Under Democracy, *Journal of African Economies*, Oxford University Press (forthcoming, November).
- Aron, Janine, and John Muellbauer. (2002). "Estimating Monetary Policy Rules for South Africa." In *Monetary Policy: Rules and Transmission Mechanisms*, edited by Norman Loayza and Klaus Schmidt-Hebbel, pp. 427-475. Central Bank of Chile: *Series on Central Banking, Analysis and Economic Policies*, Volume 4. (<http://www.bcentral.cl/books/v4/v4.htm>)
- Ball, Laurence, and Niamh Sheridan. (2005). "Does Inflation Targeting Matter?" In *Inflation Targeting*, edited by Ben Bernanke. Chicago: University of Chicago Press.
- Ballim, Goolam, and Elna Moolman. (2005). "Testing the potency and transparency of the South African Reserve Bank's inflation targeting policy". Hardcover, Standard Bank, South Africa.
- Bernanke, Ben. 2004. "The Great Moderation." Remarks by Mr Ben S. Bernanke, Member of the Board of Governors of the US Federal Reserve System, at the meetings of the Eastern Economic Association, Washington DC, 20 February 2004. Federal Reserve Web site.
- Bernanke, Ben, Thomas Laubach, Frederic Mishkin, and Adam Posen. (1999). *Inflation Targeting: Lessons from the International Experience*. Princeton: Princeton University Press.
- Bernhardson, T., and A. Kloster. (2002). "Transparency and Predictability in Monetary Policy." *Bank of Norway Economic Bulletin* (Q2), 45-57.
- Bini-Smaghi, L. and D. Gros. (2001). "Is the ECB sufficiently accountable and transparent?" Centre for European Policy Studies, Working Document No. 169, Brussels, July, 2001.
- Blinder, A., Goodhart, C., Hildebrand, P., Lipton, D., and Wyplosz, C. (2001). *How do Central Banks Talk? Geneva Reports on the World Economy 3*. London: Centre for Economic Policy Research.
- Carroll, C. D. (2003). "Macroeconomic Expectations of Households and Professional Forecasters." *Quarterly Journal of Economics* 118 (1): 269 – 298.
- Cook, T. and T. Hahn. (1990). "Interest rate expectations and the slope of the money market yield curve." *Federal Reserve Bank of Richmond Economic Review*, 76 (5): 3-24.
- Eijffinger, Sylvester C. W., and Petra M. Geraats. (2006). "How transparent are central banks?" *European Journal of Political Economy* 22 (1), 1-21.
- Geraats, Petra M.. (2002). "Central Bank Transparency." *Economic Journal* 112, F532-F565.
- Gerlach, Stefan. 2007. "Interest Rate Setting by the ECB, 1999-2006: Words and Deeds," *International Journal of Central Banking* 3(3, September): 1-46, September.

- Goodhart, C.A.E. 2005. "The Interest rate Conditioning Assumption." Prepared for the John Flemming Memorial Conference, Nuffield College, 9-10 September, 2005.
- Hendry, D.F. and H.-M. Krolzig. (2005). *Automatic Econometric Model Selection using PcGets*. London: Timberlake Consultants Press.
- Kershoff, George. (2000). "Conducting inflation expectation surveys in South Africa." Mimeo, Bureau for Economic Research, Department of Economics, University of Stellenbosch: Stellenbosch, October, 2000. (<http://www.ber.sun.ac.za/forecasts.htm>).
- Mahadeva, Lavan, and Sterne, Gabriel. (2000). (eds) *Monetary Frameworks in a Global Context*. Routledge.
- Morris, S. and H. Shin. (2004). "Coordination risk and the price of debt." *European Economic Review* 48, 133-153.
- Piazzesi, Monika and Eric Swanson. (2006). "Futures Prices as Risk-Adjusted Forecasts of Monetary Policy." Federal Reserve Bank of San Francisco Working Paper Series, 2006-23.
- Radecki, L.J. and V. Reinhart. (1994). "The financial linkages in the transmission of monetary policy in the United States." Published in *Bank of International Settlements* (1994), *National Differences in Interest Rate Transmission*, CB 393, March, 1994, 291-337.
- Roley, V. V., and H. G. Sellon, Jr. (1995). "Monetary policy actions and long-term interest rates." Kansas City: Federal Reserve Bank of Kansas City, 73-89.
- Stopford, J. 2003. "Inaccurate Statistics a Threat to the Economy." *Business Day* (Johannesburg), South Africa, April 23, 2003.
- South African Reserve Bank. (2007). "The core forecasting model of the South African Reserve Bank." Working Paper WP/07/02, June.
- South African Reserve Bank. 2000. *A New Monetary Policy Framework: Appendix, Statement of the Monetary Policy Committee*. Pretoria (April 6, 2000).
- Stals, Chris. (1994). "Governor's Address." Pretoria: South African Reserve Bank (August 23).
- Stals, Chris. (1995a). "Monetary Policy and its implications." Address to the International Herald Tribune Conference, September 11, 1995.
- Stals, Chris. (1995b). "Monetary Policy in South Africa." Address to the Second South African Economy, Investment and Trade Conference, London, October 17, 1995.
- Stals, Chris. (1997). "Effect of the changing financial environment on monetary policy in South Africa." Address to the Annual Dinner of the Economic Society of South Africa, Pretoria Branch, 15 May, 1997.
- Stals, Chris. (1999). "Statement on Reserve Bank Accommodation Procedures, 23 June, 1999." *Quarterly Bulletin*, South African Reserve Bank, June: 62.
- Shortland, A. and D. Stasavage. (2004). "Monetary policy in the CFA Franc Zone: Estimating Reaction Functions for the BCEAO." *Journal of African Economies* 13 (4), 518-535.
- Svensson, Lars E.O. (2001). "Independent Review of the Operation of Monetary Policy in New Zealand: Report to the Minister of Finance." February, 2001 (www.princeton.edu/~svensson).
- Svensson, Lars E.O., Kjetil Houg, Alfred Berg, Haakon O. Aa. Solheim, and Erling Steigum. (2002). "An Independent Review of Monetary Policy and Institutions in Norway." September. *Norges Bank Watch*. Centre for Monetary Economics, BI Norwegian School of Management.
- Swanson, Eric T. (2006). "Have Increases in Federal Reserve Transparency Improved Private Sector Interest Rate Forecasts?" *Journal of Money, Credit, and Banking* 38 (3), 791-820.
- Van der Merwe, E. J. (2004). "Inflation targeting in South Africa." *Occasional Paper No. 19*, South African Reserve Bank, July, 2004.
- Wesso, G.R., and M. Kock. (2003). "Inflation expectations and the credibility of monetary policy in South Africa: some preliminary results." WP/03/04, Research Department, South African Reserve Bank, 2003.
- Woodford, Michael. (2000). "Pitfalls of Forward-Looking Monetary Policy." *The American Economic Review* 90 (2, May), *Papers and Proceedings of the One Hundred Twelfth Annual Meeting of the American Economic Association*, 100-104.

Table 1: Measuring Central Bank Transparency

	<i>Weights</i>			Australia	New Zealand	UK	South Africa Stals	South Africa Mboweni
	E/G	P	M/S					
Year assessed				2002	2002	2002	1994	2007
1. Political				3	3	3	1	3
a. Objectives	1	1	1	1	1	1	0.5	1
b. Targets	1	1	1	1	1	1	0	1
c. Arrangements	1	1	2	1	1	1	0.5	1
2. Economic				2	3	3	0.5	2
a. Economic Data	1	1	1	0.5	1	1	0.5	0.5
b. Policy Models	1	1	0.5	1	1	1	0	1
c. Forecasts	1	1	2	0.5	1	1	0	0.5
3. Procedural				1	3	3	0	1
a. Strategy	1	1	1	1	1	1	0	1
b. Minutes	1	0	1	0	1	1	0	0
c. Voting Records	1	0	.5	0	1	1	0	0
4. Policy				1.5	3	1.5	1.5	2
a. Announcement	1	1	1	1	1	1	1	1
b. Explanation	1	1	1.5	0.5	1	0.5	0.5	1
c. Inclination	1	0	0	0	1	0	0	0
5. Operational				1.5	2	2.5	2	2
a. Control Errors	1	1	0.5	1	1	1	1	1
b. Disturbances	1	1	1	0.5	0.5	1	0.5	0.5
c. Evaluation	1	1	2	0	0.5	0.5	0.5	0.5
Weighting	Total possible score			Total country score for different weights				
Eiffinger/Geraats ²	15			9	14	13	5	10
Plenderleith ³		12		9	11	11	5	10
Mahadeva/Sterne ⁴			16	9.75	14.5	14.25	6.25	11.5
Normalised scores								
Eiffinger/Geraats ²				0.60	0.93	0.87	0.33	0.67
Plenderleith ³				0.75	0.92	0.92	0.42	0.83
Mahadeva/Sterne ⁴				0.61	0.91	0.89	0.39	0.72

Sources: Australia, New Zealand and United Kingdom: Eijffinger and Geraats (2006); South Africa: authors' calculations in this paper – see Appendix.

Notes:

1. For comparative purposes, the index applies the same survey questions and weighting used by Eijffinger and Geraats (2006).
2. Eijffinger and Geraats (2006) apply equal weights of 1 (denoted E/G).
3. Alternative weights (denoted P) suggested by Mr. Plenderleith, Deputy Governor of the Reserve Bank, 2003-2006 (also formerly member of the inaugural MPC of the Bank of England), assign a zero weight to minutes (3b), voting records (3c) and inclination (4c).
4. Weights denoted S/M are derived by the authors from Chapter 4, Mahadeva and Sterne (2000).

Table 2: Monetary Policy Committee meetings and interest rate decisions

MPC meeting	Meetings used in regressions	Repo rate (effective next day)	Comment	Prime rate (end of month)
1999				
13-Oct		~12.31		15.5
24-Nov		~12	Fixed repo rate	15.5
2000				
13-Jan		11.75	Discontinue fix	14.5
2-Mar	1	~11.75	Postponed from 22-Feb	14.5
6-Apr	2	~11.75		14.5
19-May	3	~11.75		14.5
15-Jun	4	~11.75		14.5
11-Aug	5	~11.75		14.5
21-Sep	6	~11.75		14.5
16-Oct	7	12	Special meeting	14.5
16-Nov	8	12		14.5
2001				
19-Jan	9	12		14.5
16-Mar	10	12		14.5
25-Apr	11	12		14.5
14-Jun	12	11		13.75
26-Jul	13	11		13.5
4-Sep	NA	10	No MPC statement: technical change.	13
20-Sep	14	9.5		13
15-Nov	15	9.5		13
2002				
15-Jan	16	10.5	Special meeting	14
14-Mar	17	11.5		15
13-Jun	18	12.5		16
12-Sep	19	13.5		17
20-Nov	20	13.5		17
2003				
20-Mar	21	13.5		17
12-Jun	22	12		15.5
14-Aug	23	11		14.5
10-Sep	24	10	Special meeting	13.5
16-Oct	25	8.5		12
11-Dec	26	8		11.5
2004				
26-Feb	27	8		11.5
22-Apr	28	8		11.5
10-Jun	29	8		11.5
12-Aug	30	7.5		11
1-Oct	31	7.5		11
9-Dec	32	7.5		11
2005				
10-Feb	33	7.5		11
14-April	34	7.0		10.5
9-June	35	7.0		10.5
11-Aug	36	7.0		10.5

MPC meeting	Meetings used in regressions	Repo rate (effective next day)	Comment	Prime rate (end of month)
13-Oct	37	7.0		10.5
8-Dec	38	7.0		10.5
2006				
2-Feb	39	7.0		10.5
13-April	40	7.0		10.5
8-June	41	7.5		11

Sources: MPC statements, South African Reserve Bank website; *Quarterly Bulletin*; IFS (IMF).

Notes:

- a. Dates at which interest rates were *changed* are highlighted in bold (only these are reported in the *Quarterly Bulletin*).
- b. The “~” refers to the characterisation of the rate as “at or around” in the MPC statement.
- c. Rate change on 4-Sep 2001 reported in *Quarterly Bulletin*.

Table 3: Explaining the absolute values of interest rate surprises

(a) Regressions for the absolute values of “between-meeting” surprises

Dependent variables: Absolute values of "between-meeting" interest rate surprises based on various FRA rates						
	1x4 FRA		2x5 FRA		3x6 FRA	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
Constant	-0.05	-0.6	-0.07	-0.9	0.01	0.1
Trend	-0.001	-0.8	-0.002	-1.1	-0.003	-1.3
June 2001 dummy (meeting 12)	0.83	5.7	0.72	4.8	0.58	3.4
“9/11” dummy (meeting 14)	1.06	7.3	1.05	7.0	1.01	5.9
Momentum effect	0.16	3.7	0.13	2.8	0.12	2.2
Abs(CPI shock)(-1)	34.5	2.9	59.4	4.8	70.7	5.0
Abs(Industrial production shock)(-2)	4.00	2.0	3.75	1.8	3.24	1.4
Abs(Exchange rate shock)(-2)	1.63	2.0	1.63	1.9	1.79	1.8
Abs(Gold price shock)(-2)	2.39	2.1	2.41	2.0	-	-
<i>Diagnostics</i>						
Equation Std. error	0.135		0.140		0.161	
Adjusted R ²	0.696		0.688		0.640	
Chow(meeting 27)	p=0.04		p=0.35		p=0.44	
Chow(meeting 37)	p=0.13		p=0.61		p=0.68	
Normality test	p=0.12		p=0.20		p=0.42	
AR 1-4 test	p=0.10		p=0.05		p=0.49	
ARCH 1-4 test	p=0.30		p=0.06		p=0.71	
Hetero test	p=0.44		p=0.54		p=0.38	

(b) Regressions for the absolute values of "on-the-day" surprises

Dependent variables: Absolute values of "on-the-day" interest rate surprises based on various FRA rates						
	1x4 FRA		2x5 FRA		3x6 FRA	
	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
Constant	-0.05	-1.9	-0.09	-1.9	-0.13	-1.9
June 2001 dummy (meeting 12)	0.14	2.1	0.26	2.2	0.39	2.3
Aug 2004 dummy (meeting 30)	0.37	5.5	0.35	2.9	0.33	1.9
Momentum effect	0.04	1.9	0.08	2.3	0.13	2.3
Abs(Exch. rate shock)	0.60	1.5	1.35	2.0	1.98	2.0
Abs(Gold price shock)	1.57	3.2	2.73	3.2	4.06	3.2
Abs(Industrial production shock)(-1)	2.55	2.2	4.36	2.2	6.32	2.2
<i>Diagnostics</i>						
Equation Std. error	0.065		0.114		0.168	
Adjusted R ²	0.554		0.430		0.389	
Chow(meeting 25)	p=0.45		p=0.27		p=0.23	
Chow(meeting 37)	p=0.83		p=0.83		p=0.84	
AR 1-4 test	p=0.32		p=0.50		p=0.48	
ARCH 1-4 test	p=0.16		p=0.51		p=0.58	
hetero test	p=0.04		p=0.05		p=0.05	

Sources: Authors' regression estimates; data from Table 2; JPMorgan Chase Bank; *Quarterly Bulletin*, South African Reserve Bank; and *International Financial Statistics*, International Monetary Fund.

Notes:

1. The dependent variables are (i) the absolute values of the "between meetings" surprises, defined as the residuals obtained by regressing the change in the repo rate since the previous meeting, on the change in the relevant FRA rate from the day after the previous meeting to the day before the current meeting; (ii) the absolute values of the "on the day" surprises, defined as the change in the relevant FRA rate from the close on the day preceding the repo rate announcement, to the close on the day of the announcement itself.
2. Results are reported for 3-monthly FRA agreements, in 3-months' time, called the 3x6 FRA; in two months' time, called the 2x5 FRA; and in one month's time, called the 1x4 FRA.
3. The shock variables, in absolute values, are defined from a five variable monthly VAR in log changes of five variables: the consumer price index; the producer price index; the end-of-month US Dollar-Rand exchange rate; the industrial production index; and the end-of-month Dollar gold price. Publication lags as well as timings of meetings are taken into account in the construction of the shocks. A lag of 1 reported in the table refers to a lag of 1 month on the most recent month's available data, and a lag of 2 to a lag of 2 months.
4. The policy rate momentum effect is defined as the absolute value of the lagged change in the repo rate.

Table 4: Estimated interest rate rules for monthly data

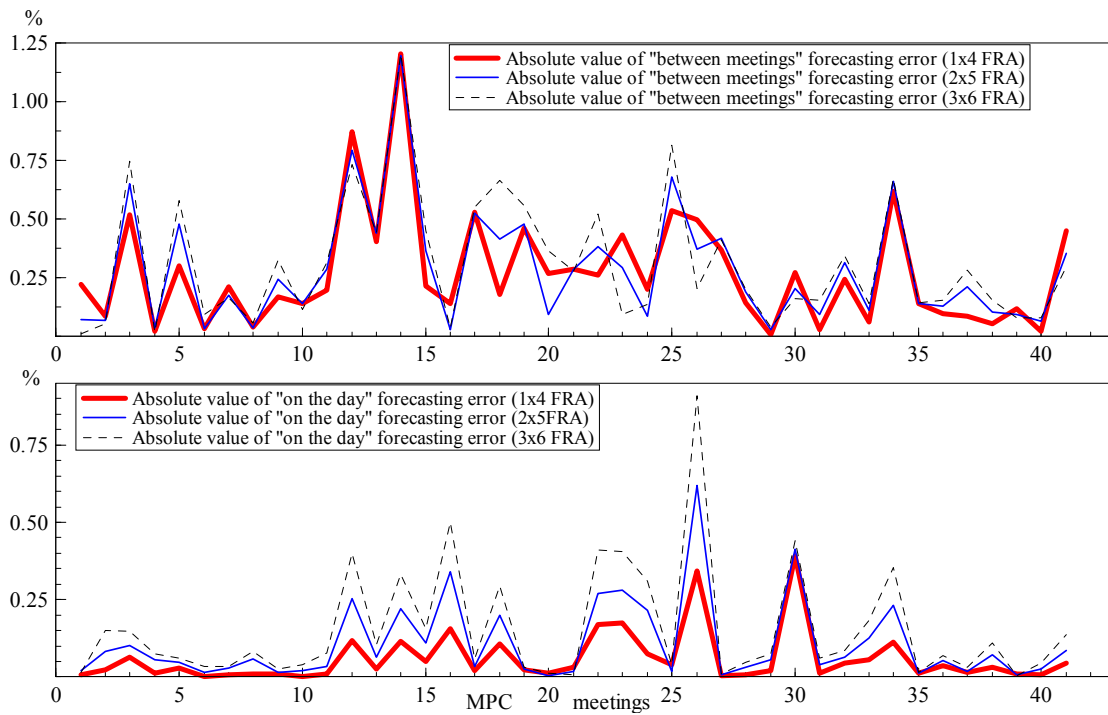
Dependent variable: Prime			
	1990:1-1998:12	1994:4-1998:12	1999:1-2006:7
Constant	2.3 (1.7)	1.7 (1.1)	2.3 (9.0)
Prime(-3)	0.82 (10.7)	0.86 (11.7)	0.74 (39.5)
$\Delta_3 \log(\text{CPI})(-2)$	35.9 (2.8)	41.1 (1.8)	29.1 (3.5)
$\Delta_{12} \log(\text{WPI})(-2)$	-	-	11.5 (4.4)
$\Delta_3 \log(\text{PGOLD})$	-	-	-2.0 (-2.2)
$\Delta_3 \log(\text{BILAT})$	14.2 (2.0)	20.1 (3.1)	-
GAP(-2)	10.7 (3.8)	-	-
<i>Diagnostics</i>			
Adjusted R ²	0.806	0.791	0.967
Equation standard error	1.005	1.113	0.495
Durbin Watson	0.59	0.81	1.00
Chow- test (after 70% of sample)	0.00	0.00	1.00
Arch 1-4 test	0.00	0.10	0.19
Heteroscedasticity	0.00	0.04	0.04

Sources of data: SARB Quarterly Bulletin, IFS, International Monetary Fund

Notes:

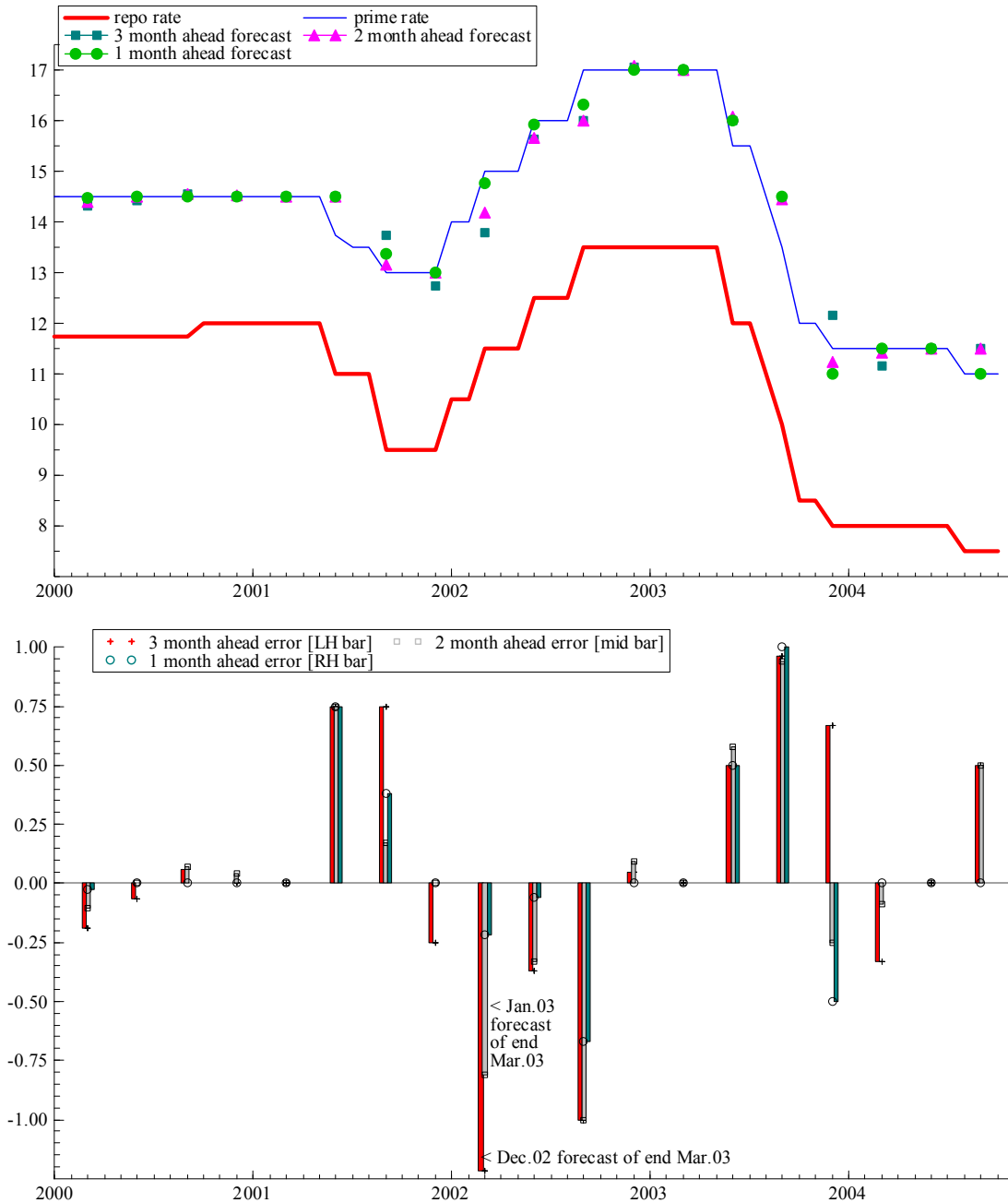
1. t-ratios are in parenthesis under the coefficients, and are corrected for heteroscedasticity and auto-correlation.
2. Prime is the market prime overdraft rate. The CPI and WPI, are respectively, the consumer price index and wholesale price index (excluding import prices). The rand price of gold is PGOLD. BILAT is the bilateral exchange rate with the US dollar. GAP is the three month moving average of the difference between the log of industrial production and a Hodrick Prescott filtered trend of the same variable.

Figure 1: Absolute values of between meetings and on the day surprises



Source: Forward rate interest agreement (FRA) data from JPMorgan Chase.

Figure 2: The predictability of interest rate decisions

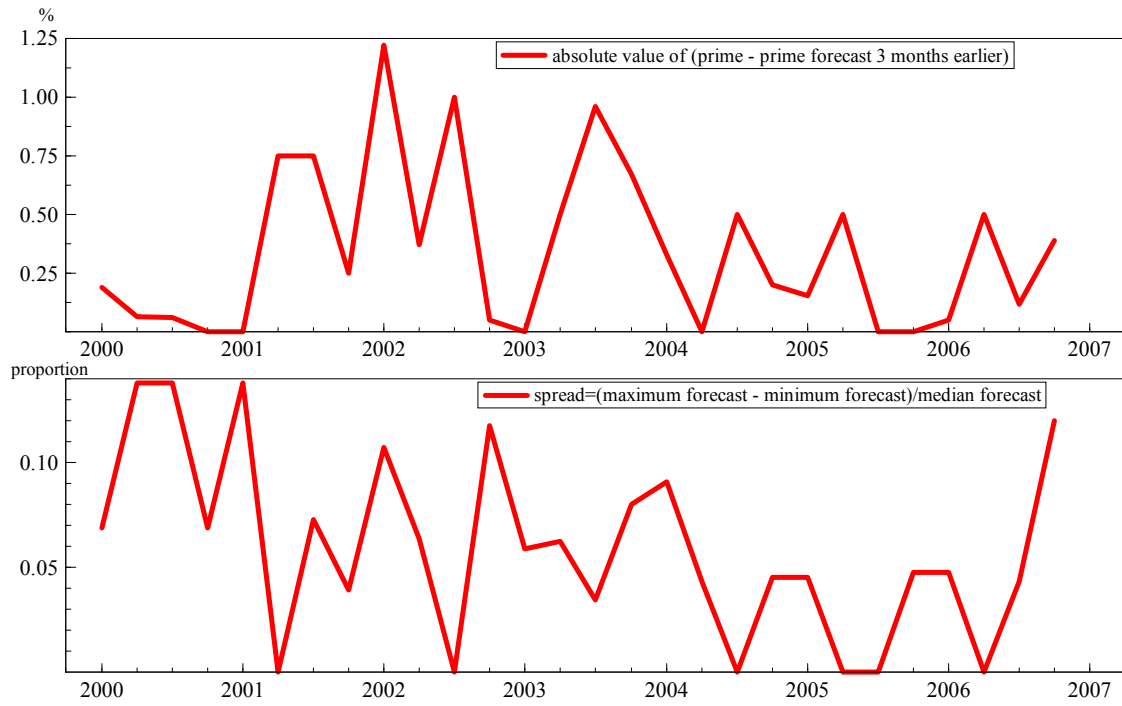


Source: Reuters monthly consensus forecasts.

Notes:

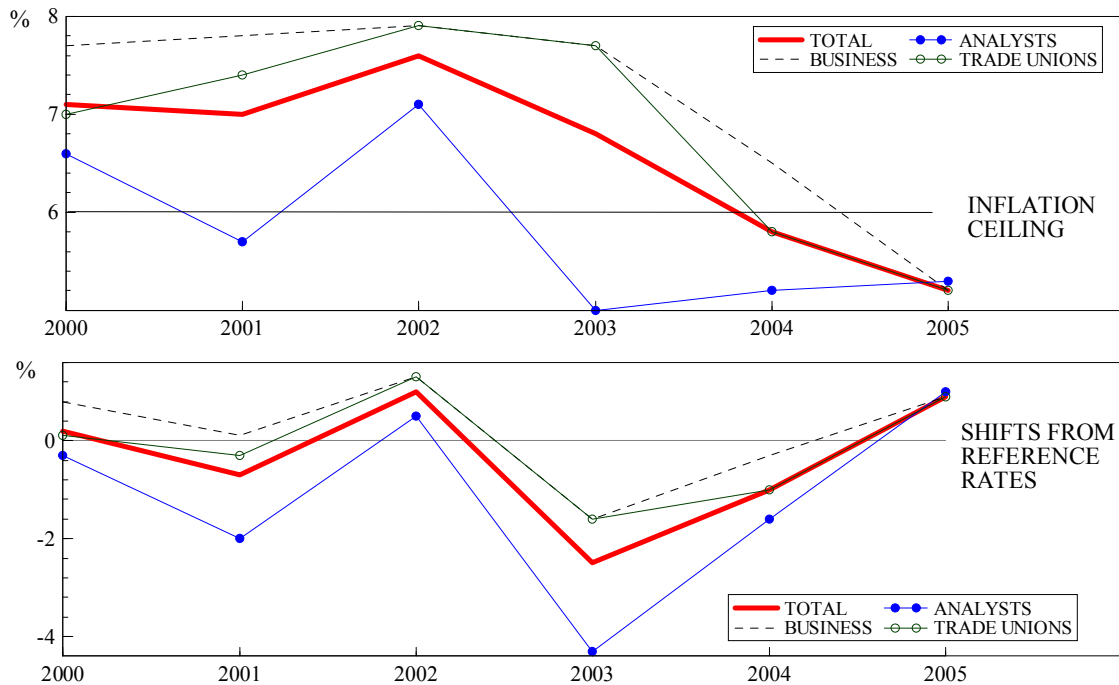
- We choose the data with the shortest forecast period, which is a quarter ahead.
- In each quarter, surveys in the first two months predict for the end of the quarter. The survey in the final month of the quarter predicts for the end of the next quarter. Thus, there are three forecasts for the end of each quarter, and each successive forecast uses more recent information than the last.
- The top graph shows the actual forecasts for the end of each quarter. The graph beneath shows the prediction errors, obtained by subtracting the end of month prime rate in the last month of the relevant quarter from each of the forecasts for that end of quarter.
- Unscheduled MPC meetings were held on 15 January, 2002 and 10 September, 2003 (Table 2).

Figure 3: Analysts' interest rate forecasting errors and the spread



Source: Reuters monthly consensus forecasts.

Figure 4: 3rd quarter CPIX inflation expectations (one year ahead) and expected shift in inflation

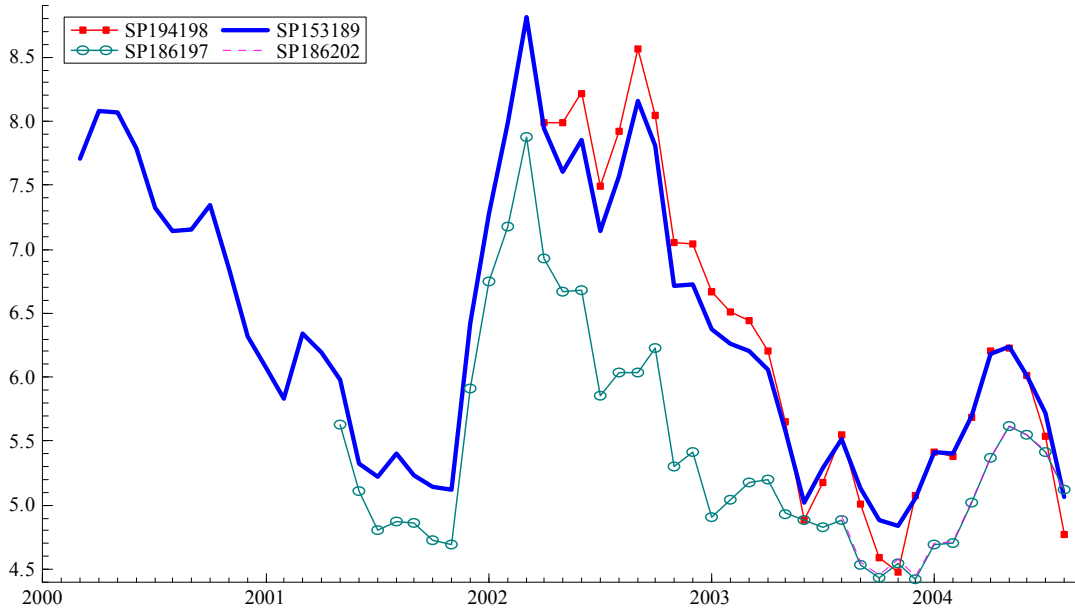


Source: Inflation Expectations Survey, Bureau of Economic Research, University of Stellenbosch.

Notes:

- The inflation ceiling fell temporarily to 5 percent in 2001 (see Figure 1).
- Shifts are calculated relative to the reference rate given on the survey form for average inflation in the preceding year. Third quarter data are used to give a consistent expectations horizon for the largest possible sample (five years). The two year ahead shifts are similar.
- The reference rates from the survey are: 6.9% (2000 survey, average annual inflation in 1999), 7.7% (2001), 6.6% (2002), 9.3% (2003), 6.8% (2004) and 4.3% (2005) (the reference rate for 2006 is 3.9%).

Figure 5: Spreads between index linked bonds and bonds of comparable maturity



Source: Original yields from Bloomberg.

Notes:

- The index linked bonds are 189 (redemption date, March, 2013), 198 (March 2008), 197 (December, 2023), 202 (December 2033), with yields divided by 100.
- The corresponding matches are, respectively, 153 (August, 2010), 194 (February, 2008), 186 (December, 2026) for both 197 and 202, with yields divided by 100.
- Calculations by authors as follows e.g., for the pair R194 and R198:

$$100 \times \left(\left(1 + \frac{R194}{2} \right)^2 \bigg/ \left(1 + \frac{R198}{2} \right)^2 - 1 \right)$$

APPENDIX: Central Bank Transparency Scores for 1994 and 2007

The scores are in brackets and bold, based on the original Geraats survey to allow direct comparison with several OECD countries (Eijffinger and Geraats, 2006). The South African Reserve Bank is abbreviated “SARB”.

1. Political Transparency

(a) Is there a formal statement of the objective(s) of monetary policy, with an explicit prioritization in case of multiple objectives?

No formal objective(s) = 0.

Multiple objectives without prioritization = 1/2.

One objective, or multiple objectives with explicit priority = 1.

(b) Is there a quantification of the primary objective(s)?

No = 0. Yes = 1.

(c) Are there explicit institutional arrangements or contracts between the monetary authorities and the government?

No central bank, contracts or other institutional arrangements = 0.

Central bank without explicit instrument independence or contract = 1/2.

Central bank with explicit instrument independence or central bank contract (although possibly subject to an explicit override procedure) = 1.

1.a “The primary objective of monetary policy is to protect the value of the currency in order to obtain balanced and sustainable economic growth in the country.” This objective is articulated in both the Constitution Act of the Republic of South Africa, No 8 of 1996 (section 224) and in the amended South African Reserve Bank Act, No 90 of 1989 (section 3 substituted by section 2 of Act 2 of 1996). “It requires the achievement of financial stability, i.e. price stability as well as stable conditions in the financial sector as a whole.” “The new inflation-targeting monetary policy framework is primarily concerned with one element of financial stability, i.e. price stability.” Both quotes from Appendix to the Statement of the Monetary Policy Committee (MPC) - 6 April 2000: “A New Monetary Policy Framework”, Statement issued by Mr. T.T. Mboweni, Governor of the SARB (website). The score in 2007 is **[1]**. Under Stals, an initial mission statement, published in 1990, entrusted the protection of the domestic *and* external value of the Rand to the Bank. This was carried through to the Interim Constitution (commencing in late April, 1994): “The primary objectives of the South African Reserve Bank shall be to protect the internal *and* external value of the currency in the interest of balanced and sustainable economic growth in the Republic.” This can be interpreted as having both a price and an exchange rate target in mind, without explicit prioritisation. Money supply growth guidelines superseded strict targets by the early 1990s and an eclectic monetary policy with an informal inflation target from the middle 1990s. Despite statements that the rand was freely floating, *de facto* there were clear episodes of heavy intervention in the foreign exchange market to prevent appreciation and at times depreciation of the rand. There were multiple and conflicting objectives for monetary policy – see section 4.3 above. The score for 1994 is **[0.5]**.

1.b The SARB conducts monetary policy within an inflation targeting framework with clear targets. The score for 2007 is **[1]**. The score for 1994 is **[0]**. Monetary guidelines had replaced the monetary targets and were exceeded in each year. The eclectic monetary policy remained opaque: it was not clear what weights attached to the broader indicators (see Aron and Muellbauer, 2002).

1.c Constitutional independence of the SARB was enacted in 1996: Section 224 (2) of the Constitution states: “The SARB, in pursuit of its primary object must perform its functions independently and without fear, favour or prejudice, but there must be regular consultation between the Bank and the Cabinet member responsible for national financial matters.” Operational independence was achieved initially through an exchange of letters between government and Bank. The score in 2007 is **[1]**. At the beginning of 1994, the score is **[0.5]**. Operational responsibility was described by the South African Reserve Bank Act (No 90 of 1989). But before the Interim Constitution was adopted there were no explicit arrangements or contracts between the government and the SARB on instrument independence. The Interim Constitution (Act 200, 1993, assented to on 25 January, 1994, commencing on 27 April, 1994) gives multiple objectives to the SARB, but states it shall perform its functions independently.

2. Economic Transparency

(a) Is the basic economic data relevant for the conduct of monetary policy publicly available? The focus is on the following five variables: money supply, inflation, GDP, unemployment rate and capacity utilization.

Quarterly time series for at most two out of the five variables = 0.

Quarterly time series for three or four out of the five variables = 1/2.

Quarterly time series for all five variables = 1.

(b) Does the central bank disclose the formal macroeconomic model(s) it uses for policy analysis?

No = 0. Yes = 1.

(c) Does the central bank regularly publish its own macroeconomic forecasts?

No numerical central bank forecasts for inflation and output = 0.

Numerical central bank forecasts for inflation and/or output published at less than quarterly frequency = 1/2.

Quarterly numerical central bank forecasts for inflation and output for the medium term (one to two years ahead), specifying the assumptions about the policy instrument (conditional or unconditional forecasts) = 1.

2.a Money supply, inflation, GDP, employment figures and capacity utilisation data are available from the website and published at least quarterly (except for GDP, all other series are also monthly) back to at least 1970. The CPI-X data are published monthly from 1997. Comparable unemployment rate data from 1994 are available at 6-month intervals from <http://www.statssa.gov.za/>, to 1993 on a narrow definition of unemployment; and further back annually, though on a very narrow definition from the ILO website. Applying the Geraats test *strictly*, the limited labour data implies a score of **[0.5]** in 1994 and 2007.

2.b The SARB model has been reconstructed since about 1999 with assistance from the Bank of England and others. It is still under development, and one working paper has been published with the core model. Prior to inflation targeting, various Quarterly Bulletin articles revealed parts of the SARB's large (400-equation) model, but it was never published as a whole. The score is **[0]** in 1994 and **[1]** in 2007.

2.c The *Monetary Policy Review* is published twice annually (see website), and contains an inflation forecast up to 2 years ahead in the form of a fan chart. No detail is given on the underlying assumptions, except that the repo rate is assumed unchanged for the forecast period. There are no forecasts for output. No forecasts were published in the Stals era. The score is **[0]** in 1994 and **[0.5]** in 2007.

3. Procedural Transparency

(a) Does the central bank provide an explicit policy rule or strategy that describes its monetary policy framework?

No = 0. Yes = 1.

(b) Does the central bank give a comprehensive account of policy deliberations (or explanations in case of a single central banker) within a reasonable amount of time?

No, or only after a substantial lag (more than eight weeks) = 0.

Yes, comprehensive minutes (although not necessarily verbatim or attributed) or explanations (in case of a single central banker), including a discussion of backward and forward-looking arguments = 1.

(c) Does the central bank disclose how each decision on the level of its main operating instrument or target was reached?

No voting records, or only after substantial lag (more than eight weeks) = 0.

Non-attributed voting records = 1/2.

Individual voting records, or decision by single central banker = 1.

3.a Inflation targeting with an explicit target was adopted in 2000, and a brief description can be found in: Advertorial published by the SA Reserve Bank in Business Day newspaper: The Objectives and Importance of Inflation Targeting (2002-11-13) and Appendix to the Statement of the Monetary Policy Committee - 6 April 2000: "A New Monetary Policy Framework", Statement issued by Mr. T.T. Mboweni, Governor, SARB. The score is **[1]** for 2007. In 1994 under Stals, the monetary policy targets had given way to a range of indicators (*Quarterly Bulletin*, October, 1997). There was no explicit rule and policy was opaque (see Aron and Muellbauer, 2002). The score is **[0]** in 1994.

3.b Decisions are reached by the Monetary Policy Committee (initially 15 and now 9 members). In 1994, decisions were made by the Governor, in consultation with the Deputy Governors. Minutes of these meetings are not published now, and were not in 1994. The score in each of 2007 and 1994 is **[0]**.

3.c No voting is carried out in the MPC. In 1994, decisions were reached by the Governor and his deputies, without voting or records. The score in each of 2007 and 1994 is **[0]**.

4. Policy Transparency

(a) Are decisions about adjustments to the main operating instrument or target promptly announced?

No, or after a significant lag = 0.

Yes, at the latest on the day of implementation = 1.

(b) Does the central bank provide an explanation when it announces policy decisions?

No = 0.

Yes, when policy decisions change, or only superficially = 1/2.

Yes, always and including forwarding-looking assessments = 1.

(c) Does the central bank disclose an explicit policy inclination after every policy meeting or an explicit indication of likely future policy actions (at least quarterly)?

No = 0. Yes = 1.

4.a Policy decision changes are currently announced on the last day of the three day MPC meeting, at 3 p.m.. There is a press release and the announcement is televised. The score is thus **[1]** in 2007. In 1994, there were sometimes press announcements with explanations about rate changes, but not *every* time the rate changed. The score in 1994 is **[1]**.

4.b An explanation is currently given in the MPC statement, including when interest rates don't change, with a very brief forward-looking assessment. The score is thus **[1]** in 2007. In 1994, explanations were given on those occasions when there were press statements, which was not every time they changed. There were no explanations when it was decided to *maintain* the rate after a meeting. A generous score for 1994 is therefore **[0.5]**.

4.c There is currently no explicit policy inclination after policy meetings, nor quarterly. Nor were explicit inclinations given *at least* quarterly in 1994. The score in each case is **[0]**.

5. Operational Transparency

(a) Does the central bank regularly evaluate to what extent its main policy operating targets (if any) have been achieved?

No, or not very often (at less than annual frequency) = 0.

Yes, but without providing explanations for significant deviations = 1/2.

Yes, accounting for significant deviations from target (if any); or, (nearly) perfect control over main operating instrument/target = 1.

(b) Does the central bank regularly provide information on (unanticipated) macroeconomic disturbances that affect the policy transmission process?

No, or not very often = 0.

Yes, but only through short-term forecasts or analysis of current macroeconomic developments (at least quarterly) = 1/2.

Yes, including a discussion of past forecast errors (at least annually) = 1.

(c) Does the central bank regularly provide an evaluation of the policy outcome in light of its macroeconomic objectives?

No, or not very often (at less than annual frequency) = 0.

Yes, but superficially = 1/2.

Yes, with an explicit account of the contribution of monetary policy in meeting the objectives = 1.

5.a The main operating instrument in 2007 is the repo rate, and in 1994 was the bank rate. There is no data, graphical or other evaluation of the control of the operating target in either case. But control over the operating target in both cases has been nearly perfect. The score for each is **[1]**.

5.b There is a quarterly analysis of current macro-economic developments and disturbances in the *Quarterly Bulletin*, but no (at least) annual discussion of past forecast errors (no forecasts were published in 1994). The score in each of 1994 and 2007 is **[0.5]**.

5.c The *Monetary Policy Review* only superficially accounts for discrepancies between the policy outcome and the target. The benchmark against which this score is made, is the Swedish Riksbank comprehensive and explicit annual assessment in the Inflation Report, March issue (see Eijffinger and Geraats, 2006). The score for the SARB in 2007 is **[0.5]**. Stals in 1994 scores **[0.5]**, based on his extensive speeches and explanations, which were available on the web, and in the *Quarterly Bulletin*.