

# **Communication as a Strategic Monetary Policy Tool: An Evaluation of the Effectiveness of the South African Reserve Bank's Communication**

by

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## Declaration

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## Abstract

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*The effectiveness of monetary policy depends importantly on the expectations of the private sector, as it is largely through this channel of the transmission mechanism that policy changes are transmitted to long-term interest rates. This has increased the emphasis on the role of central bank communication as a monetary policy tool. Successful communication is essential both to enhance the effectiveness of monetary policy and to build support for the institutional framework within which monetary policy is implemented. While the large and growing literature on central bank communication over the past decade has delivered strong support for the important role of central bank communication, there is less agreement about what the optimal communication strategy is. Furthermore, research has been limited mainly to studies of communication between central banks and the financial markets. In an evaluation of progress in the literature, Blinder et al. (2008) highlight the need to examine the interaction between central banks and the rest of the private sector (the general public) as well.*

*The objective of this PhD dissertation is to evaluate the South African Reserve Bank's (SARB's) use of communication as a monetary policy tool. Special focus is given to communication with the inattentive general public, who set prices in the labour market and the market for goods and services. Different aspects of the SARB's communication were studied, including the consistency of the South African Reserve Bank's communication, the transmission of this communication via the media to the general public, and the process by which the general public gathers and processes the information on inflation.*

*An evaluation of the SARB's communications (its original messages) provided some evidence that the SARB has succeeded in communicating consistently over the inflation targeting period. This was followed by an assessment of the role of the media in transmitting the original communications to the general public. The results suggest that South African media reports generally show a lack of critical assessment of monetary policy decisions and that the inter-meeting communication by the SARB is ineffective at influencing these. An important challenge is for the SARB to consider how it can participate more actively in the economic discussion at this level and how it can build productive strategic relationships with the media. The final section of this dissertation explores the process by which the general public forms its inflation expectations, relying on epidemiological models to describe the spread of*

*inflation information and to estimate the speed at which the general public, in aggregate, updates their inflation expectations. This estimate of the speed of adjustment will be valuable to future research that aims to build a Phillips curve in a new way for South Africa. A well-modelled Phillips curve will both improve the monitoring of the impact of monetary policy and inform future policy design and implementation.*

*JEL Classification: D82, D83, D84, E31, E37, E42, E52, E58, E65*

*Keywords: South Africa, central bank communication, inflation expectations, consistent communication, monetary policy transmission mechanism, transparent monetary policy, media, inattentive general public.*

## Opsomming

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*Die doeltreffendheid van die monetêre beleid is beduidend afhanklik van die verwagtinge in die privaat sektor, aangesien beleid hoofsaaklik deur hierdie kanaal langtermyn rentekoerse beïnvloed. Hierdie bewustheid het die klem op die rol van sentrale bank kommunikasie as 'n monetêre instrument versterk. Suksesvolle kommunikasie is noodsaaklik om beide die effektiwiteit van monetêre beleid te verseker sowel as om ondersteuning vir die institusionele raamwerk waarbinne die monetêre beleid geïmplimenteer word, te bou. Hoewel daar 'n groot en groeiende literatuur is wat die belangrikheid van sentrale bank kommunikasie oor die afgelope dekade beklemtoon, is daar nie eenstemmigheid oor wat die optimale kommunikasie strategie behels nie. Daarbenewens is meeste studies beperk tot die kommunikasie tussen monetêre owerhede en die finansiële sektor. In 'n evaluering van die literatuur het Blinder et al. (2008) die noodsaaklikheid beklemtoon om die wisselwerking tussen monetêre owerhede en die res van die privaat sektor (die publiek) te bestudeer.*

*Die doel van hierdie proefskrif is om die Suid-Afrikaanse Reserwebank (SARB) se gebruik van hierdie kommunikasie instrument te evalueer. Spesiale aandag word geskenk aan kommunikasie met die onoplettende publiek wat pryse bepaal in die arbeidsmark en markte vir goedere en dienste. Verskillende aspekte van die SARB se kommunikasie strategie word bestudeer, insluitende die konsekwentheid van kommunikasie, die oordrag van hierdie kommunikasie via die media aan die publiek, asook die proses waarmee die publiek informasie rakende inflasie versamel en verwerk.*

*'n Evaluering van die SARB se kommunikasie (die oorspronklike boodskappe) lewer bewys dat die SARB daarin geslaag het om konsekwent te kommunikeer tydens die inflasie teikeningsperiode. Dit word gevolg deur 'n evaluering van die rol van die media om oorspronklike informasie suksesvol aan die publiek oor te dra. Die resultate dui daarop dat berigte in die Suid Afrikaanse media oor die algemeen aan kritiese evaluering van die monetêre beleidsbesluite ontbreek en die SARB se kommunikasie tussen monetêre beleidsvergaderings is ook oneffektief gevind. 'n Belangrike uitdaging vir die SARB is dus om te bepaal hoe dit op hierdie vlak tot die ekonomiese debat kan toetree en hoe dit produktiewe strategiese verhoudings met die media kan bou.*

*Die laaste afdeling van die proefskrif bestudeer die proses waarvolgens die publiek hul inflasieverwagtinge formuleer deur gebruik te maak van epidemiologiese modelle wat die verspreiding van inflasie verwagtinge, asook die spoed waarteen die publiek oor die algemeen hul inflasieverwagtinge opdateer, beskryf. Die snelheid waarmee die publiek hul verwagtinge opdateer behoort veral van waarde te wees vir toekomstige studies wat poog om 'n Phillips kurwe met 'n nuwe aanslag vir Suid Afrika te skort. 'n Goed geformuleerde Phillips kurwe sal monitering van monetêre beleide se impak verbeter, en sal ook as 'n goeie riglyn vir toekomstige beleidsontwerp en -implimentering dien.*

*JEL Klassifikasie: D82, D83, D84, E31, E37, E42, E52, E58, E65*

*Sleutelwoorde: Suid-Afrika, sentrale bank kommunikasie, inflasieverwagtinge, konsekwente kommunikasie, monetêre beleid transmissie meganisme, deursigtige monetêre beleid, media, onoplettende publiek.*

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Finally, I wish to acknowledge the Lord.

„For I know the plans I have for you,” says the Lord, “plans to prosper you and not to harm you, plans to give you hope and a future.” ’

(NIV, Jeremiah 29:11)



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## 1. INTRODUCTION

The implementation of monetary policy in South Africa cannot be successful in the long run without the cooperation of the general public – the price setters and ultimate political control over the central bank. The South African Reserve Bank (SARB) has instrument independence, but it does not have goal independence, and its independence such as it is, remains conditional on its political legitimacy.

„In the end, it is the general public that gives the central bank their legitimacy, and hence their independence.’

(Blinder et al., 2008: 47)

The institutional framework within which monetary policy is implemented and the goals set for the SARB are dependent on the democratic process, which ultimately relies on the support of the general public. Once the goals have been set, the SARB has constitutional protection to pursue its mandate without short-term political interference. However, even with this protection, policy makers cannot disregard the general public’s assessment of the SARB when implementing monetary policy. Today, central bankers recognise that monetary policy is strategic in nature, that is to say, the economic decisions of the private sector in response to the policy choices of the central bank impact on the Bank’s ability to achieve its objectives. In South Africa, the operational success of the inflation targeting SARB remains heavily dependent on its ability to anchor the inflation expectations of the general public.

These modern trends in the practice of monetary policy have been greatly influenced by important developments in both monetary theory and historical experience since the 1970s. Theory and experience have helped to clarify the goals of monetary policy, highlighted the strategic nature of the interaction between a central bank and the public, and therefore emphasised the need for the central bank to communicate with the public, which is the focus of this dissertation.

Research about the use of communication as a monetary policy tool, like any evaluation of monetary policy implementation, should logically begin by identifying its objective. Within academic and central bank circles, there is no longer much disagreement that price stability should be the primary objective of a prudent central bank, with the aim of maintaining

macroeconomic stability and thereby encouraging economic growth<sup>1</sup>. Friedman (1968) relied on the Phillips curve relationship to identify the objectives that monetary policy could achieve. His argument hinged on the long and variable lags with which monetary policy impacted on the economy. In the short run the impact of monetary policy is largely on real output, but in the long run it falls mostly on the price level. This implies that monetary policy is unable to control output in the long run and should instead focus on maintaining low and stable inflation in order to create a stable macroeconomic environment conducive to economic growth.

The public and its representatives periodically challenge this goal of monetary policy, despite its strong theoretical justification and the benefit of historical experience. Domestically, inflation targeting has repeatedly been blamed for inhibiting economic growth over the past few years, and there has been increased pressure for monetary authorities to loosen monetary policy or to „target employment’ rather than inflation. The short-term trade-off between inflation and output creates political tension that is not unique to South Africa. Arthur Burns (1975) blamed the central banks’ failure to control inflation in the 1970s on philosophical and political factors. He argued that central banks possessed the tools and desire to avoid the rampant inflation, but that in practice the political environment had limited their ability to use them.

The recognition that monetary policy operates with a lag also calls for a forward-looking approach and therefore an emphasis on expectations. The rational expectations revolution of the 1970s was another theoretical development that greatly influenced the practice of monetary policy. In this tradition, expectations in economic models are formed in a model-consistent<sup>2</sup> manner so that decision makers avoid systematic errors (Klamer, 1984).

---

<sup>1</sup> Internationally, the 2007/2008 financial crisis has called into question the role and scope of monetary policy. Before the crisis, it was assumed that price stability was enough to ensure financial stability (Issing, 2009; Goodhart, 2010; White, 2006). However, in an evaluation of the future role for central banks, given the experience of the financial crisis, Goodhart (2010) concluded that additional macroprudential regulations were required rather than new operational procedures to pursue price stability.

<sup>2</sup> Model-consistent expectations are formed by the same process that determines other variables at stake, combined with access to all information in the model. Rational expectations do not suggest that people have perfect foresight, but rather that the modelled individuals avoid repeating mistakes, and use the information available to them to make decisions.



Therefore, decision makers learn about the „character’ of the central bank and incorporate this information when making their economic decisions.

The strategic nature of monetary policy was soon recognised once rational expectations were incorporated into models. In this spirit, Kydland and Prescott (1977) found that a central bank’s optimal monetary policy decision is dynamically inconsistent if the rational public recognises that the monetary authority has an incentive to renege on its promise once the public has acted on prior policy commitments. In such a strategic setting, policy makers have to recognise that the response of the public to policy decisions impacts on the likelihood of policy success.

The need for the central bank to cooperate with the public in this strategic setting must be balanced against its responsibility to protect its independence and to make responsible policy decisions, informed by academic developments and the lessons of historical experience. For this reason, some institutional features such as central bank independence cannot be changed in South Africa within a short time frame. This protects monetary policy from the incentives created by the shorter-term objectives of government and labour. However, the SARB needs to continue communicating with the public and not lose sight of the fact that in the long run the institutions and objectives of monetary policy are determined through the democratic process. Continual, effective communication is necessary to protect monetary policy institutions, secure the SARB’s credibility and anchor inflation expectations.

The significance of inflation expectations in modern monetary policy emerges from the combined insights about the importance of forward-looking policy and the modelling perspective brought about by rational expectations which culminated in the strategic perspective on monetary policy. Today, it is widely accepted that the effectiveness of monetary policy depends importantly on the expectations of the private sector, as it is largely through the expectations channel of the transmission mechanism that policy changes are transmitted to longer-term interest rates (Woodford, 2005). Monetary authorities have embraced high levels of transparency in recognition of this fact, in what Alan Blinder (2004) describes as a „revolution’ in central bank thinking.

Subsequent to this revolution, communication demands far greater attention as a monetary policy tool, used to enhance the predictability of monetary policy and help manage inflation

expectations. While the large and growing literature on central bank communication over the past decade has delivered strong support for the important role of central bank communication, there is less agreement about what the optimal communication strategy is (Blinder et al., 2008).

In practice central bank communication is heterogeneous. This is influenced by a range of factors, including the economic and political climate of a particular economy and the characteristics of the audience with which the central bank is communicating. The vast majority of research on central bank communication focuses on the interaction between a central bank and the financial markets, partly because readily available and high quality asset price data makes it much easier to study the response of financial markets to central bank communication. But Blinder and Wyplosz (2004) divide the central bank's audience into the broad public and its political representatives on the one side, and the financial markets on the other, a classification also adopted here. While others have studied communication with financial markets, this dissertation focuses on the rest of the audience.

The general public will also be called price setters, as this larger group comprises the majority of the economic decision makers who set prices for goods and services across the economy and who also set the wage rate, with significant consequences for inflation. Cukierman (2007) suggested that the general public will be rationally inattentive to short-term fluctuations of the inflation rate if the central bank has credibility, as the cost to them of searching for and processing information about monetary policy outweighs the potential benefits.

This dissertation explores the communication of the SARB with this inattentive general public. The SARB's communication is analysed with the intention of achieving a number of related objectives. It will allow policy makers to manage the inflation expectations of the general public and increase the effectiveness of monetary policy. From a policy perspective, learning more about the inflation expectations channel of the transmission mechanism will enable the SARB to enhance its credibility in the eyes of the general public and encourage them to support monetary policy institutions. In addition, an improved formal description of the microfoundations reflecting the process by which the general public forms their inflation expectations is a way to test our theories about how aggregate inflation expectations are formed. It will also provide a new approach for estimating the Phillips curve in future work.

In order to analyse the use of communication by the SARB, a number of aspects of the communication between the SARB and the general public were considered. The research begins by evaluating the consistency of the SARB's communication in chapter 2. The focus is on the original message sent (the monetary policy statement) and whether this message is consistent with subsequent policy actions. Predictable monetary policy is essential to encourage coordination between the decisions of policy makers and those of the private sector. This helps to minimise economic volatility and is beneficial to both the SARB and its audience. In addition, consistent communication engenders trust which is necessary for the SARB to build credibility.

A numerical index was constructed to capture the communication of the SARB about its likely future monetary policy actions. This research extends the literature by formally analysing the *communication* of the SARB rather than by focusing solely on its *actions*. Exploratory data analyses, formal tests and regression analyses revealed that the communication of the SARB has shown a high degree of consistency since the adoption of inflation targeting.

However, in the case of the general public, very few ever receive the message that the SARB sends in its original form. It is costly in terms of time and skills for the general public to gather the information that generates inflation expectations. It is rational for them to be relatively inattentive to this information, as they have to use their limited resources to fulfil the demands of their own circumstances. Instead, they rely on the media, which reduces the cost of accessing and interpreting inflation information for people who are not financial specialists. Although the general public are inattentive, they are the price setters and their economic decisions are crucial to the success of monetary policy. Therefore, chapter 3 is dedicated to exploring the role of the newspaper media in conveying the SARB's communication to the general public.

Two indices, *extent of coverage* and *assessment* were created to characterise newspaper reports in the week following each of the MPC meetings. This allowed a systematic analysis of the factors that impact on the news reports (the outcome of the communication between the SARB and the general public). The results reveal limited critical assessment of monetary policy by the South African media, although the *extent of media coverage* does increase when inflation is outside of the target band. It is revealing that inter-meeting communication by the

SARB appears to have little influence on the assessment of monetary policy decisions by the media. Improved central bank communication potentially offers the SARB a way to contribute to the level of economic evaluation and to build credibility.

Turning to the ultimate recipients of central bank communication, chapter 4 investigates how the general public incorporates information about inflation. This helps to explain how information about inflation disseminates through the economy. Following Carroll (2001, 2003), epidemiological models are used to describe the process by which the inflation expectations of the price setters are formed. The hypothesis is that price setters are inattentive and only update their inflation information periodically, causing information stickiness in the aggregate inflation expectations data. An attempt is made to estimate the speed at which the inattentive general public updates their inflation expectations on average (which is used to calculate information stickiness<sup>3</sup>). The use of survey-based data, uncertainty about the stationarity of some of the data series, and the short sample period makes this estimation difficult. Therefore, two different time series models are used to provide a robust estimate.

Agent-based models, which explain the complex aggregate inflation expectations of the general public from agent level upwards, are then used to verify these estimates of information stickiness and explore the microfoundations from the disaggregated level. The final estimate of information stickiness for South Africa is between 0.65 and 0.70. This range is much higher than estimates of between 0.15 and 0.30 for Germany, the UK and France, but only a little higher than the range of between 0.50 and 0.60 for Italy. These findings are in line with the hypothesis that in countries where the risks of inflation are greater, the general public tend to rationally pay more attention to developments in inflation, and therefore adjust their inflation expectations more rapidly.

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<sup>3</sup> Parameter  $\lambda$ , which lies between 0 and 1, is used in this dissertation to represent information stickiness. It captures the speed at which the general public update their inflation expectations or the fraction of the general public that update their inflation expectations each period. Therefore, a value of  $\lambda$  close to 1 represents a small degree of information stickiness, whereas a value close to 0 represents a large degree of information stickiness. This description of information stickiness is adopted in line with early papers on information stickiness (Mankiw and Reis, 2001b; Kahn and Zhu, 2006; Döpke et al, 2008).

In conclusion, this dissertation explores the role of communication in the transmission mechanism of South Africa. By analysing the consistency of the SARB's communication, how it is transformed into „news' by the media, and how the general public (price setters) process this information, this dissertation aims to illuminate the expectations channel of the transmission mechanism. A better understanding of this channel will allow the SARB to tailor its communication more purposefully and offer the opportunity to improve the modelling of the macro economy, where the Phillips curve is quintessential.

## 2. LOUD AND CLEAR? CAN WE HEAR WHEN THE SARB SPEAKS?

### 2.1. Introduction

Communication is increasingly recognised as an essential tool for the implementation of modern monetary policy. Most modern monetary policy regimes, whether inflation targeting regimes or not, identify price stability as their primary objective and recognise that central bank transparency<sup>4</sup> and credibility are crucial to the attainment of this objective. As a result of the broad move towards greater transparency, communication has become part of any modern monetary regime.

In order for monetary policy to effectively influence economic decisions, it must influence interest rates along the entire yield curve, but modern monetary authorities only have direct control over the repo rate (or equivalent) at the very short end of this curve. The decomposition of nominal interest rates into real interest rates, inflation expectations and risk premia, as given by the Fisher equation, shows that the South African Reserve Bank (SARB) needs to manage expectations of the future real interest rate as well as inflation expectations if it is to influence nominal interest rates over longer horizons. As a consequence, managing inflation expectations is increasingly recognised as essential for effective monetary policy.

“For successful monetary policy is not so much a matter of effective control of overnight interest rates as it is of shaping market expectations of the way in which interest rates, inflation, and income are likely to evolve over the coming year and later ... not only do expectations about policy matter, but, at least under current conditions, very little else matters.”

(Woodford, 2005:15)

Reid (2009) analysed the effectiveness of monetary policy in South Africa, with an emphasis on the communications of the central bank with the public. The results of her empirical tests of the sensitivity of inflation expectations (derived from market interest rates) to macroeconomic surprises, support inferences about the relative predictability of monetary policy and the degree of coordination between the central bank and financial markets. Reid

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<sup>4</sup> There is, however, ongoing debate about the limits of the benefits of transparency; see, for example, Cukierman (2007).

(2009) found that the evident coordination between the SARB and financial markets attests to successful strategic interaction between these parties: although both pursue their own interests, they optimise the interest rate outcome through strategic co-operation. This collaboration has been encouraged by the characteristics of modern monetary policy, such as transparency, accountability, credibility and a commitment to rules-based policies. This does not suggest any duress, but rather that the SARB and financial markets, as players in a strategic game, have decided that it is in their respective best interest to cooperate (Reid, 2008).

Even greater transparency could be achieved, as suggested by Reid (2008), if the SARB published a forecast of the expected path of its policy instrument. In addition to greater transparency, this would emphasise the forward-looking nature of monetary policy and thereby enhance the predictability of the SARB's policy decisions. Presently, only three central banks (the Reserve Bank of New Zealand, the Norges Bank and the Reserve Bank of Sweden) have any experience with publishing such forecasts, and the impact has not yet been studied empirically (Blinder et al., 2008). Although the SARB does not publish its forecasted interest rate path, it is possible to investigate empirically the implicit forward-looking content of the SARB's communications.

This chapter aims to assess the degree to which the South African Reserve Bank's (SARB) Monetary Policy Committee (MPC) has, since the introduction of inflation targeting, successfully communicated to the public its policy analysis, and, in particular, the expected future policy changes. Section 2 introduces the literature that studies the communication of central banks about future monetary policy. The monetary policy inclination index, how it was created and a preliminary discussion of its application to study the SARB's communication about future monetary policy are described in section 3. In section 4 the index is applied to evaluate the *consistency* of the SARB's communication, where consistency is essentially the degree to which the deeds of the SARB match its prior words. The information content of the inclination index is studied from a number of angles, starting with exploratory data analysis and econometric tests, followed by OLS and ordered probit regression analyses. These techniques, jointly, will provide insight into the consistency of the SARB communication about intended future monetary policy. Section 5 concludes.

## 2.2. Communication about future monetary policy

The recent paper by Blinder, Ehrmann, Fratzscher, De Haan and Jansen (2008), surveys the theoretical and empirical literature in the field. They describe the compelling move towards greater transparency in central bank communication, which has the goal of improving the management of expectations. Additionally, the authors review the evidence on the contribution of central bank communication to the successful implementation of monetary policy.

According to Blinder et al. (2008), central banks used better communication to increase the signal-to-noise ratio of their interaction with the broad public, including financial markets. From this perspective, literature on the success achieved with better communication can be divided into two strands: first, research about the extent to which the central bank “creates news” considers the impact of central bank communication on financial markets; and, second, research that considers the extent to which central bank communication “reduces noise” examines how these improve the predictability of its policy decisions.

Starting with the first strand, some international research (including Kohn and Sack (2004) and Reeves and Sawicki (2007)) investigates whether a central bank creates news, without considering whether this news moves the markets in the desired direction. The second strand of the literature measures (quantitatively) the communication of the central bank in question, in order to provide an indication of the direction of the communication and to establish whether the markets responded in the desired manner, or whether this just increased volatility (Musard-Gies, 2005; De Haan and Jansen, 2005; Rosa and Verga, 2007; Ehrmann and Fratzscher, 2007).

This literature has been influenced by authors such as Romer and Romer (1989), who adopted a narrative approach – creating indices based on the examination of policy records – to measure the stance of monetary policy. By translating what the central bank communicates about *future* monetary policy into an index, it becomes possible to identify the direction (and the magnitude, if desired) in which the central bank intends to influence the markets. Ultimately, then, one can judge the degree to which this communication was successful.



Two approaches have been adopted in the literature, each offering different advantages. Some researchers, for example, Heinmann and Ullrich (2005), have created an “objective index”, which measures the frequency of coding words, whilst avoiding the use of judgement in the construction of the index. Other researchers – Rosa and Verga (2007) and Ehrmann and Fratzscher (2005) – have created indices that entail some judgement or interpretation in codifying the communication of the central bank. Rosa and Verga (2007) argue that subjective indices are supported by hermeneutic theory. These indices can be used to investigate the information content of a central bank’s communication, which in turn will enable evaluation of the consistency and effectiveness of the monetary policy communication of the central bank.

In South Africa there have been few formal studies of the extent to which the SARB creates news or reduces noise, and these have been limited, primarily, to evaluations of the predictability of monetary policy (Ballim and Moolman, 2005; Aron and Muellbauer, 2006), or to the sensitivity of financial markets to macroeconomic surprises (Reid, 2009). All of these previous studies investigate the movement of market interest rates in anticipation of, or in response to, monetary policy *action* (an announcement of the monetary policy decision). This chapter contributes to the South African literature through the creation of an index that will allow for direct evaluation of the SARB’s *communication* on its possible future monetary policy stance through its regular monetary policy statements.

### 2.3. Method: Monetary policy inclination index

The concept of consistency is explored comprehensively in section 4, but the assumption is that consistency (in the sense that the central bank’s deeds match its prior words) is essential for building the reputation of a central bank. This is supported by Blinder’s (2000) finding that central bankers and academic economists share widespread consensus that credibility is exceptionally important to a central bank<sup>5</sup>. In addition, both groups agree that credibility is built mainly through a track record of matching words with deeds - that is, through consistent policy decisions that are communicated to the public.

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<sup>5</sup> Although the responses of academic economists reflected far greater dispersion than those of central bankers, the mean response was still 4.23 out of 5, where 5 signified that the respondent believed credibility to be ‘of the utmost importance’.

Monetary policy requires repeated interaction which creates incentives for the bank to communicate in a consistent manner in order to be considered credible. The relevant commitment is not to any given path of policy decisions, but rather to the process by which policy decisions are taken. Svensson (2002) calls such a process a targeting rule, in contrast to an instrument rule, where a particular policy-reaction function is itself fixed<sup>6</sup>.

This chapter evaluates the SARB's communication as a tool of monetary policy. To that end, it assesses the degree to which likely actions indicated in the SARB's communication was followed by policy action consistent with the prior communication. In other words, we evaluate the informational content of the SARB's communication, using a measure of consistency.

The analytical tool used to examine the consistency of the SARB's communication is a subjective index of monetary policy inclination, supported by the hermeneutic argument<sup>7</sup> of Rosa and Verga (2007). However, Rosa and Verga start by forming a glossary of words and phrases that they use as a guide to their index. This was viable for their study of the European Central Bank (ECB) as the ECB uses a "very standardised form of language" (Rosa and Verga, 2007: 149). On a number of occasions, the ECB president even explained his use of a particular term. The same approach did not deliver useful information in the South African case where, to the best of the authors' knowledge, the SARB made fewer explicit attempts to clarify the informational content of any particular word or phrase.

We created an index to capture the information (in terms of the *direction* of change) contained in the official statement after each Monetary Policy Committee (MPC) meeting, with respect to the likely future development of the stance of monetary policy conveyed by the policy statement. Details about the factors the researchers considered when constructing

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<sup>6</sup> However, Woodford (2003) offers further theoretical complication by showing that commitment to a policy procedure is inconsistent within a standard New Keynesian framework, except if the policy procedure has the additional characteristic that he calls a "timeless perspective". Policy with a timeless perspective is a decision rule that is optimal not only at a point in time, but one that would have been optimal in any earlier period, with the present knowledge of the transmission mechanism. From a timeless perspective the optimal policy procedure for the economy evolves with our knowledge of the economy and with structural changes in the economy.

<sup>7</sup> According to Rosa and Verga (2007), hermeneutic theory and textual analysis emphasise that communication is subjective, and its success depends jointly on the content of the messages sent and their interpretation by the receiver. Hermeneutic theory also highlights the dynamic nature of language, which seems relevant for the analysis of the SARB during a period where, as a young inflation targeter, it was learning to use communication as a monetary policy tool.

the index are presented in Appendix 2.1. Although the SARB uses a number of other communication devices, including monetary policy reviews and monetary policy forums, we focus in this study on the monetary policy statements released at 15:00, directly after the monetary policy committee meetings. The wide publicity attracted by these statements and their higher relative frequency were the important criteria in this decision, but the research could be extended to analyse the other channels of communication in a similar fashion. Apart from the formal channels of the SARB's communication, it might also be instructive to study the information content of other, more informal, communication such as comments by the governor at press conferences. Jac Laubscher (2009) recently argued that the governor's comments at a press conference provided valuable information to assist understanding of the MPC's surprising decision to leave the repo rate unchanged in June 2009, but lamented the exclusion of such information from the formal policy statement.

To limit the inherent subjectivity of the method used here, each MPC statement was read and judged independently by two researchers, each of whom assigned a numerical value between -2 and +2 to the statement, reflecting the monetary policy inclination communicated by the statement. Both researchers were asked to provide an overall index value for each statement, after considering the following themes in each statement: comments about headline and core inflation, and expected inflation (especially the SARB's own forecast, the BER's survey of inflation expectations and the break-even inflation rate from the bond market); comments about the business cycle and the output gap; comments about wages and labour-market pressures; comments about money supply; comments about external accounts; and finally, overall comments about the appropriateness of the monetary policy stance. Each researcher had to justify the index value assigned in terms of the aforementioned topics. Following their independent evaluations, the researchers discussed each report and their evaluations in detail to arrive at a consensus index value.

An index value of 0 suggests that the overall message of the statement is that the stance of monetary policy is unlikely to change in the near future (i.e. that monetary policy at the time was appropriate). A value of -1 was assigned when the communication suggested that there is a *possibility* of the interest rate being lowered at the following monetary policy meeting, while -2 reflected communication that suggested an *imminent* easing. Similarly, values of +1 or +2 respectively represented communication of the *possibility* of an interest rate tightening, and an *imminent* interest rate rise.

For example, the MPC statement of 22 April 2004 was given an index value of 0. Although the statement comments on rising inflation, it was still within the target band and the expressions “the inflation outlook over the coming months as well as over the longer term continues to be favourable” and “domestically, most conditions seem to endorse the containment of inflation”, suggest that the MPC judged inflationary pressure to be contained. The report’s final section (subtitled, “Monetary Policy Stance”) concludes that “CPIX inflation will remain within the target range during the forecast period while the economy should pick up momentum”, which was interpreted as an indication that the MPC judged the stance of policy to be appropriate at the time.

By contrast, a value of -2 was given to the report following the meeting of 28 May 2009. The MPC had reduced the repo rate at the preceding four MPC meetings, and the following sentences add to the impression that, in terms of inflationary pressures, there was, if anything, an even stronger case for a further easing of monetary policy:

“The most recent CPI inflation forecast of the Bank shows a relatively unchanged outcome for the near-term as compared to that presented to the previous meeting of the Monetary Policy Committee. Over the longer term, there appears to be a moderate improvement [in the inflation outlook].”

(SARB, 2009)

With regard to output, the statement reports that “GDP contraction was broad-based” and “high frequency indicators suggest that the negative trend in GDP growth is likely to continue during the second quarter of 2009, although at a more moderate pace of contraction” (SARB, 2009). The following comment in the final section of the statement cements the authors’ view that the SARB was communicating a continuation of its easing stance:

“The evidence which was presented to the Monetary Policy Committee suggests that the output gap has widened further. This is expected to contribute to an improved inflation outlook, notwithstanding some current inflation inertia.”

(SARB, 2009)

The monetary policy decision following this statement (25 June 2009) turned out, however, to be a controversial one, and will be discussed in detail in section 4.2.

Table 2.1 Dates on which MPC statements were released

Year	Date	Horizon (months)	Year	Date	Horizon (months)
<b>2000</b>	13 Jan		<b>2005</b>	10 Feb	2
	2 Mar	1.5		14 Apr	2
	6 Apr	1		9 Jun	2
	19 May	1.5		11 Aug	2
	15 Jun	1		1 Oct	1.5
	11 Aug	2		8 Dec	2.5
	21 Sept	1.5	<b>2006</b>	2 Feb	2
	16 Oct	1		13 Apr	2.5
	16 Nov	1		8 Jun	2
<b>2001</b>	19 Jan	2		3 Aug	2
	16 Mar	2		12 Oct	2.5
	25 Apr	1.5		7 Dec	2
	14 Jun	2	<b>2007</b>	15 Feb	2.5
	26 Jul	1.5		12 Apr	2
	20 Sept	2		7 Jun	2
	15 Nov	2		16 Aug	2.5
<b>2002</b>	15 Jan	2		11 Oct	2
	14 Mar	2		6 Dec	2
	13 Jun	3	<b>2008</b>	31 Jan	2
	12 Sept	3		10 Apr	2.5
	28 Nov	2.5		12 Jun	2
<b>2003</b>	20 Mar	4		14 Aug	2
	12 Jun	3		9 Oct	2
	14 Aug	2		11 Dec	2
	10 Sept	1	<b>2009</b>	5 Feb	2
	16 Oct	1		24 Mar	1.5
	11 Dec	2		30 Apr	1
<b>2004</b>	26 Jan	1.5		28 May	1
	22 Apr	3		25 Jun	1
	10 Jun	1.5		13 Aug	1.5
	12 Aug	2		22 Sept	1.5
	14 Oct	2			
	9 Dec	2			

*Note: The horizon lengths are rounded to the nearest 0,5 of a month*

A challenge faced in the application of the inclination index is the fact that the horizons between meetings varies in our sample period. The dates of the MPC meetings and the resulting horizons between meetings are presented in table 2.1. While the intervals between meetings differ, they have mostly been two months apart<sup>8</sup>, with a standard deviation of 0.58, suggesting that the range 1.5 to 2.5 months covers the majority (48 out of 62) of the intervals.

<sup>8</sup> The median interval length is two months.

The robustness of the regression results in section 4.2 to these changing horizons is evaluated by comparing the results of regressions using an “event horizon” to those using a “calendar horizon”.

## 2.4. Consistency

In the literature (Rosa and Verga, 2007; Ehrmann and Fratzscher, 2005), the term *consistency* is used to describe the degree to which the *actions* of the central bank correspond with their previous communication about monetary policy (their *words*). According to Ehrmann and Fratzscher (2005: 7), consistency is a “necessary condition if the statements are meant to help markets anticipate better future decisions”, and Blinder (1998) argues that it is crucial to building credibility:

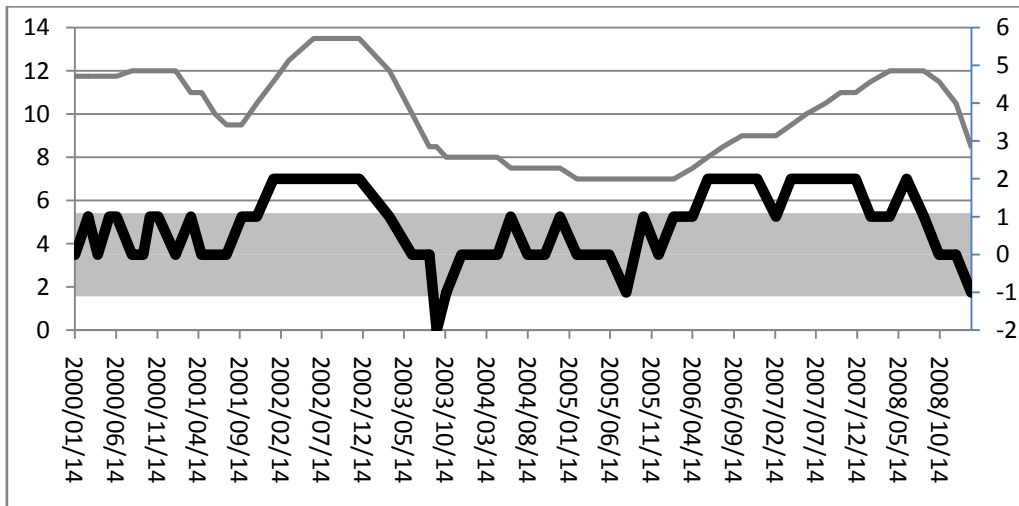
“To me, that is the hallmark of credibility: matching deeds to words. ... Credibility means that your pronouncements are believed – even though you are bound by no rule and may even have a short-run incentive to renege. In the real world, such credibility is not normally created by incentive-compatible compensation schemes or by rigid precommitment. Rather, it is painstakingly built up by a history of matching deeds to words. A central bank that consistently does what it says will acquire credibility by this definition almost regardless of the institutional structure.”

(Blinder, 1998: 64)

### 2.4.1. Exploratory Data Analysis

Visual inspection of the indicator variable and the policy rate at subsequent meetings (Figure 2.1) provides the first indications of the consistency of the SARB’s communication. The shaded band highlights the values between -1 and 1 (as read off the secondary axis).

Figure 2.1 Consistency: The indicator variable and policy rate



*Note: The grey line represents the repo rate at t+3, and the black line represents the index. The shaded area highlights the area between -1 and 1, where the communications are not suggesting an imminent adjustment of monetary policy.*

*Source: SARB (repo rate), Own construction (index)*

The grey line depicting the repo rate at time  $t+3$ <sup>9</sup>, i.e. three months after the index value (measured on the primary axis), shows the actual monetary policy decisions over this period. For a central bank to influence market expectations about future policy adjustments, its communication should lead the policy adjustment.

It is important to recognise that central bank communication that merits an index value of 1 or -1, even if it never becomes 2 or -2, is a valuable part of the monetary policy toolkit, acting as a credible threat, if used consistently. Index fluctuations between 1 and 0 in 2000-2001 could simply reflect uncertainty, or learning by a then newly constituted MPC. However, if this kind of communication is understood by the SARB's audience to be consistent, credible, and conditional on the state of the economy, it could be used to manage inflation expectations. It would thereby contribute to price stability without requiring an actual monetary policy change – policy change which could impose other costs on the economy.

<sup>9</sup> The choice to illustrate the repo rate at time t+3 is ad hoc and simply shifts the repo rate line backwards by three months to show that the SARB's communication does precede the actual changes in the repo rate. The SARB's communication will precede the actual repo rate moves by varying horizons with respect to different MPC decisions and the choice to depict the repo rate at t+3 does not impact materially on our interpretation of figure 2.1.

Table 2.2 Transition matrix (2000-2009)

Index in Period t	Repo rate change Period t+1							
		Cut	Unchanged	Rise	Total	p(decline)*	p(unchanged)*	p(rise)*
-2		3	1	0	4	75.0	25.0	0.0
-1		2	1	0	3	66.7	33.3	0.0
0		6	14	1	21	28.6	66.7	4.8
1		2	12	4	18	11.1	66.7	22.2
2		0	5	10	15	0.0	33.3	66.7
					61			

Note: \*p (decline/unchanged/rise) means the sample probability of decline/unchanged/rise in the repo rate given the index value in each row.

Transition matrices (Tables 2.2 and 2.3) provide a more systematic way of evaluating this data to investigate the consistency of the SARB's communication. The monetary policy inclination communicated by the SARB is read horizontally in rows, and the actual monetary policy that transpired is read vertically in columns. Table 2.2 assesses the period 2000-2009, whereas Table 2.3 evaluates only 2004-2009<sup>10</sup>. An investigation of a period starting a few years after the adoption of inflation targeting (2004 in this case) allows us to compare the full sample with the sample excluding the first four years, and thereby to test the theory that the communication within the inflation targeting framework of the SARB became more consistent as the framework matured.

In these tables, we interpret consistency as follows:

1. Strong consistency: the MPC adjusts the repo rate at its next meeting in a manner consistent with the index value, e.g. a +2 index value is followed by an interest rate rise and a -2 index value is followed by an interest rate cut.

<sup>10</sup> In addition, a transition matrix was created which included only MPC decisions where the committee *knew* that inflation was outside of the target range (i.e. the date on which the CPIX data was *released* was considered to allow for a lag with regard to data availability). In other words, all the data points where inflation was within the target range were removed from the full dataset. The results do not differ materially from those in the full sample. Communication of a 2 and 1 became 100% consistent and -2 became 90% consistent, whereas communication of a 0 and 1 revealed slightly more hawkish communication than the full sample.



2. Mild inconsistency: the MPC adjusts the repo rate at its next meeting even though the index value had shown only a risk of policy adjustment (e.g. +1 or -1) and not an imminent policy adjustment.
3. Strong inconsistency: the MPC adjusts the repo rate at its next meeting in a direction inconsistent with the present index value, e.g. cutting the repo rate following a meeting where the index value was +2.

From the first row in Table 2.2 it emerges that an index value of -2 was followed by a repo rate cut at the subsequent MPC meeting in three-quarters of the cases, while the repo rate remained unchanged in a quarter of cases. The latter is a mild form of inconsistency, in that the repo rate remained unchanged (the rate adjustment was not imminent). Communication with a value of 2 likewise achieved a high degree of consistency, with a repo rate rise following two-thirds of the cases where such a value is recorded. There was no evidence of strong inconsistency for index values of +2. An index value of zero (the value most frequently observed) was followed by a constant repo rate in two-thirds of the cases, and it is notable that of the seven interest rate adjustments that did follow an index value of zero, six were interest rate cuts. There were only three instances of a -1 index value, and in two of these cases the MPC cut the repo rate at subsequent meetings, keeping the repo rate constant in the third case. These cases present no evidence of strong inconsistency.

By contrast, an index value of 1 (the second most frequent index value) was followed by an unchanged repo rate in two-thirds of the cases, possibly capturing a baseline (or neutral) communication from the SARB, which warns against inflationary risks even when they are not imminent. This would certainly be a reasonable baseline for an inflation-targeting central bank, but it does mean that an index value of +1 should be interpreted as indicating a neutral stance with respect to the expected interest rate path. On two occasions (12 June 2003 and 12 August 2004), a value of 1 was followed by a cut in the repo rate, which indicates strong inconsistency. However, the first of these two can be explained by a correction of the miscalculated inflation figures by Stats SA, rather than by inconsistent communication from the SARB. The event on the 12 August 2004 is evaluated in further detail in section 4.2.

We can test formally whether there is any relationship between the index values in the rows and the subsequent interest rate decisions in the columns of Table 2.2, using the Pearson test

statistic. The null hypothesis in this procedure is *independence*, i.e. no relationship between the rows and columns, compared with an alternative of *dependence*. Rejecting the null hypothesis is evidence that the index value is associated in a significant manner with particular outcomes for subsequent interest rate decisions. The Pearson test statistic for Table 2.2 is 32.13, which is larger than the critical value of the appropriate chi-squared distribution with 8 degrees of freedom, even at significance levels as exacting as one-tenth of a percent. While these results suggest that there is a relationship between the index and subsequent interest rate decisions, it does not reveal the nature of that relationship, a question to which we return with appropriate techniques, below.

Table 2.3 Transition matrix (2004-2009)

Starting in 2004	Repo rate change Period t+1							
		Cut	Unchanged	Rise	Total	p(decline)*	p(unchanged)*	p(rise)*
Index in Period t	-2	2	1	0	3	66.7	33.3	0.0
	-1	1	1	0	2	50.0	50.0	0.0
	0	3	8	0	11	27.3	72.7	0.0
	1	1	5	3	9	11.1	55.6	33.3
	2	0	3	7	10	0.0	30.0	70.0
					35			

Note: \*p (decline/unchanged/rise) means the sample probability of decline/unchanged/rise in the repo rate given the index value in each row.

The data in Table 2.3, representing the results for the period 2004 to 2009, is very similar to the full sample, with only a few exceptions. Communications awarded an index value of -2 or -1 were a little less likely to be followed by an easing of monetary policy than for the full period, and communications awarded an index value of 2 or 1 were slightly more likely to be followed by a tightening of the repo rate. Communications awarded an index value of 0 were more likely to be consistent (followed by unchanged monetary policy) and never to be followed by monetary policy tightening. Repeating the Pearson test for independence in Table 2.3 yields a test statistic of 20.43, which rejects the null hypothesis of independence very comfortably at a 1% level of significance.

#### 2.4.1.1. Inflation surprises versus policy confusion

Buliř, Šmidková, Kotlán and Navrátil (2008: 9) make an important distinction between “inflation surprises” and “policy confusion”. They recognise that a central bank’s deeds can turn out differently from its prior words for two reasons: One possibility is that the central bank did communicate clearly, but that the macroeconomic environment subsequently changed in such a way that the Bank understandably had to depart from the policy direction communicated previously. Buliř et al. call such cases, “inflation surprises”. Another possibility is that inconsistency between prior communication and subsequent policy might reflect poor communication by the central bank, so creating what Buliř et al. (2008) call “policy confusion”. Careful study of the circumstances behind each apparently surprising decision is required to distinguish between these two cases.

Table 2.4 identifies occasions on which analysts and financial markets were surprised. The first two columns show the dates and interest rate decisions that were to some extent controversial. In the third column (“Reuters surprise”), the difference between the median of the Reuters Econometer forecast<sup>11</sup> for the repo rate and the actual subsequent monetary policy decision identifies when and in which direction the analysts were surprised. The fourth column identifies policy announcement dates on which the change in the Banker’s Acceptance rate (BA rate) moved more than 0.25%. This was indicator of a market surprise, and the threshold change of 0.25% was calibrated to identify days on which the markets were substantially surprised. Using media reports together with speeches, media releases, Monetary Policy Reviews and Quarterly Bulletins published on the SARB’s website to contextualise these surprises, potentially allows us to distinguish between inflation surprises and policy confusion.

The fifth column of Table 2.4 shows the monetary policy inclination index for each of these decisions (the index value assigned at the previous meeting reflecting the policy inclination relevant to each decision). This column will help us to distinguish between “inflation surprises” (i.e. unanticipated changes in the economy) and potential “policy confusion” (i.e. policy surprises attributable to inefficient communication, as opposed to economic shocks).

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<sup>11</sup> A survey by Reuters of forecasts made by a panel of professional economists.

The final column identifies those interest rate decisions that could be classified as instances of potential “policy confusion” based on this method. It should be noted, however, that this column is likely to overstate the instance of policy confusion (it is an upper bound) as the index is based on the monetary policy report alone, and disregards the other mechanisms by which the SARB communicates with the public. Consequently we investigated each instance of potential ‘policy confusion’ by studying speeches, media releases, monetary policy reviews and Quarterly bulletins that were available on the SARB’s website prior to each of these meetings, to discover any communication that might have prepared the public for the subsequent MPC decision. Such communication might reveal that the economic environment had changed, or that the SARB was evaluating it differently. Finally, numerous media reports were evaluated following each case of potential policy confusion to assess whether the media anticipated (for example from communication not published on the SARB’s site) the changed stance of the SARB.

Of the twenty interest rate surprises shown in Table 2.4, seven were identified as instances of potential “policy confusion” (marked with an X), and three of these are readily explicable, as shown below: the unexpected reduction of the repo rate in September 2001 both surprised the markets and was not anticipated by the index, but should be classified as an inflation surprise due to a technical adjustment of the repo rate<sup>12</sup> and the September 11 attacks on the World Trade centre, just prior to the policy decision. The June 2003 policy decision (which wrong-footed the markets and the index) was also an inflation surprise, because Statistics South Africa (Stats SA) acknowledged on 26 May 2003 that inflation statistics had been overstated for some time, resulting in a clamour for immediate repo rate adjustments (Loxton, 2003). Finally, the surprise decision in September 2003 was made at an unscheduled meeting of the MPC, following the rapid change in the economic environment, which implicitly suggests that this was an inflation surprise<sup>13</sup>.

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<sup>12</sup> The technical adjustment of the repo rate on 5 September 2001 was aimed at improving the functioning of the money market in South Africa (SARB, 2001) and should therefore not be seen as an adjustment of the policy stance.

<sup>13</sup> The international context for these surprises should not be forgotten: During the period from late 2001 until 2005 the Federal Reserve Board in the USA kept its policy interest rate (the Federal Funds Rate) at a markedly lower level than would have been suggested by an application of the Taylor rule – that had hitherto correlated closely with the Fed’s policy stance (Taylor, 2009). While there is no suggestion of a simple relationship between interest rates in the USA (or elsewhere) and the repo rate in South Africa, the SARB had to weigh up the unusually large spread between local and international interest rates against the concomitant effects on capital flows and the exchange rate of its policy decisions during this period.

Table 2.4 Inflation surprises vs. policy confusion

Date	Interest rate decision	Reuters surprise	Change in BA rate	Index	Confusion
2001/06/14	-100bp	#N/A	-0.82	0	X
2001/09/20	-50bp	#N/A	-0.4	0	X*
2002/01/15	+100bp	#N/A	0.45	1	
2002/09/12	+100bp	#N/A	0.37	2	
2003/06/12	-150bp	#N/A	-0.6	1	X*
2003/09/10	-100bp	#N/A	-0.32	0	X*
2003/10/16	-150bp	#N/A	-0.61	-2	
2003/12/11	-50bp	#N/A	0.35	-1	
2004/08/12	-50bp	#N/A	-0.66	1	X
2005/04/14	-50bp	-0.5	-0.57	0	X
2006/06/08	+50bp	0.5	0.38	1	
2006/10/12	+50bp	-0.5	0.04	2	
2007/02/15	0	0	-0.29	2	X
2007/10/11	+50bp	0.5	0.253	2	
2008/04/10	+50bp	0.5	0.237	1	
2008/06/12	+50bp	-0.5	-0.384	1	
2009/02/05	-100bp	0	-0.412	0	
2009/03/24	-100bp	-1	-0.1	-1	
2009/04/30	-100bp	1	-0.232	-2	
2009/06/25	0	0.5	0.201	-2	

*Note: The Reuters panel did not forecast the repo rate at the beginning of the period; hence, the N/A values in the first column. In columns 3 and 4, x's are used to identify dates on which each of the variables measured a surprise, and the (+) or (-) indicates the direction of the surprise. The \*'s in the final column identify the decisions which are readily explainable and can therefore be classified as inflation surprises rather than policy confusion.*

We are left with four instances of potential “policy confusion” out of 20 interest rate surprises and more than 60 policy meetings. The evidence for an “inflation surprise” will now be considered for each of these: Starting with the decision of 14 June 2001, where the MPC surprisingly cut the repo rate by 100bp. The degree of surprise can be read in the associated 82bp decline of the BA rate. The SARB released one speech by Governor Mboweni (on 14 May 2001) and 4 press releases in the interval between this meeting and its immediate predecessor. The press releases contained no information regarding the inflation outlook, and while the Governor’s speech, entitled “Volatility of the currency and its impact on monetary policy” touched on domestic economic developments it gave no indication of a change to the inflation outlook. In fact, the concluding comments encouraged the audience to „sit tight, grit

our teeth and suffer in silence’, and ‘inflation is coming down slowly but surely. Further evidence that the public had not been prepared for the interest rate change can be seen in the media’s response, e.g. Business Day (15 June 2001) wrote that “Mboweni’s pre-emptive strike caught even the most optimistic by surprise...”

On the 12<sup>th</sup> of August 2004 the MPC cut the repo rate by 50bp, which surprised the market to the extent that the BA rate decline by 66bp. The monetary policy inclination index stood at 1 following the preceding MPC meeting. Of the five media releases by the SARB in the interval none were relevant for the inflation outlook. Nor did the Quarterly Economic Review section of the SARB’s Quarterly Bulletin (released on 24 June 2004) suggest a change in the inflation outlook. Governor Mboweni gave three speeches in the interval, on the 22<sup>nd</sup> and 27<sup>th</sup> of July and the 5<sup>th</sup> of August respectively. The former contained a general discussion of factors impinging on inflation (both positively and negatively) as well as suggesting that inflation might breach the upper bound of the target temporarily, but nothing suggested an improvement in the inflation outlook that would justify an easing of policy. The remaining two speeches did not concern domestic economic developments. Finally, the media was taken completely off guard by the MPC’s decision, for example Business Day’s headline on 13 August 2004 read “Markets rocked by Mboweni’s rates shock” and they referred to the previous meeting where the Governor had “...signalled at the time that the rate-cutting cycle had ended, saying ‘the party was over’”. SARB Press releases, speeches or other communications accessible to the media did not therefore prepare the public for the policy decision of 12 August 2004.

The circumstances surrounding the policy decision of 12 August 2004 were further clouded by the arrival of a delegation of trade union representatives and management from the Chamber of Mines at the SARB on the final day of the MP meeting. Their purpose was to hand a memorandum to the Governor “demanding immediate steps to weaken the currency’s value” (Phasiwe, 2004). Interrupting an MPC meeting to meet with a delegation intending to pressurise the committee was, with the benefit of hindsight, probably an error of judgment. It was doubly regrettable since the MPC surprised the markets by lowering the repo rate at that meeting (Laubscher, 2009). The confluence of a surprising repo rate reduction with an inappropriate accommodation of interest groups pressurising for just such a decision might have undermined the perceived independence of the SARB.

On the 14<sup>th</sup> of April 2005 the MPC cut the repo rate by 50bp, which caused a market surprise that pushed the BA rate down by 57bp and was 50bp below the expectations summarised in the Reuters Econometer. While the December 2004 SARB Quarterly Bulletin referred to moderating inflation it also mentioned firm economic growth, giving no clear indication of a change in the assessment on the domestic outlook. Certainly, the media did not anticipate the policy adjustment, with the Business Day observing that "... last week's statement has had analysts reading between and beneath the lines in an attempt to puzzle out what really motivated the committee."

On the 15<sup>th</sup> of February 2007 the MPC kept the repo rate constant, in line with the expectations summarised by the Reuters Econometer, but not in line market expectations where the surprise could be read in the associated 29bp BA rate decline. The monetary policy inclination index stood at plus 2, suggesting an imminent rate rise. In the interval between this meeting and its predecessor the SARB released a Quarterly Bulletin which referred to a „robust economy’ where „domestic expenditure continued on its robust expansion path’, wages were edging higher and CPIX that had „picked up significantly’ although it „remained well within the target area’. While this description of the economy does not itself suggest an imminent rate rise, it does not contradict the preceding monetary policy statement where that intention was more clearly flagged. In this instance the press was not as sharply critical of the MPC’s decision, though they did not report any prior information that suggested circumstances or their analysis thereof had changed since the previous meeting.

In summary, the evidence suggests that on four occasions (June 2001, August 2004, April 2005 and October 2007) the MPC’s decisions were surprising for reasons not easily attributable to changing economic circumstances<sup>14</sup>, at least not as communicated by the SARB to the public in any of the platforms analysed here. Given that the method used in this chapter is likely to overstate the number of interest rate surprises, the evidence suggests that the SARB has communicated its intentions about the future direction of policy with considerable success over the period studied.

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<sup>14</sup> Mention should also be made of the case of June 2006: although our method does not identify it as potential policy confusion. The media lamented the lack of transparency surrounding the monetary policy decision, claiming that despite warnings of a possible rate hike by the Governor of the South African Reserve Bank, the available data and the Reserve Bank’s communication had not convinced the market that the threat was credible (Business Day, 2006b). Although our index did reflect that the SARB had communicated the possibility of a rise in the future (an index value of 1), the Reuters Econometer was surprised by 0.5 and the BA rate by 0.38, reflecting that they had not believed the rise was imminent.

#### 2.4.1.2. Turning points

Some of the most challenging policy decisions which the MPC has had to communicate were the turning points of the policy cycles - 14 June 2001, 15 January 2002, 12 June 2003, 8 June 2006 and 11 December 2008. The second and third turning points (15 January 2002 and 12 June 2003) coincided with inflation surprises discussed in the previous section, so it is inappropriate to assign these to poor communication. However, the first turning point (14 June 2001) was clearly a substantial surprise to financial markets and was not predicted by the index (see Table 2.4). The fourth (8 June 2006) surprised the Reuters panel, financial markets, and elicited media criticism (Business Day, 2006b). In this case, the index corresponding to this policy decision was 1, also indicating mild inconsistency. The final turning point (11 December 2008) is interesting in that it did not surprise the Reuters panel or financial markets much (it is therefore not identified in Table 2.4), but the index did not predict the turning point at all (the index value was 0). In summary, the SARB has found it much more difficult to communicate likely turning points in the interest rate cycle, an unsurprising result given the inherent difficulty of the decisions involved.

#### 2.4.2. Regression analysis

In this section, the approach of Rosa and Verga (2007) is adopted to begin a process of describing the information content of the index. Firstly, the change in the SARB's instrument rate (the repo rate) is regressed on the index variable, while controlling for the technical adjustment of September 2001 with a dummy variable.

$$(\text{Repot}+m - \text{Repot}) = \alpha + \beta_1 \text{Index} + \beta_2 \text{Tech\_adjt} + \epsilon_t \quad \dots (2.1)$$

The results of the regressions for  $m=1$  to  $m = 6$  (i.e. the change in the repo rate between time  $t$  and the repo rates one, two, three, four, five and six months later) are presented in Table 2.5. The estimates for the coefficient on the variable "index" should provide an indication of the relationship between the change in the actual repo rate and the index value, or the amount of information provided by the index on future monetary policy decisions.



Table 2.5 OLS regression results

	m=1	m=2	m=3	m=4	m=5	m=6
<b>Constant</b>	-0.021	-0.257***	-0.458***	-0.604***	-0.743***	-0.819***
<b>Index</b>	0.010	0.271***	0.444***	0.570***	0.723***	0.814***
<b>Tech_adj</b>	0.010	-0.014	0.015	1.034***	1.020***	2.005***
<b>R-squared</b>	0.006	0.351	0.330	0.351	0.348	0.328
<b>Observations</b>	58	58	58	58	58	58

*Note: OLS regressions at various horizons, using the index and a dummy variable for the technical adjustment as explanatory variables. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* signify that a variable is significant at the 1%, 5% and 10% levels.*

The weak results for m=1 can be explained by the fact that most of the MPC meetings took place every second month, so there is very little movement in the dependent variable at t+1 (one month after the statement). From m=2 to m=6, the coefficient estimates of the index are positive and significant (increasing in size as the horizon lengthens), and the R-squared is between 0.328 and 0.351, which suggests that the index does indeed have informational content<sup>15</sup>.

The coefficient on the index suggests that a statement which signalled an imminent monetary policy tightening (an index value of 2) was on average followed by 50 and 100 basis point increases in the repo rate within the following two and four months respectively. These coefficients are larger in magnitude than those estimated by Rosa and Verga (2007) for the ECB, which is unsurprising as the monetary policy adjustments by the SARB (in the context of an emerging market economy) are usually greater than those of the ECB. In line with the results of Rosa and Verga (2007), the constant was negative and significant at all horizons, which could reflect that the communication tended to emphasise greater inflation risk (tendency toward monetary policy tightening) than what usually materialised.

As a robustness check, the regressions were estimated with alternative index values independently scored by Reid prior to consultation with Du Plessis. These results (shown in Table A2.2 in Appendix 2.2) do not differ substantially from the combined index<sup>16</sup>.

<sup>15</sup> The regressions were estimated with alternative index values independently scored by the first author prior to consultation with the second author. These results (shown in appendix 2.2) do not differ substantially from the combined index, which suggests that the results are robust despite the subjective nature of the index.

<sup>16</sup> As with the transition matrix, this regression was re-run including only points where inflation was outside the target range. The results were similar, but a little stronger.

Secondly, OLS regressions using dummy variables for each of the five possible index values, rather than a continuous variable “index”, were estimated to determine whether the values of the index displayed a cardinal or ordinal relationship. This will provide insight into how this index can be used appropriately in further studies. Again, the technical adjustment of September 2001 was controlled for by including a dummy variable.

$$(\text{Repot}+m - \text{Repot}) = \beta_1 D_{-2} + \beta_2 D_{-1} + \beta_3 D_0 + \beta_4 D_1 + \beta_5 D_2 + \beta_6 \text{Tech\_adjt} + \epsilon_t$$

... (2.2)

Table 2.6 OLS regression results (using dummy variables)

	m=1	m=2	m=3	m=4	m=5	m=6
<b>D -2,t</b>	0	-1.50***(NA)	-1.50***(NA)	-2.00***(NA)	-2.00***(NA)	-2.00***(NA)
<b>D -1,t</b>	0	-0.50**	-0.83	-1.17	-1.17	-1.17
<b>D 0,t</b>	-0.04	-0.20*	-0.45***	-0.62**	-0.86***	-0.95***
<b>D 1,t</b>	0	0.03	-0.03	0.06	0.06	-0.03
<b>D 2,t</b>	0	0.23***	0.43***	0.47***	0.70***	0.90***
<b>Tech_adj</b>	0	-0.03	0.03	0.94***	0.94***	2.03***
<b>R-squared</b>	0.02	0.41	0.33	0.36	0.36	0.34
<b>Observations</b>	58	58	58	58	58	58

*Note: OLS regressions at various horizons, using dummy variables for each of the index values and a dummy variable for the technical adjustment, as explanatory variables. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* indicate that a variable is significant at the 1%, 5% and 10% levels.*

Again, m=1 is uninformative due to the fact that most of the MPC meetings are two months apart. The regression outputs show that the coefficients on three of the index values (-2, 0, 2) are significant, suggesting that these values of the index contain fairly reliable information. The signs of the coefficients on the dummy variable for index values -2 and 2 are as expected, but the coefficient for the index value 0 is negative and significant (although much smaller than the coefficients for -1 and -2). This supports the interpretation following the regression using the continuous variable “index”, that communications have a slight bias towards overstating the inflation risk.

Wald tests were used to determine whether the index was ordinal or cardinal in nature (whether a 2 (-2) reflects double the upward (downward) inflation risk that a 1 (-1) does).

The Wald test null hypothesis that  $\beta_1 - \beta_2 = \beta_2 - \beta_3$ ,

$$\beta_2 - \beta_3 = \beta_3 - \beta_4,$$

$$\beta_3 - \beta_4 = \beta_4 - \beta_5 \quad \dots (2.3)$$

was firmly rejected at all horizons, suggesting that the relationship between the coefficients (different values of the index) is ordinal, but not cardinal.

This outcome and the fact that the index comprises discrete outcomes motivated the use of an ordered probit model to further test the robustness of the results. Due to the previous conclusion that the index values have an ordinal rather than cardinal relationship, this ordered probit contained the dummy variables for each index value, and the technical adjustment, as regressors.

The dependent variable in the OLS regression was the interest rate change over fixed calendar periods (2 months, 3 months, etc.). In contrast, the dependent variable in the ordered probit model is interest rate change between successive meetings, with these meetings spaced irregularly over the calendar. The consistent results for the two models show, however, that our inference does not depend on either of the two expressions for changes to the interest rate path.

The ordered probit results were then used to investigate the number of type I and II errors that arose from the regression model.

Table 2.7 Predictive ability of the ordered probit model

Index prediction	True positives	False positives	True negatives	False negatives
Interest rate decline	5 (71.4%)	2 (28.6%)	46 (83.6%)	9 (16.4%)
Unchanged	26 (65%)	14 (35%)	15 (68.2%)	7 (31.8%)
Interest rate rise	10 (66.7%)	5 (33.3%)	42 (89.4%)	5 (10.6%)

Table 2.7 summarises the predictive ability of the ordered probit model based on the index values described above. There are three rows in the table, each of which considers potential type I and II errors by the model with respect to the following predictions: an interest rate

decline (in row 1), an unchanged interest rate (row 2) and an interest rate rise (row 3). The first two data columns show the proportion of true and false positives, e.g. in 71.4% of the cases where the model predicted an interest rate cut, an actual interest rate cut followed at the subsequent meeting. In two-thirds of the cases where the model predicted an interest rate rise, the MPC raised the repo rate at the subsequent meeting. The second column provides an empirical estimate of the model's type I forecasting error, and the highest type I error is 35% for the "unchanged" signal.

The final two data columns show the proportion of true and false negatives, e.g. in 83% of the cases where the model suggested there would not be an interest rate cut, the MPC did not reduce the repo rate at their next meeting, and in 89.4% of the cases where the model suggested there would not be an interest rate rise, the MPC followed suit. The final column is, therefore, an empirical estimate of the model's type II prediction error for the three relevant categories. It is encouraging that the type II error never rises above 32%.

Finally, it is notable that the type I and II errors are both highest for the model's ability to predict no change in the repo rate. An index value of zero should therefore be interpreted as indicating (i) that the MPC did not communicate a likely future change in the policy stance and (ii) uncertainty about the likely future policy direction. Positive signals, whether indicating a likely rise or decline in the repo rate, seem to have been communicated with greater accuracy.

## 2.5. Conclusion

Communication is widely recognised as a valuable tool for the implementation of modern monetary policy, but research has tended to focus more on the effects of the *actions* of central banks, rather than their *communication*. A numerical index was constructed to reflect the monetary policy inclination communicated by the SARB's MPC statements. This index was applied in a number of ways to investigate the nature and success of the communication of the SARB. Exploratory data analysis and formal econometric tests revealed commendable consistency in the communication contained in the MPC statements, which was supported by more formal regression analyses. Our evidence suggests that the MPC has succeeded in signalling its likely future policy decisions with admirable consistency over this period.

## Appendix 2.1: Monetary policy inclination index

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Hermeneutic theory and textual analysis emphasise that communication is subjective, language is dynamic in nature, and the success of communication depends jointly on the content of the message sent and its interpretation by the receiver (Rosa and Verga, 2007). Following this argument, the researchers in this study examined *what* was said in the monetary policy statements, *how* it was said, as well as its context. A scorecard such as that illustrated by Table A2.1 was used to evaluate each monetary policy statement systematically. For example, a phrase such as „the inflation outlook has deteriorated further’ would have been viewed by the researchers as informative and would therefore have been noted in the final column of the table. This phrase may have indicated that the MPC was concerned about the inflation trend, but it revealed little about the degree of the concern or whether an adjustment of the repo rate was imminent. In order to interpret this statement it was useful to consider other factors such as previous warnings about the level of inflation, its level relative to the inflation target, past experience of the SARB’s inflation aversion and the state of the economy at the time. Similarly, the conspicuous absence of reference to a factor that had previously been emphasised could have contained information that the risk posed by the variable had decreased.

It was also important to recognise that the communication of the SARB developed over time as the inflation targeting regime matured. The introduction of terms or phrases (such as „balance of risks’ in December 2006), which have accepted meanings in the communication of the Federal Reserve Bank or the European Central Bank, deserved special attention.

In addition to individual elements of the statement such as these described above, the final section of the monetary policy statement, titled *the monetary policy stance*, was viewed as crucial. This section acted as a summary and conclusion of the monetary policy statement and often provided insight into the relative weights given to competing considerations raised in the body of the statement.

Table A2.1 is an example of the scorecard used to evaluate each monetary policy statement before assigning it an index value. Statements were identified by the date of the MPC statement, as recorded in the first column. In the final column notes were made by the

researcher while reading the statement. These notes could then be reconsidered at the end before assigning a score in the second column. The third column contains the final score agreed upon by the two researchers after comparison of their separate evaluations.

Table A2.1: Scorecard, 20 March 2003

Date	Score	Final score	MPC	Reasons
20-Mar-03	1	1	0	Inflation outlook has improved further
				This is confirmed by slowdown in the prices of production goods, recent recovery of the rand and lower rate of increase in food prices.
				Other factors pointing to an improvement:
				- recovery of the exchange rate
				- slowdown in food price increases
				- slower momentum in the growth of money supply
				- continued moderate growth in bank credit extension
				- excess production capacity
				- surplus on the current account
				- continued fiscal discipline
				CPIX retraced only moderately, but are still at high levels and leave little room for complacency.
				Considerable risks still exist:
				- high rate of increase in the avg nominal remuneration per worker
				- slowdown in labour productivity growth
				- few signs that administered prices are tapering off

## Appendix 2.2: OLS regression results (Reid)

Table A2.2: OLS regression results (Reid)

	M=1	M=2	M=3	M=4	M=5	M=6
<b>Const</b>	-0.020	-0.225**	-0.398***	-0.523***	-0.632***	-0.684***
<b>Index</b>	0.010	0.259***	0.410***	0.522***	0.649***	0.717***
<b>Tech_adj</b>	0.020	0.225**	0.398***	0.152***	1.632***	2.684***
<b>R-squared</b>	0.007	0.427	0.378	0.391	0.374	0.338
<b>Observations</b>	58	58	58	58	58	58

*Note: OLS regressions at various horizons, using Reid's index and a dummy variable for the Tech\_adj(technical adjustment), as regressors. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* represent that a variable is significant at the 1%, 5% and 10% levels.*

### **3. TALKING TO THE INATTENTIVE PUBLIC: HOW THE MEDIA TRANSLATES THE RESERVE BANK'S COMMUNICATIONS**

#### 3.1. Introduction

Private sector inflation expectations are critical to successful monetary policy. Developments discussed in the first two chapters of this dissertation have placed the expectations channel of the monetary policy transmission mechanism and communication as a monetary policy tool, at the centre of mainstream monetary economics theory and practice. The academic literature concerning central bank communication has flourished over the past two decades (Blinder et al., 2008). However, most of this research has focused solely on the central banks' communication with financial markets.

In practice, central banks' audiences are heterogeneous and are not all equally attentive to central bank policies, a fact that central banks should bear in mind when designing communication strategies. It is impractical to incorporate the full range of this heterogeneity within a single economic model, but it is possible to identify broad groups with similar characteristics. Blinder and Wyplosz (2004) divide the central bank's audience into two groups: the broad public and its political representatives (general public) on the one side, and the financial markets on the other. Cukierman (2007) proposes that the general public will be rationally inattentive to short-term fluctuations of inflation if the central bank is credible. The concept of rational inattention is more common in the fields of behavioural economics and the economics of information, from which this chapter will draw. However, recent application of rational inattention to the modelling of the Phillips curve has offered valuable insights (including Mankiw and Reis, 2001a, 2001b, 2006, 2007; Carroll, 2001, 2003; Sims, 2003, 2005, 2010).

The communication tools used by the SARB to promote transparency about monetary policy include the monetary policy statements, monetary policy forums, the publication of monetary policy reviews and quarterly bulletins, occasional press releases, speeches by the governor, and the presentation of a report at least three times a year to the parliamentary portfolio committee on finance (SARB, 2006). However, very few members of the general public are ever exposed to these forms of communication directly. Most monetary policy



communication with the general public is transmitted via the media, and this chapter will focus on evaluating the role the South African media plays as part of the expectations channel of the transmission mechanism. The chapter's policy relevance lies in identifying factors that affect the manner in which the original communication of the SARB is transformed into news (as James Hamilton (2004) describes it) and demonstrating how the SARB can influence these to improve the effectiveness of its communication with the rationally inattentive public. This study will focus on communication via a particular segment of the printed press (newspapers), and draws on existing research in the fields of political science, communications and economics.

The results reveal notable shortcomings in the evaluation and reporting of monetary policy by the South African media. They are not adequately fulfilling their role of digesting monetary policy information and thereby promoting transparency or holding the SARB accountable to the public. This in turn inhibits the successful use of the expectations channel of the transmission mechanism, which inflation targeting is designed to employ.

### 3.2. Monetary policy communication via the media with the rationally inattentive public

In the broadest practical sense, the objective of central bank communication should be, firstly, for the message to *reach* its audience and, secondly, for its message to be *perceived* as trustworthy. If central bank communication is successful in reaching its audience, it has created the opportunity to earn a reputation for credibility through its decisions and behaviour and to manage inflation expectations in the interests of improving the effectiveness of monetary policy. The challenge is that the extent of the media's coverage of monetary policy and the manner in which the message of the central bank is interpreted and conveyed to the public are the result of a number of interacting influences and are only very loosely influenced by the central bank.

In order for a central bank to communicate effectively with the rationally inattentive public, it needs to understand the characteristics and incentives of the media that transmit the central bank communication to the general public, the professional economists quoted in the media, as well as the characteristics of the rationally inattentive audience itself. The recognition that

the success of the central bank's communication depends at least partially on the actions of the media, professional economists and the rationally inattentive audience highlights the strategic nature of the interaction between the central bank and its audience (Schotter, 2001; Shelling, 1960).

An understanding of the incentives facing each of the participants is essential to influence the outcome of these interactions (the news reports). We begin this study with the „news’, which is the outcome of this strategic interaction, our objective being to improve our understanding of the process that produces it.

### *3.2.1. The sender's (SARB's) incentives*

Della Vigna and Gentzkow (2009:4) define persuasive communication as “a message provided by one agent (a sender) with at least a potential interest in changing the behaviour of another agent (a receiver).” They argue that the supply of persuasive information is endogenous and is determined by both senders' incentives to distort the information and their offsetting incentives to provide accurate information in order to build a reputation. For example, the editor of a newspaper may favour a certain political bias in his or her newspaper in order to earn political favour (he or she may have an incentive to distort the information). Alternatively, the editor may be targeting a group of receivers that place great value on the accuracy of the reporting, providing an incentive for the editor to build a reputation for accurate and impartial reporting.

Similarly, the use of central bank communication in modern monetary policy implementation is precisely aimed at persuading the public to behave in a manner that promotes the central bank's objectives. Central banks face incentives to build a reputation of being credible. According to Blinder (2000), both central bankers and academic economists report that they view credibility as very important to a central bank. Blinder conducted a survey of academic economists and central bankers, in which he explored why these two groups believed credibility was important to a central bank and how they believed it could be built<sup>17</sup>.

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<sup>17</sup> Regarding reasons why credibility is important, respondents were provided with seven potential reasons, which they had to rate along a scale of 1-5, where 1 is „unimportant’ and 5 is „of the utmost importance’. Six of the reasons Blinder listed related to how greater credibility would make the goals of the central bank easier to achieve. The 7<sup>th</sup> reason suggested was that it was the „duty of a central bank to be truthful’.

Although the academic economists and central bankers did not exactly agree on the relative importance of the seven potential reasons provided to explain why they viewed credibility as important for a central bank, they did rate all of them as important (above neutral, 3). Interestingly, both groups of respondents regarded “it is the duty for a central bank to be truthful” as one of the least important reasons for pursuing credibility, although it was still regarded as important (rated above neutral, 3). This suggests that the pursuit of credibility is endogenous and is strongly influenced by strategic incentives.

Both central bankers and academic economists believe that a ‘history of living up to its word’, ‘central bank independence’ and a ‘history of inflation fighting’ are the most important ways to build credibility<sup>18</sup>. Based on these findings, it appears that central banks have a strong incentive to communicate with their audiences in order to build a reputation. They need to demonstrate, over time, that the central bank is independent and trustworthy.

In this chapter, the focus is on the central bank’s communication with a particular segment of its audience – the rationally inattentive general public. The following section explores the characteristics of the general public in order to better understand the incentives they face and to communicate effectively with them.

### *3.2.2. Rationally inattentive general public*

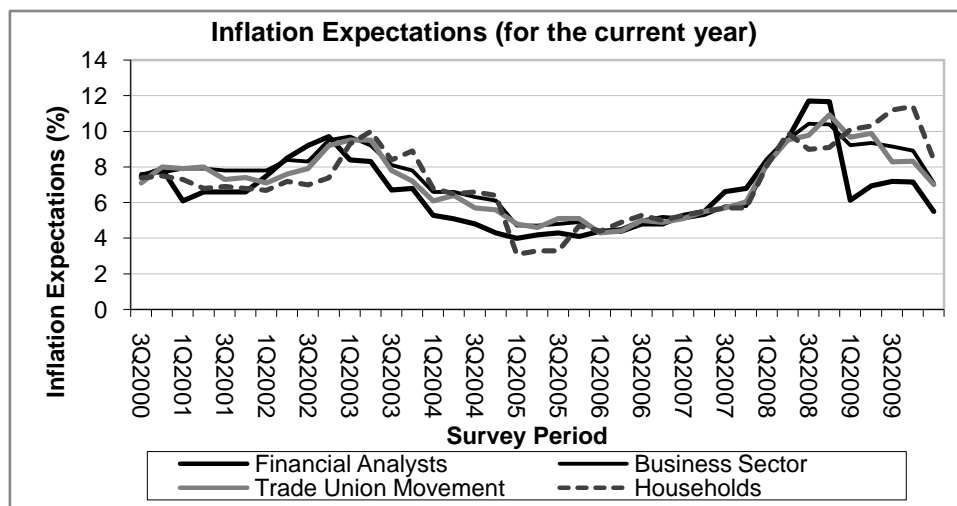
The interaction between central banks and financial markets has been extensively explored in the literature, largely due to the increased focus on the management of private sector inflation expectations and the relative abundance of high frequency, accurate financial market data. However, the financial markets comprise only part (albeit an important part) of a central bank’s audience. In addition, the interaction of the financial market with the central bank will necessarily differ from the rest of the central bank’s audience, owing to the role and nature of its business. It is rational for market participants to pay close attention to the communication of the central bank, making their own judgements about the central bank’s policy primarily from official communication (first-hand versus second-hand communication).

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<sup>18</sup> Both central bankers and academic economists ranked the potential methods of building credibility, provided by Blinder in the survey, in precisely the same order.

In contrast, most of the general public are rationally inattentive to monetary policy, as they have other priorities with regard to their available time and attention. Figure 3.1 illustrates the inflation expectations survey data collected by the Bureau for Economic Research (BER) between the third quarter of 2000 and the first quarter of 2010. The BER surveys four groups of the SARB’s audience separately, which provides important information by revealing discrepancies between these groups. For example, between the beginning of 2006 and mid- to late-2007, the inflation expectations of the four groups were very similar. CPIX (the index targeted by the SARB) was within the target range the majority of the time between mid-2003 and mid-2007, and economic theories and models that considered only the inflation expectations of the financial analysts during this period would have been a fair reflection of the actual inflationary pressures. In contrast, there were large differences between the inflation expectations of the four groups in 2008 and 2009. During these periods of higher inflation, effective communication with the non-financial market part of the SARB’s audience became increasingly valuable in order to contain inflationary pressures. In addition, economic models that do not consider this divergence in inflation expectations between the different groups potentially compromise the quality of the model, which in turn will influence policy decisions.

Figure 3.1: Inflation and inflation expectations



Source: Bureau for Economic Research, inflation expectations surveys, 2000-2010

Both the acquisition and processing of the information concerning monetary policy is costly, and the public will rationally limit the amount of attention they dedicate to the task (Birchler and Büttler, 2007; Della Vigna, 2007). In Della Vigna’s (2007) review of the empirical evidence on psychology and economics (a.k.a. behavioural economics), he offers „limited

attention' as a possible reason for non-standard decision making. He decomposes the actual value of the good,  $U$ , (in this case information communicated by the central bank) into a visible component,  $v$ , and an opaque component,  $o$ :

$$U = v + o \quad \dots (3.1)$$

However, the perceived value of the information,  $\tilde{U}$ , varies depending on the degree of inattention,  $\Theta$ , chosen by the general public:

$$\tilde{U} = v + (1 - \Theta)o \quad \dots (3.2)$$

$\Theta$  is a function of the salience of the information ( $s$ ) and the number of competing stimuli ( $N$ ),  $\Theta = (s, N)$ , which are both influenced by the agenda-setting role of the media (elaborated on in the following section).

Media articles on monetary policy, which also typically report the views of professional economists, simplify both the acquisition and processing of the relevant information. According to Morris and Shin (2002), when decision makers have no private information and are making strategic decisions, even though public information is uncertain or imperfect, more precise information is welfare enhancing. It is reasonable to assume that the general public has very limited private information and that they turn to the media as a source of public information (interpretation of central bank policy and comments from economists). A substantial portion of the adult population of South Africa reports that they read newspapers, so they are likely to be exposed to the communication of the SARB as presented by these newspapers. According to the South African Advertising Research Foundation's All Media and Products Surveys (SAARF AMPS, 2007, 2008, 2009), about 26.5% – 31.5% of South Africa's adult population report reading any AMPS daily newspaper, and about 33% – 35.5% report reading any AMPS weekly newspaper. Given the above description of the rationally inattentive public's media consumption patterns, comprehensive management of a central bank's communication strategy should involve an understanding of the media's role in transmitting and interpreting the central bank's original message.

### 3.2.3. *The role of the media in monetary policy communication*

News is a commodity, the production of which depends on supply and demand (Hamilton, 2004). Della Vigna and Gentzkow (2009) suggest that incentives facing the media depend on both consumer demand and supply-side incentives. Profitable media firms obviously react to consumer demand by aiming to produce a product that consumers will choose to purchase. This could result in media reports with varying levels of objectivity, depending on the target market's demand for accuracy versus entertainment or affiliation. In addition, the firm will face supply-side incentives to distort reporting, such as the personal views of the editor or pressure exerted by politicians and advertisers. The news report is the product of the interaction between these forces of demand and supply. Understanding that the press is not a passive conduit of central bank communication complicates the challenge of communicating with the public. Influenced by various incentives, the media can either aide the central bank by interpreting the central bank's message in such a way that the public understands it, or it can hinder the communication, for example, by pursuing provocative, newsworthy headlines (Filardo and Guinigundo, 2008).

For the central bank's communication to be successful, it must be judged by the media as interesting or important enough to be included as news (it must *reach* the public), and the message must be accepted by the public as appropriate. In order to *reach* the public, the central bank's communication would need to dominate other news and communication competing for the public's attention (N and s from equation 3.2, above). Filardo and Guinigundo (2008) identify the potential for an information paradox to exist in this situation, where the public rationally judges it to be unnecessary to use resources to monitor the decisions and behaviour of a central bank that is credible – especially if this central bank is operating in an economic environment with low and stable inflation. If the public believes that the central bank has both the ability and incentive to control inflation in the medium- to long-term, the inflation expectations of the public are anchored to the inflation target. Under these circumstances, the central bank should experience greater flexibility and require less aggressive adjustments of the monetary policy stance to achieve their goals.

Between the 1930s and 1970s, the prevailing consensus was that the effects of mass communication on the attitudes of those that receive the messages were minimal (Roger, Hart and Dearing, 1997; Scheufele and Tweksbury, 2007). However, when McCombs and Shaw

(1972) changed the research question slightly, from whether media had a direct effect on the audience's attitudes, to whether the media's coverage of an issue influenced how important (or salient) the issue was considered by the audience, their results challenged the mainstream view. This agenda-setting research has expanded and deepened substantially since then, adopting a number of different approaches to answer the question – „Does the media matter?'

This avenue of research has been productively applied to the question of whether the mass media has political influence. In 2007, two influential empirical studies were published to address this issue, one focusing on television and the other on newspaper reports. Della Vigna and Kaplan (2007) used the fact that, for technical reasons, the conservative FOX Media Channel was introduced to only some channel systems in the US before the 2000 presidential elections to set up a natural experiment. Changes in support for the Republican Party could then be compared across areas that had access to Fox News and those that did not. They found that exposure to the conservative news coverage had a significant and sizeable impact, estimating that it persuaded between 3 - 8 percent of its non-Republican voters to vote for the Republican Party. In the other study, Gerber, Karlan and Bergan (2007) set up a field experiment in Washington, three weeks before the 2005 Virginia gubernatorial elections in the USA to measure the effect of newspapers on voting behaviour. They contacted 1800 people and randomly offered 25% of them a free subscription to the Washington Post (biased toward the Democratic presidential candidate) and another 25% of them a subscription to the Washington Times (biased towards the Republican candidate). Using surveys, they were able to investigate how the political opinions of the respondents of the control group and the two treatment groups compared over the three weeks. They found that even exposure of only three weeks to either newspaper increased the chances that the reader would vote (it increased the salience of the election), but that regardless of which paper the people in the treatment groups received, they were more likely to vote for the Democratic candidate, suggesting that the actual information content rather than the slant of the newspapers had a greater influence on readers. Although the results of the two experiments differed slightly regarding the impact of media *bias* on the political opinions of the public, they both showed that exposure to the mass media did have some influence on the political behaviour of the public.

In conclusion, agenda-setting research suggests that „the media does matter' and that it responds to incentives in the production of „news' (it is not a passive conduit of communication). A central bank (the senders) should therefore monitor the role of the media

in transmitting its communication to the general public (the receiver) in order to improve the effectiveness of its monetary policy. Given the technical skills required to understand and evaluate monetary policy, the media are also influenced by the analyses of professional economists. The incentives faced by these professional economists and their influence on the „news’ reports are explored in the following section.

#### 3.2.4. *Professional economists*

Professional economists are extensively quoted in these kinds of media reports. The economists are viewed as specialists, who are able to interpret and evaluate the SARB’s policies. They are also viewed as independent of the SARB, and therefore, their opinion is regarded as a more trustworthy reflection of how these policies influence the private sector.

As third parties in the communication process, professional economists face interesting incentives. Using the inflation expectations surveys of Reuters and the Bureau for Economic Research (BER), Ehlers and Steinbach (2010) recently provided empirical evidence indicating that although the inflation expectations of financial analysts in South Africa cannot be classified as naïve, and they are comparatively more accurate than those of the trade unions and the business sector, they are not formed in a fully rational manner either. Ehlers performed empirical tests that evaluated the extent to which the inflation expectations of the financial analysts were *weakly rational* (unbiased and efficient), *sufficiently rational* (outperform the forecasts of other naïve models) and *strictly rational* (outperform the forecasts of a suite of models). She concluded that on average the inflation expectations of South African financial analysts do not satisfy the conditions for weak rationality (they are unbiased, but inefficient), and tests results for the extent to which they are sufficiently rational are mixed, so they can consequently not be classified as strictly rational either. Since the 1990s, a branch of the literature has investigated the possibility that professional economists could have „strategic’ reasons for making forecasts that are not rational, rather than that they are myopic or lack the skill to forecast more accurately (Ashiya, 2009). These studies suggest that economists face two incentives that are potentially in conflict – an incentive to forecast as accurately as possible and some strategic incentive to bias their forecasts (to pursue their own self-interest).



Some reasons have been proposed to explain this strategic or rational bias. Ito (1990) found that forecasters in the survey he evaluated, which differentiated between forecasters from different industries, were slightly biased towards forecasting movements in the exchange rate that would please their employer most (wishful thinking hypothesis), but did not resolve whether this bias was unintentional or a strategic reaction on the part of the forecasters to incentives they faced. Laster et al. (1999) proposed that forecasters are remunerated or rewarded based on both the accuracy of their forecasts (which will facilitate better internal decision making within the company they work for) as well as the publicity they command for the company. These two objectives could be in conflict, and the weight placed on one goal relative to the other is likely to vary across industries. Despite findings that consensus forecasts are more accurate than almost any individual and the fact that they are readily available to forecasters, many forecasters still regularly provide forecasts relatively far from the consensus. The results of the empirical study by Laster et al. (1999) suggest that industry members, such as banks, which are likely to value accuracy highly, tend to make forecasts in line with the consensus forecast, whereas independent forecasters who are likely to benefit substantially from publicity tended to forecast the outliers. Another potential explanation of rational bias in the forecasts of professional economists is the signalling hypothesis by Ashiya and Doi (2001), which proposes that forecasters who make forecasts that are different to the consensus may be signalling confidence, and conversely, forecasters who are weak are likely to remain close to the consensus to avoid being identified as particularly weak. Ashiya (2009) argues that there is little empirical evaluation of the validity of these hypotheses. He used a 26-year panel of annual GDP growth forecasts to rigorously test which of these hypotheses is supported empirically for GDP growth forecasts, and found that the data supported only the publicity hypothesis.

In conclusion, given the characteristics and incentives facing the rationally inattentive general public, the media is likely to be the main source through which these people receive the communications of the central bank. Effective communication of a central bank with the general public should be designed with an understanding of the incentives of the media and professional economists who influence the message that the general public ultimately receives. In the remaining part of the chapter, the South African news (the outcome of a strategic interaction between the SARB and the South African media, economists and the general public) will be analysed empirically. This analysis aims to determine the role that the

South African media has played in transmitting the communications of the SARB to the general public since 2000.

### 3.3. Empirical method

Berger, Ehrmann and Fratzscher (2006) evaluate central bank communication according to two criteria – the extent of the media coverage, and its favourableness (how well the decision is understood rather than how popular it is). Using similar indices to evaluate the communication of the SARB will offer insight into the degree to which the SARB has succeeded in *reaching* the public and whether its communication succeeds in convincing the media that the policy decision was the correct one, given the economic environment.

The creation of the two indices for South Africa will be discussed in section 3.1, followed by exploratory data analysis in section 3.2. Section 3.3 proposes some factors that potentially correlate with the indices *COV* and *ASMT*, and section 3.4 tests the relevance of these factors with more formal ordered probit regression analyses.

#### 3.3.1. Construction of the indices

##### 3.3.1.1. Qualitative index

Following Berger et al. (2006), two index variables were constructed to describe the extent of coverage and assessment of the SARB's monetary policy decisions by South African newspapers. Relevant newspaper reports were collected from the week following each MPC (monetary policy committee) meeting. Media reports for the entire sample period of January 2000 to September 2009 were collected via an electronic archive of media clippings (University of the Free State, 2000-2009), compiled at the University of the Free State. Careful attention was paid to ensure that the leading South African newspapers (by circulation numbers)<sup>19</sup> were represented in the media clippings collected, and cartoons were also included, recognising their role in opinion formation. The *Daily Sun* (the country's leading daily newspaper by circulation numbers) and the *Sunday Sun* (a weekly newspaper with substantial readership) were not represented in the SAMedia archive, so these were

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<sup>19</sup> The SAARF AMPS (2000-2009) surveys were used to identify the leading newspapers by readership numbers.

sourced directly from the compact storage archives of the Media24 central library at the company's head office<sup>20</sup>. Table A3.1 in Appendix 3.1 records a few details of each of the main newspapers<sup>21</sup> included in the study.

Each article or cartoon was read and evaluated independently by two researchers to allow the construction of the two indices. A qualitative index was created to capture the assessment of each monetary policy decision (*ASMT*). This measures the degree to which the media regards the SARB's monetary policy decision as appropriate, given the economic environment (it does not indicate the popularity of the decision). The index ranges from -2 (reflecting a strongly negative response of the publication to the policy decision) to 2 (reflecting strong approval of the decision). Greater detail about the qualitative index (*ASMT*) is provided in Appendix 3.2.

The creation of this qualitative index is inherently subjective. Both objective and subjective approaches to creating indices have been proposed in the literature, but in line with the arguments in Reid and Du Plessis (2010), the subjective approach was preferred. To limit the bias introduced by this subjectivity as far as possible, two researchers independently read each media article and assigned an index value for the assessment of each article. They then discussed each article and its score, and where their scores differed they agreed on a consensus index value for each.

The two researchers made some preliminary observations after reading the media articles. It was noted that generally the economic content of the articles was of a low quality. There were many mistakes in economic reasoning and a misunderstanding of the inflation targeting system. Although this understanding did improve over time, even years after the introduction of the inflation targeting framework, misunderstandings of the fundamental issues were not uncommon. For example, in June 2006, the editorial of the *Business Day* displayed a misunderstanding of the forward-looking nature of monetary policy and the flexibility with which the SARB conducts inflation targeting.

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<sup>20</sup> Gratitude is expressed to Leonie Klootwyk at the Media24 library for her assistance.

<sup>21</sup> Articles from other newspapers were also occasionally represented in the sample, as they were identified as relevant in the searches of the SAMedia archive. However, the newspapers in Table I were identified as having sizable readership numbers, and therefore, special attention was given to ensure that these were represented in the sample.

“The Bank’s inflation-targeting mandate now doesn’t permit it to let inflation go above the 6% ceiling of the target range for even a single month.”

(*Business Day*, 9 June 2006a: 10)

Similarly, the following extract from the editorial of the *City Press* in 2008 claims that the SARB is employing strict inflation targeting, where the Bank places no weight at all on economic growth.

“Calls to have the bank’s mandate expanded to include job creation appear to be justified. The exclusive focus on fighting inflation has meant that borrowing money is expensive and the credit squeeze has compounded the problem.”

(*City Press*, 14 December 2008: 26)

Fortunately, Mervyn King’s (1997) ‘inflation nutter’ (who places no weight on any objective but inflation) is a hypothetical character, an extreme case scenario, and there is no evidence that the SARB deserves such a title. A reading of the SARB’s constitutional mandate makes it clear that even the pursuance of price stability as the primary (not exclusive) objective of the Bank is done with the intention of improving the prospects for economic growth in South Africa.

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

(South African Reserve Bank Act 90 of 1989, amended: 3)

Some newspapers made more effort to grapple with the system than others, which was probably influenced by the perceived demands of their audiences (as discussed in section 2.3). For example, the *Business Day* devoted notably more valuable newspaper space and journalistic effort to reporting on monetary policy decisions than the *Daily Sun* did. However, many of the media reports consisted of undigested patch writing, which reflected little effort to evaluate the policy decisions. They often relied extensively on quoting market economists and were internally inconsistent (especially if the economists quoted did not agree).

There appeared to be a general bias indicating that repo rate cuts were welcomed and rises were met with criticism. Cartoons were often amazingly extreme and mostly negative (although their satirical nature is acknowledged). They often attributed to Governor Mboweni

intent and power that seems misplaced. The two examples reproduced below were hardly exceptional in this regard.



### 3.3.1.2. Quantitative index

The second index is a quantitative index that was created to measure the extent of the media coverage (*COV*) given. This index ranges from 1, representing poor media coverage, to 5, representing very extensive media coverage. The criteria used to allocate values for the quantitative index are the size of the article, its position in the newspaper, and its authorship.

In line with media industry practice (VMS, 2006), the standard advertising unit (SAU) or column inch was used to compare the size of each article. Using a ruler to measure the length and width and then multiplying the two (see Appendix 3.3 for further details), the column inch measure (a single number) was calculated for each article. The result is a continuous series of numbers, which was divided into 5 groups (percentiles) distinguishing articles according to size. The extent of the coverage also accounts for the position of the article in the newspaper, recognising, for example, that an article on the front page represents better coverage of the SARB's communication than an article on page 5. Finally, the authorship of each article is considered, specifically whether the article was written by one of the newspaper's own staff, reflecting that greater importance was placed on the issue reported on, or whether the article was a Sapa or Reuters article.

In order to account for all of these factors, a protocol was designed to categorise the extent of the coverage of each article (see Table 3.1). The size of the article is captured by the rows. The smallest articles are in the top row (article size 1) and the largest are in the bottom row

(article size 5). The location and authorship of the articles are captured in the columns, which are ranked from those that are allocated the prime positions and attention of the newspaper’s staff, in the left-most column, to those allocated the lowest ranked locations and little attention from the staff, in the right-most column. For example, the first column from the left represents front page articles written by the newspaper’s own staff. Note that the protocol illustrated by Table 3.1 is not necessarily symmetrical. In addition, as discussed earlier, cartoons were also included in the sample. All cartoons were allocated a quantitative index value of 4 (irrespective of their size and location). Refer to Appendix 3.2 for further details about the construction of the quantitative index, COV.

Table 3.1: Protocol for quantitative index, COV

Article Size	Front pg; Staff 6	Editor’s page or editorial; Staff 5	Pg 2, 3 or the business report; Staff 4	Pg 2, 3 or the business report; SAPA, etc. 3	Not pg 1-3 or the business report; Staff 2	Not pg 1-3 or the business report; SAPA, etc. 1
1	3	2	1	1	0	0
2	3	3	2	1	1	0
3	3	3	2	1	1	0
4	4	3	3	1	1	1
5	4	4	3	2	2	1

Source: Own construction

### 3.3.2. Exploratory data analysis

Firstly, the index data created was evaluated using frequency tables. The rows of frequency table (Table 3.2) reflect whether the repo rate was cut, held constant or raised at each MPC meeting, and the columns represent the values (between -2 and 2) of the assessment index allocated to media reports in the week following each MPC meeting. The first 5 columns of numbers reflect the frequency with which each case occurred in the sample period. For example, the top left-hand cell shows that on 12 occasions a cut in the repo rate was followed by media reports with an index value of -2. The last 5 columns reflect the same information as a proportion of the row total. For example, 7% of the time a repo rate cut was followed by media reports with an assessment index of -2.

Table 3.2: Frequency table for qualitative index, *ASMT*

Change in the repo rate at each MPC meeting	Assessment of the media reports in the week following each MPC meeting											
		-2	-1	0	1	2	Total	p(-2)	p(-1)	p(0)	p(1)	p(2)
<b>Cut</b>	12	30	47	46	26	<b>161</b>	0.07	0.19	0.29	0.29	0.16	
<b>Constant</b>	13	20	72	48	10	<b>163</b>	0.08	0.12	0.44	0.29	0.06	
<b>Rise</b>	48	52	40	30	5	<b>175</b>	0.27	0.30	0.23	0.17	0.03	
						<b>499</b>						

Due to the imprecise nature of the data itself, it is useful to consider broader categorisations, which highlight clearer trends. When the repo rate was cut (top row), 45% of the media reports received favourable assessments (either p(1) or p(2)) and 29% of the media reports received neutral assessments. This suggests that the vast majority of the time a repo rate cut was not judged to have been inappropriate, given the economic environment. Almost half (45%) of the media reports following decisions to keep the repo rate constant (second row) were neutral and a large proportion (29%) were only slightly positive. The strongest result occurred in cases where the repo rate was raised (third row); 57% of the media reports were given an unfavourable assessment (either p(-2) or p(-1)).

If we assume that neither the MPC nor the media is biased and we assume that there is no uncertainty about the economic environment, then we would expect the SARB and the media to agree on the appropriate monetary policy stance. In reality, there is uncertainty about the economic environment, and the data analysis reveals a pattern of systematic, negative assessments by the media when the repo rate is raised. The uncertain economic environment cannot be responsible for this systematic pattern, so it must be the result of bias, by either the MPC or the media.

A range of statistics and empirical evaluations of the SARB's track record are available to evaluate the claim that this observed pattern is the result of an overly „hawkish' SARB. If the SARB displayed a bias towards tightening, inflation would consistently have been either within or below the inflating targeting band over the sample period. Instead, the targeted inflation rate was above the upper band for approximately 60% of the sample period. In addition, empirical analyses by Woglom (2003) and Ortiz and Sturzenegger (2007) of the SARB's reaction find that the SARB places a substantial weight on output. Woglom (2003) finds that the SARB placed more weight on output during the inflation targeting period than in the period immediately prior to the adoption of inflation targeting, and Ortiz and

Stuzenegger (2007) argue that the weight devoted to output in the reaction function of the SARB is relatively high compared with other emerging market economies. The 18 – 24 month target horizon of the SARB also bares testament to the flexible manner in which the SARB has implemented monetary policy, because it allows the SARB discretion and flexibility in pursuing the inflation target (Du Plessis, 2009). Short-term breaches of the inflation target will be tolerated by the SARB as long as inflation is expected to move back within the range before the end of the target horizon. In addition, the fact that the inflation targeting regime has lasted almost a decade is impressive by modern standards and again reflects the flexibility the framework allows in handling different situations (Du Plessis, 2009). In conclusion, there is no evidence of bias by the SARB towards tightening monetary policy. By deduction, the assessment index seems to simply reflect that the media is pleased when the repo rate is decreased, reducing the cost of credit, and unhappy when the opposite occurs (reflecting the *popularity* of the decision). On average, these results reflect little attempt by journalists to judge the *appropriateness* of each decision, based on an understanding of the institutional framework and economic circumstances.

Tables 3.3 and 3.4 are the frequency tables for the two subcomponents (size and location) of the composite index, *COV*, and Table 3.5 reflects the frequency tables for the composite index, *COV*. Table 3.3 reflect little variation in the size of the articles across categories (they are all around 0.20), although using the broader categorisations does reveal some weak associations. When the repo rate was cut, 0.46 of the articles were small (size 1 or 2); when it was kept constant, 0.41 of the articles were small; and when it was raised, 0.36 were small. In contrast, the proportion of the articles that were large was 0.36 when the rate was cut, 0.38 when it was held constant, and 0.43 when it was raised. In summary, rate cuts were associated with the smallest media articles, and rises in the repo rate resulted in larger articles. The article size varied based on the direction of the monetary policy decision, rather than on an evaluation of the appropriateness thereof.



Table 3.3: Frequency table for quantitative index, *size*

Change in the repo rate at each MPC meeting	Size of the media reports in the week following each MPC meeting											
		1	2	3	4	5	Total	p(1)	p(2)	p(3)	p(4)	p(5)
Cut	35	29	24	20	30	138	0.25	0.21	0.17	0.14	0.22	
Constant	27	31	30	32	21	141	0.19	0.22	0.21	0.23	0.15	
Rise	26	26	30	32	28	142	0.18	0.18	0.21	0.23	0.20	
							421					

According to Table 3.4, very few media reports are in location 1, which represents articles that are not on pages 1-3 or the Business Report and are not written by the newspaper’s own staff. There are also very few reports in category 3, which represents articles on pages 2, 3 or the in the Business Report, but which are not written by the newspaper’s own staff. The clearest result is that articles are more likely to appear in the prime locations and to be reported by the newspaper’s own staff (categories 4 or 5) when the repo rate is cut (0.42) or raised (0.43) than when the rate is held constant (0.29). The location of the articles appears to depend on whether the repo rate was adjusted, rather than on the level of disagreement with the decision.

Table 3.4: Frequency table for quantitative index, *location*

Change in the repo rate at each MPC meeting	Location of the media reports in the week following each MPC meeting												
		1	2	3	4	5	6	Total	p(1)	p(2)	p(3)	p(4)	p(5)
Cut	4	43	4	28	35	24	138	0.03	0.31	0.03	0.20	0.25	0.17
Constant	6	58	0	35	26	16	141	0.04	0.41	0.00	0.25	0.18	0.11
Rise	11	58	0	12	40	21	142	0.08	0.41	0.00	0.08	0.28	0.15
							421						

The composite index, extent of coverage (*COV*) (Table 3.5), finds that few reports fall into category 0 (the weakest coverage) and there is little variation across categories 1 - 4. The clearest results are that again articles are more likely (0.50 and 0.51 of the time) to fall into categories 3 and 4 (greatest extent of coverage) when the repo rate is changed than when it is held constant (0.43 of the time)

Table 3.5: Frequency table for composite quantitative index, *COV*

Change in the repo rate at each MPC meeting	Extent of coverage of the media reports in the week following each MPC meeting											
	0	1	2	3	4	Total	p(0)	p(1)	p(2)	p(3)	p(4)	
Cut	11	33	35	45	37	<b>161</b>	0.07	0.20	0.22	0.28	0.23	
Constant	15	46	32	38	32	<b>163</b>	0.09	0.28	0.20	0.23	0.20	
Rise	11	43	34	40	47	<b>175</b>	0.06	0.25	0.19	0.23	0.27	
						<b>499</b>						

Formal regression techniques are adopted in the following section, which offers some insight into the robustness of the results from the four frequency tables above.

### 3.3.3. Factors that correlate with the extent of media coverage and assessment of monetary policy by the media

A list of factors that are likely to influence *COV* and *ASMT* are listed below. Berger et al. (2006) included determinants related to the ECB's policy decisions and communication, the economic environment, and because they were using panel data for a number of EU countries, country-specific conditions were considered. Similar factors related to the SARB's policy decisions and communication, and its economic environment were identified in this chapter, but the country-specific variables were irrelevant, as only South Africa was investigated.

Monetary policy surprise:

Two dummy variables were created, *surprise up* and *surprise down*, to indicate whether the particular monetary policy decision was a surprise in either direction. For the *surprise up* variable, a value of 1 was allocated if the Banker's Acceptance rate (BA) rate changed by 0.25 or more on the day of the MPC's monetary policy announcement, reflecting that either monetary authorities increased the repo rate when the financial markets did not expect them to, or they increased the repo rate more than the markets had predicted. Otherwise, the variable was allocated a value of 0. The *surprise down* variable received a 1 if the BA rate changed by -0.25 or more, and 0 otherwise. Berger et al. (2006) did not make the distinction between a surprise up and a surprise down, but the frequency tables in the previous section suggested that the distinction would be valuable for analysing the South African media.

Adjustment of the repo rate:

Four dummy variables (*100 decrease*, *50 decrease*, *50 rise*, *100 rise*) were constructed to capture adjustments made to the repo rate. The dummy variables were used to differentiate between upward adjustments of 0 - 50 basis points (bp) (*50 rise*), upward adjustments of 51 - 100 bp (*100 rise*), downward adjustments of 0 - 50 bp (*50 decrease*) and downward adjustments of 51 - 100 bp (*100 decrease*). It was deemed appropriate to investigate the potentially asymmetrical reactions to upward and downward adjustments of the repo rate that were suggested by the frequency tables.

GDP growth relative to the sample average:

By subtracting the average GDP growth for the sample period from the actual GDP growth for each period, the variable *GDP:Avg* was constructed to reflect where GDP growth was situated relative to the trend over the sample period. A positive (negative) value indicates that the economy is growing faster (slower) than the average for the sample period. This variable was constructed using real-time data<sup>22</sup> from the original statistical releases archived on the STATS SA website.

Inflation outside the inflation targeting range:

A variable *outside range* was used to measure inflation relative to the target band. A value of 0 was assigned to the index when inflation was within the target range of 3-6% and 6% (3%) was subtracted from the actual inflation figure in each period when inflation was above (below) the upper (lower) limit of the target band, in order to capture the distance of inflation from the target. In line with the discussion for the preceding variable, real-time data<sup>23</sup> from the STATS SA website was used to construct this inflation variable.

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<sup>22</sup> GDP data usually undergoes numerous revisions after the first release of the data to the public, so if the final historical time series is downloaded and used for empirical work, it is ignoring the fact that that was often not the information available to decision makers at the time the decision was made. The figures used in these regressions are the first releases of GDP data for that quarter.

<sup>23</sup> The inflation index used was the one officially targeted by the SARB. Therefore, CPIX was used until the end of 2008, and CPI thereafter.

#### Adjustments of FED policy rates:

Two dummy variables were created to capture whether the SARB's adjustments of the repo rate were in line with the direction of the most recent change in the Fed Funds rate. A value of 1 was allocated to the variable *F&S increase* when the most recent change in the Fed Funds rate was upward and was followed by the SARB increasing its policy rate, and a value of 0 otherwise. Conversely, a value of 1 was allocated to the variable *F&S decrease* when the SARB's reduction of the repo rate is preceded by a downward movement of the Fed Funds rate. This variable is designed to capture the degree to which the SARB's decision is judged against that of the Fed. This variable was constructed using data that was sourced from the Federal Reserve Bank of New York's and the South African Reserve Bank's websites.

#### Inconsistency:

In Reid and Du Plessis (2010), on four occasions the SARB's monetary policy actions were judged to be inconsistent with its communication at the previous meeting. A dummy variable was constructed for this chapter in which these four instances are allocated a 1 and the rest of the MPC decisions in the sample period a 0.

#### Inter-meeting communication:

A number of dummy variables were constructed to investigate whether they had any impact on the assessment and extent of coverage with which the media reported on the following decisions. The inter-meeting communications considered were the monetary policy forums (MPF), monetary policy reviews (MPR), quarterly bulletins (QB), parliamentary briefings (PB), speeches by the governor (SP), annual general meetings (AGM) and the annual reports. All of these are occasions on which the bank comments on monetary policy. Only speeches by the Governor of the Reserve Bank that were relevant to South African monetary policy were included. It was also recognised that the MPR is released on the evening of the first MPF, so it is not possible to distinguish between the impacts of the two, and therefore, only the

variable *MPR* was used to capture the impact of the two. Similarly, the annual report is released officially on the evening of the AGM, so only the variable *AGM* was used in the regression analysis.

### 3.3.4. Regression analysis

Following the approach of Berger et al. (2006), ordered probit models were used to identify factors that correlate with the extent of media coverage. Berger et al. use panel data to evaluate the role of the media in the constituent countries of the European Union, whereas this study focuses on South African time series data alone. The panel data has the advantage of allowing the use of fixed effects to limit the impact of the subjectivity of the experts who created the indices.

Table 3.6: The relationship between *COV* and *ASMT* in media reports

Dependent variable: <i>COV</i>	Model 1	Model 2	Model 3	Model 4
Assessment	-0.085**	--	-0.050	--
Absolute assessment	--	0.438***	0.427***	0.388***
Negative assessment	--	--	--	0.153 (0.185)
Number of observations	500	500	500	500

Note: Models 1 - 4 are ordered probit regressions, and the regression coefficients are represented in the cells. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* signify that a variable is significant at the 1%, 5% and 10% levels, and numbers in brackets appear below coefficients where the p-value is between 10 and 25%.

Models 1 - 4 (Table 3.6) investigate whether there is a relationship between *COV* and *ASMT* in the media reports. The dependent variable is *COV*. Model 1 (column 1) tested whether there is a linear relationship between *COV* and *ASMT*, and model 2 whether there is a relationship between *COV* and absolute assessment. The coefficients on assessment in Model 1 and absolute assessment in Model 2 were both significant. Furthermore, when both assessment and absolute assessment were included in the same regression in Model 3, absolute assessment dominated, so there does not appear to be a robust linear relationship between *COV* and *ASMT*. Model 4 included absolute assessment and negative assessment to test whether the relationship between *COV* and *ASMT* is non-linear. The coefficient on negative assessment was insignificant at the standard 1%, 5% and 10% levels, but given the imprecise nature of the data, its p-value of 18.5% does not convincingly rule out the

possibility of a non-linear relationship. These results are in line with the main findings from the frequency tables for *COV*, indicating that changes in the repo rate are more likely to receive a greater extent of coverage than a decision to keep the repo rate constant. The significantly negative coefficient on assessment in Model 1 and the marginally significant coefficient on negative assessment in Model 4 also indicate that *COV* possibly increases slightly when *ASMT* is negative. However, this result is less conclusive.

Regressions 5 - 10 in Table 3.7 aim to identify factors in our list that correlate with *ASMT*. Model 5 is the most parsimonious of the models and includes the variables identified as most likely to influence the assessment in media reports. The regression results indicate that a large decrease in the repo rate (a 100bp decrease) has a significantly positive effect on the assessment, and any increase of the repo rate (either 50 or 100 basis points) has a significantly negative effect. This regression reinforces the results of the frequency tables. The two variables *outside range* and *GDP:Avg* are designed to capture the monitoring role of the media, based on the economic circumstances. Although the coefficient on *outside range* is only significant at the 12,8% level of significance, as before, the imprecise nature of this data means that this positive coefficient cannot convincingly be judged to be insignificant. However, *ASMT* is most strongly affected by a rise in the repo rate, which elicits a significantly negative report.

In Model 6, the variables *surprise up* and *surprise down* were included instead of the four dummy variables representing adjustments of the repo rate. The reason that these surprise variables are not included with the repo rate adjustment variables is that they have a substantial degree of collinearity<sup>24</sup>. However, both groups of variables were expected to exert an influence on assessment, so Model 6 was estimated to check whether there was any important change in the regression results when the first set of variables were replaced with the second. The results reflect a similar pattern to those of Model 5. A surprise adjustment of the repo rate upward had a significantly negative effect and a surprise adjustment downward, a significantly positive effect on assessment. In addition, *GDP:Avg* had a significantly negative coefficient, which is interpreted as an indication that an increase in the repo rate is generally given an unfavourable assessment when it is viewed as potentially harming robust

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<sup>24</sup> This was confirmed using auxiliary regressions, regressing the repo rate changes on surprise up and surprise down.

economic growth. However, this finding is not robust, as it is not significant in the other specifications of the model.

Table 3.7: Factors that correlate with *ASMT*

Dependent variable: <i>ASMT</i>	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Surprise up	--	-0.598***	--	--	--	--
Surprise down	--	0.359**	--	--	--	--
100 decrease	0.245*	--	0.030*	0.341**	0.394**	0.355*
50 decrease	0.061	--	-0.086	-0.037	-0.008	-0.107
50 rise	-0.713***	--	-0.861***	-0.819***	-0.847***	-0.949***
100 rise	-0.742***	--	-0.741***	-0.522**	-0.283 (0.155)	-0.305 (0.158)
Outside range	-0.053 (0.128)	-0.040	-0.041	0.044 (0.192)	0.021	0.022
GDP:Avg	-0.019	-0.042**	0.016	0.016	-0.020	0.019
Inconsistency	--	--	0.078	-0.076	0.060	0.046
F&S increase	--	--	0.338 (0.108)	0.291 (0.179)	0.336 (0.133)	0.428*
F&S decrease	--	--	-0.137	-0.095	-0.002	-0.023
MPR	--	--	--	-0.064	0.094	-0.009
Q. Bulletin	--	--	--	0.267**	0.206*	0.137
Parliamentary briefings	--	--	--	-0.135 (0.161)	-0.108	-0.091
Speeches	--	--	--	0.062	0.033	0.062
AGM	--	--	--	-0.535***	-0.227	-0.228
D_AG M(02&03)					-0.769***	-0.955***
Observations	500	500	500	500	500	500

Note: Models 1 - 4 are ordered probit regressions and the regression coefficients are represented in the cells. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* signify that a variable is significant at the 1%, 5% and 10% levels, and numbers in brackets appear below coefficients where the p-value is between 10 and 20%.

Model 7 is an expansion of Model 5, where the variables *inconsistency*, *F&S increase*, and *F&S decrease* are added to the model. The positive coefficient on the large decrease in the repo rate and the negative coefficients on the variables that capture the increases in the repo rate remain significant, confirming the robustness of these results, but the slightly significant negative coefficient on the variable capturing whether inflation is outside the target band is no longer significant. In addition, the variable that captures when the Fed and the SARB are both increasing their policy rates is also slightly significant and positive. This suggests that

increases in the South African repo rate are more readily accepted when the policy rate of the Fed is also being increased at that time. It is interesting that the response is asymmetrical in that there is no significant impact on assessment when both central banks are reducing rates.

The inter-meeting communication variables are introduced in Model 8. This is done in order to investigate whether inter-meeting communication by the SARB is effective at influencing evaluation of the policy decisions by the media. The negative coefficient on the AGM variable is highly significant, the positive coefficient on the Quarterly Bulletin is significant at the 5% level, and the negative coefficient on parliamentary briefings is marginally significant. The robustness of the impacts of the inter-meeting communication variables was tested using slightly different specifications of Model 8. The impact of the AGM on assessment remained highly significant and negative, and the QB variable was consistently positive and significant as the model was adjusted. The persistently significant, negative impact of the AGM was surprising and warranted further investigation. On closer inspection, it was confirmed that this result was being driven by only two points (the AGMs of 2002 and 2003)<sup>25</sup>. Once a dummy variable was created to control for these two occasions (Model 9), the impact of the AGMs became insignificant. The findings reflect little influence of inter-meeting communication on the evaluation of monetary policy by the media – only the QB variable has a significant influence on assessment.

A range of ‘goodness of fit’ measures have been proposed in the literature, and a few of these will be considered here to assess the adequacy of the proposed models. This range of measures is used due to the comparative difficulty in assessing the quality of a model with limited dependent variable. According to Wooldridge (2002:465), for logit and probit models “goodness of fit is not as important as the statistical and economic significance of the explanatory variables”. In addition, various Pseudo-R squareds commonly used to evaluate the fit of a model with a limited dependent variable have fewer intuitive interpretations.

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<sup>25</sup> The SARB AGMs of 2002 and 2003 were uncharacteristically newsworthy. Media reports following the AGM of 2003 focused strikingly on Governor Mboweni’s salary increase, which was far above the inflation target, and on shareholder activism at the SARB’s AGM. In turn, media reports following the 2002 AGM were dominated by disagreement between the SARB Governor and the Minister of Finance regarding who should be responsible for banking regulation. Dramatic language used in these report such as “Mboweni and Manuel lock horns”, “clash on bank supervision out in the open” and “low intensity war” captures the negative mood created by their disagreement.



Firstly, contingency tables were considered for each of the regressions, allowing type 1 and 2 errors to be identified. Table 3.8 presents the contingency table for Model 9, where the frequency of each index value between -2 and 2 as per the actual index are presented horizontally in row, and the frequency of each level of assessment predicted by the model is presented in the columns.

It is immediately evident that the variables included in the model lead to a skewed distribution of predictions. Although the total values of the actual index (final column) are relatively normally distributed across the index values, the model never predicts the assessment of -1 or 2. Most of the variables included in the models are dummy variables, so to test that it was not their discrete nature that made it more difficult for the model to increase from one index value to the next, a number of the variables were changed to continuous regressors. Changes in the repo rate were represented by one variable, *policy change*; one variable was constructed to capture the magnitude and direction of the surprise experienced in reaction to policy changes, and continuous variables were created to capture the difference between the policy changes of the Federal Reserve Bank and the SARB. These changes did not improve the ability of the model to predict -1 and 2 index values and diminished the quality of the model. Most importantly, the four dummy variables were preferable in order to capture the different responses to the specific direction and magnitude of the policy changes. Therefore, the regressors in question were returned to their original forms.

The skew predictions of the models suggest that the variables included in the models are more sensitive to MPC decisions that elicit a strongly negative reaction. This is consistent with the robust finding that the coefficient on the variable *F&S increase* is marginally significant, but that on *F&S decrease* is insignificant. This suggests that assessments in media reports are more favourable towards increases of the SARB's repo rate that are preceded by an increase in the Fed Funds rate, whereas a decrease in the SARB's repo rate that is preceded by a decrease in the Fed's policy rate has no significant impact. The media is more sensitive when the SARB is tightening monetary policy than when it is loosening it, and they are more likely to accept the SARB's decision if it is not out of step with the Fed's monetary policy.

Table 3.8: Contingency table for Model 9

ACTUAL ASSESSMENT	ASSESSMENT PREDICTED BY THE MODEL				
		-2	0	1	Total
-2		30	39	4	73
-1		28	56	18	102
0		17	103	39	159
1		7	77	41	125
2		1	20	20	41
Total		83	295	122	500

To improve the model's ability to predict, the index was reduced to a coarser grid, where all negative index values are represented as -1 and all positive index values by 1 (Model 10 in Table 3.7). The results are very similar to those of Model 9, except that now none of the inter-meeting communication variables seem to influence assessment.

Table 3.9 presents the contingency table for Model 10, and these results are used to identify the true (false) positives and true (false) negatives in Table 3.10. When *ASMT* is simplified in this way, the model is able to predict all three index values. The true positives represent the proportion of the time that the model correctly predicted that a specific index value would occur. For example, according to the top left cell, 58% of the time the model correctly predicted a negative index value. The false positives capture the proportion of the time that the model incorrectly predicted that specific index value, which is the type 1 error). Similarly, the false negatives represent the type 2 errors, where the model incorrectly predicts that assessment will not be a specific index value. For example, the top right-hand cell reports that 22% of the time when the model predicted that assessment *would not* be 1, it *was* indeed 1.

According to Table 3.10, the model is far more susceptible to type 1 errors than type 2 errors. In addition, the type 1 errors deteriorate as we move down the rows from -1 - 1, which is a result of the skewed distribution of the model predictions, given the independent variables of the model. To gauge how far wrong the model predicts when it does predict incorrectly, the percentage of predictions that were more than one cell away from the correct predictions were considered. When the true value of the assessment index was -1, 29% of the time the model mistakenly predicted a 1, and when the true index value was 1, 20% of the time the

model mistakenly predicted -1. The type 1 and 2 errors identified for Models 5 - 9 are similar to those of Model 10 and are available from the authors on request.

Table 3.9: Contingency table for Model 10

ACTUAL ASSESSMENT	ASSESSMENT PREDICTED BY THE MODEL				
		-1	0	1	Total
	-1	106	17	52	175
	0	44	34	81	159
	1	34	27	105	166
	Total	184	78	238	500

Table 3.10: Type 1 and 2 errors for Model 10

	True positives	False positives	True negatives	False negatives
-1	58%	42%	78%	22%
0	44%	56%	70%	30%
1	44%	56%	77%	23%

To further evaluate the adequacy of this model, various other measures of fit were considered (Greene and Hensher, 2010 and UCLA: Academic Technology Services, 2010). Due to the nature of these models, the measures of fit can either compare the ability of competing models to fit the data, or compare the model to the null hypothesis of „no model’(in the sense of a model with only a constant as a regressor) (Greene and Hensher, 2010). For example, McFadden’s pseudo R-squared considers the likelihood ratios to assess the degree to which the full model improves on the intercept model. McFadden’s pseudo R-squared for Model 10 is 0.077.

More revealing, and related to the analysis in the tables above, are the Count R-squared and adjusted count R-squared goodness of fit measures. The count R-squared provides a scalar that represents the percentage correctly predicted by the model. The count R-squared for Model 10 is 0.478. The adjusted count R-squared adjusts this measure to control for the modeller’s „best guess’. In a bivariate model where one outcome is obviously more likely than the other, by simply guessing the more likely outcome all the time, the modeller would be correct most of the time (UCLA: Academic Technology Services, 2010). To apply this to our multivariate case, we adjusted the count R-squared by 0.333 (assuming that each of the three categories has an equal probability of being chosen):

$$R^2 = \frac{(\text{No. correctly predicted} - \text{count of the most frequent outcome})}{(\text{Total obs} - \text{count of the most frequent outcome})} \dots (3.3)$$

The adjusted count R-squared for Model 10 is 0.215, so the model is 21,5% better than a reasonable guess that each category of the index is equally likely.

Table 3.11: Factors that correlate with *COV*

Dependent variable: <i>COV</i>	Model 11	Model 12	Model 13
Absolute assessment	0.443***	0.435***	0.448***
Surprise up	--	0.109	--
Surprise down	--	-0.056	--
100 decrease	0.124	--	0.149
50 decrease	-0.018	--	-0.007
50 rise	-0.045	--	-0.027
100 rise	0.140	--	0.225
Outside range	0.238**	0.262**	0.215*
GDP > avg	0.135	0.111	0.128
Inconsistency	--	--	-0.143
F&S increase	--	--	-0.050
F&S decrease	--	--	-0.062
Number of observations	500	500	500

Note: Models 10 - 13 are ordered probit regressions and the regression coefficients are represented in the cells. White heteroskedasticity-consistent standard errors were used. \*\*\*, \*\* and \* signify that a variable is significant at the 1%, 5% and 10% levels, and numbers in brackets appear below coefficients where the p-value is between 10 and 25%.

Models 11 - 13 investigate some factors that potentially correlate with the extent of coverage (*COV*). The coefficient on absolute coverage is consistently positive and significant, indicating that the more extreme the assessment the greater the extent of coverage. All the other coefficients are clearly insignificant, except *Outside  $\pi$  range*, which is consistently positive and significant. This is an indication that the media does play some monitoring role in that they increase media coverage of monetary policy when the SARB is not achieving the goal of keeping inflation within the target range, which it communicated to the public. This is the easiest measure against which to gauge the performance of the SARB, and by increasing media coverage during these periods, the media has „placed monetary policy on the agenda’. Monetary policy officials should recognise that the general public, via the agenda-setting behaviour of the media, are sensitised during these periods.

The contingency table for Model 13 reflected a similar pattern as Models 5 - 10. The model does not predict any *COV* index values of 0 or 2, which can be explained by the fact that the index values of 0 and 2 were the least frequent in the actual data (as is clear from the exploratory data analysis). McFadden's pseudo R-squared for Model 13 is 0.0363, the count R-squared is 0.348 and the adjusted count R-squared is 0.185. The results for Models 11 and 12 are similar to those for Model 13<sup>26</sup>.

By comparing the results above of Models 5-13 with those of Berger et al. (2006) for the European media, we can potentially gain more insight into the role of the South African media in the expectations transmission mechanism of monetary policy in South Africa.

### 3.4. Comparison with ECB results

Berger et al. (2006) find that in practice the European media positions itself to play a monitoring role, and it tends to report critical views more extensively than positive views. The results show that the tone of the reporting is more negative when the markets are surprised by a monetary policy decision, and when the latest inflation figure is above 2% (the ECB's definition of price stability). More crucially, the findings suggest that more inter-meeting communication, and ECB press conferences on the day of the monetary policy decisions that provide more information lead to media coverage that is both more extensive and favourable. Although they find that reporting is always more negative when inflation is high, the surprising decisions appear to be better accepted when they are accompanied by extensive explanations and supported with information.

In contrast, the results of this study indicate that the South African media plays far less of a monitoring role in that the economic variables, *GDP:Avg* and *outside band*, seemed to have a limited impact on assessment, although being outside the inflation target band did increase the extent of coverage. These economic variables were far outweighed by what appeared to be an uncritical response to adjustments of the repo rate (particularly increases in the repo rate). Finally, inter-meeting communication does not seem to have had much impact, suggesting that the SARB is not making effective use of inter-meeting communication to influence the perceptions of the Bank by the media and public. A more deliberate attempt to

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<sup>26</sup> The results for models 10 – 12 are available from the corresponding author on request.

understand its audience would potentially allow the SARB to improve its use of this channel of communication.

### 3.5. Conclusion

The monetary policy framework adopted by the SARB, inflation targeting, relies greatly on the expectations channel of the monetary policy transmission mechanism. The strategic interaction between central banks and financial markets has been extensively studied, enabling much more informed policy actions and communication. Comparatively little focus has been dedicated to understanding the communication of central banks with the general public. This chapter explored the role of the South African newspaper media in the expectations channel of the transmission mechanism of the SARB. The objective was to systematically investigate the process by which the SARB's communication is transformed into news, which will impact on the inflation expectations of the general public (potentially the source of much of South Africa's wage and price pressures). The results reflect a relative lack of critical assessment of monetary policy by the media, which limits the degree to which the SARB is held accountable to the public against its stated objectives. The media does increase the extent of coverage when the SARB is outside of the target range, but inter-meeting communication appears to be ineffective at influencing the assessment of monetary policy decisions by the media. The challenge is for the SARB to use communication to provide an opportunity for the Bank to contribute to the level of economic evaluation undertaken by stakeholders and to build credibility through purposeful engagement with the media.

Appendix 3.1: Newspaper characteristics and readership

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Table A3.1: Newspaper characteristics and readership

<b>Newspaper title</b>	<b>Characteristics</b>	<b>AMPS (% of adult population that read these newspapers)</b>
Business Day	National; Daily	0.3%
City Press	Weekly	6.5%
Daily Sun	Daily	14%
Rapport	Weekly	4.5%
Sowetan	Daily	4.7%
Sunday Sun	Weekly	8.3%
Sunday Times	National; Weekly	12.6%

*Source: (AMPS, 2009A)*

## Appendix 3.2: Additional details about the construction of the qualitative and quantitative indices

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### Assessment (Qualitative Index)

Table A3.2a presents an example of the information collected by the researchers for each media report in order to assign a value for the qualitative index, *assessment*. Each news article was identified by the date on which it was published and the newspaper in which it appeared (shown in the first two columns). Then a number of characteristics of the articles were considered and the views of the researchers were recorded in columns 8 to 11. Values between -2 and 2 were used to indicate whether the headline and tone of an article was strongly positive (2), slightly positive (1), neutral (0), slightly negative (-1) or strongly negative (-2). The researchers also investigated whether the article was contextualised and whether there was an explicit judgement of the MPC decision. Provision was made to record any other observations in the final column. These criteria were not employed mechanically fashion, but were used to organise the evaluation of each article in a systematic fashion. Given this evaluation, index values of between -2 and 2 were assigned in columns 3 to 7.



Table A3.2a: Scorecard for qualitative index, *ASMT*

Date	Newspaper	Very Neg (-2)	Neg (-1)	Neutral (0)	Pos (1)	Very Pos (2)		Head-line	Context-ualised	Explicit Judgement	Tone		Comments / Notes
2000/03/03	Business Day			X				0	Fair	None	0		Lots of general comments about the monetary policy framework and almost no comment about the reception of the decision by the financial market or public
2000/03/05	Sunday Times				X			0	Little	None	1		Suggestions were made that the data showed inflation pressures and that economists were also a little worried about the rising inflation. However plenty debate about the inflation target was still reported. None of this was critical of the latest actual decision

### Extent of coverage (Quantitative Index)

*Extent of coverage* is a composite index, comprising 2 sub-indices, *size* and *location*. The size of the news report was decided objectively, using Standard Advertising Unit Column Inches (see Appendix 3.3 for more details). Once all the articles were measured in column inches, they were divided into percentiles to identify 5 groups according to size. Articles in the smallest group were assigned a value of 1 and those in the largest group a value of 5. Table A3.2b presents an example of how the column size data for each article was recorded.

The criteria set to differentiate between the favourability of different positions in a newspaper are represented in Table 3.1 in the main text. Notice that the Business Report, which usually appears later in the newspaper was treated more favourably than other later pages. The Business Report appears in a range of the newspapers, including the Cape Times, Pretoria News, Mercury, Star, Cape Argus, Daily News, Sunday Independent and Sunday Tribune. The author of the news report was considered together with the evaluation of the location of the article in the newspaper. If one of the journalists from the newspaper was assigned to write the report it gave the impression that greater priority was being given to the report than if the source was Reuters or Sapa, which would have required fewer resources.

The size and location of each article was combined as shown in Table 3.1 in the text to select the composite index, COV. Table A3.2c provides an example of how data for this index was collected and organised.

Table A3.2b Scorecard for quantitative index, *size*

Date	Newspaper	Width (cm)	Width (columns)	Length (cm)	Length (inches)	Extra (column inches)	Total (column inches)	Size
2000/01/14	Business Day	16	3	17	6.693	4.429	24.5	5
2000/01/16	City Press	26	5	11.5	4.528	-	22.6	5

Note: Refer to Appendix 3.3 to convert width (cm) to width (columns)

Table A3.2c Scorecard for quantitative index, *COV*

Date	Newspaper	Size (column inches)	Size (index)	Position	Author	Location (index)	COV (composite index)
2005/10/14	Business Day	23.6	5	1	Kevin O'Grady	6	4
2005/10/14	The Star	9.1	2	1 (Business Report)	Andile Ntingi	4	2

### Appendix 3.3: Standard column inches

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„Standard Advertising Unit Column Inches’ are typically used to sell or compare space in a newspaper. If, as was the case for this study, the media material is paper-based (rather than electronic), the SAU column inches are calculated using a ruler (VMS, 2006). Measuring horizontally, the width of the article is represented as number of SAU columns, using the list below:

- 1 SAU COLUMN = 2 1/16”
- 2 SAU COLUMN = 4 1/4”
- 3 SAU COLUMN = 6 7/16”
- 4 SAU COLUMN = 8 5/8”
- 5 SAU COLUMN = 10 13/16”
- 6 SAU COLUMN = 13”

Then the length of the articles is measured in inches, and the two measurements are multiplied to represent the size of the article in column inches (one number).

## **4. INFLATION EXPECTATIONS OF THE INATTENTIVE GENERAL PUBLIC**

### **4.1. Introduction**

Central banks recognise that they are engaged in strategic interactions with the citizens of their countries (their audiences). Central bank communication is crucial to the implementation of monetary policy, as it is used to build credibility, manage citizens' inflation expectations and improve coordination between the actions of the central bank and the citizens, which is mutually beneficial. However, the central bank's audience has almost always been treated as a single group, and empirical research in South Africa has focused solely on the interaction of the SARB with the financial markets. In line with chapter 3, this chapter divides the central bank's audience into the broad public and its political representatives on one side, and the financial markets on the other. It turns to the ultimate recipients of the SARB's communication, the general public, and studies the process by which the inattentive general public form their inflation expectations in South Africa.

This chapter extends the literature by conducting a formal, comprehensive analysis of the characteristics of the South African general public as an audience distinct from the financial markets. No attention has previously been devoted in the literature to understanding the non-financial market segment of the SARB's audience. This does not suggest that researchers believe that the general public's behaviour is very similar to that of the financial markets, or that the impact of their behaviour is negligible and not worth studying. Instead, it reflects challenges such as the lack of relevant, high-frequency asset prices that incorporate the inflation expectations of the general public.

It is impractical to attempt to incorporate the full range of inflation expectations within a single economic model. However, it does seem beneficial to identify the main characteristics of broad groups of the central bank's audience that are likely to affect the way the central bank's communication is received and interpreted, and to tailor communication to these distinct groups. This chapter focuses on the process by which the general public forms their inflation expectations. Insight into this process will offer two important benefits – it will

enhance the effectiveness of monetary policy, and provide microfoundations to improve the modelling of the Phillips curve and enrich monetary policy analysis.

Firstly, a better understanding of the process by which the inattentive general public, who are responsible for the majority of the price setting behaviour in South Africa, form their expectations will improve the SARB's ability to communicate effectively with them and to influence their inflation expectations. Successful communication is essential both to enhance the effectiveness of monetary policy and to build public support for the institutional framework within which monetary policy is implemented.

Secondly, an improved understanding of the microfoundations of aggregate inflation expectations will enable better-quality modelling of the South African Phillips curve and advance policy analyses. For monetary policymakers, the benefits of improved modelling of the Phillips curve and insight into the microeconomic foundations of its dynamics are unquestionable. These would improve their ability to explain the time-varying effects of monetary policy on inflation and output, and thereby assist the implementation of monetary policy. The “inexorable and mysterious trade-off between inflation and unemployment” (Mankiw, 2001: 45) is fundamental to our understanding of monetary policy. It is impossible to explain the business cycle without it, and there is broad consensus that there is a trade-off between inflation and unemployment in the short run, but not in the long run, so any reasonable model of the economy should strive to capture these features.

#### 4.2. The inattentive general public

Blinder, Ehrmann, Fratzscher, De Haan and Jansen (2008) review the literature on the contribution of central bank communication to the successful implementation of monetary policy and suggest some areas where further research is required. In the closing paragraph, they identify the need to research the role of the general public as a separate audience with whom a central bank is communicating.

“Finally, virtually all the research to date has focused on central bank communication with the financial markets. It may be time to pay some attention to communication with the general public. Admittedly, studying communication with the general public will pose new challenges to researchers – not least because the financial market prices will be less relevant. But the issues are at least as important. In the end, it is the general public that gives the central bank its legitimacy, and hence their independence.”

(Blinder et al., 2008: 47)

Blinder et al. (2008) stress the importance of studying the communication of the central bank with the general public, despite the difficulty of doing so. The inflation expectations of this group have a substantial effect on the ability of monetary policymakers to achieve low and stable inflation. Literature from the field of behavioural economics is used in this section to improve our understanding of the incentives facing the inattentive general public and their behaviour under these conditions. Next, we begin to explore the implications for modelling inflation expectations.

#### *4.2.1. Rational inattention*

Proponents of behavioural economics have long contested the use of the standard utility maximising agent model adopted by mainstream economics. They argue that the amount and quality of information that rational economic man is assumed to possess, and the clear and stable set of preferences used to describe his utility are unrealistic. In addition, they question the ability of rational economic man to evaluate the range of options available to him and calculate which will enable him to optimise his utility, given his preferences and budget constraint (Simon, 1955, 1956). In essence, behavioural economists criticise mainstream economists for ignoring the limits to economic man’s knowledge and computational ability.

Proponents of the standard model respond by arguing that the assumption of rationality does not suggest that people are fully able to perform optimisation calculations for every decision they make. People do not know the future with certainty. Rather, they propose that people’s expectations and behaviour will be guided by their best guesses, based on all the information they have available to them. They will also avoid *systematic* errors, which are predictable and

costly (Klamer, 1984). Rational expectations can be viewed as an analytical condition that excludes these systematic errors, rather than an assumption that economic man has perfect knowledge and computational ability. However, the debate surrounding the validity of rational expectations and its implications has not been settled yet.

The reality is that monetary economists require a pragmatic approach to making policy recommendations while the theoretical debate continues. Monetary policy makers need to make important policy decisions now, despite the lack of consensus. Whatever one's ideological view, it is difficult to deny that sensible monetary policy must account for the formation of expectations,<sup>27</sup> and it is, by definition, not possible to model 'irrational expectations'. Rational expectations models do not fully explain the complexity of individual decisions, but the assumption does provide a way to incorporate expectations into the model when decisions are made in a dynamic setting. A compromise such as using the standard rational models, modified or extended to account for the limitations of human ability that behavioural economics has highlighted, seems like a reasonable way to address the pressing questions asked by applied macroeconomic research.

It is argued here that an examination of Simon's concept of bounded rationality shows that this compromise does not require a substantial concession on the part of the behavioural economists. Among the critics of the standard view, Herbert Simon takes a prominent place. He did not try to replace 'rational' economic man with an 'irrational' economic man. His aim was instead to redefine economic man as an agent that is still essentially rational, but who is limited in some way, such as having limited information or computational ability (Simon, 1955, 1956).

Behavioural economists have offered numerous examples of deviations from the standard model, which Della Vigna (2007) divides into three broad groups: non-standard preferences, non-standard beliefs, and non-standard decision-making. The concept of rational inattention falls into the third group – non-standard decision-making. Rationally inattentive agents recognise that gathering and processing information is costly, so they make rational decisions to limit the amount of time and money they allocate to the task (Della Vigna, 2007; Birchler and Bütler, 2007).

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<sup>27</sup> There is broad consensus that monetary policy affects the economy with long and variable lags, so monetary policy must be forward-looking.



Monetary models are continually being extended to improve their explanation of monetary policy's impact on the economy. These extensions have especially tried to grapple with uncertainty and learning. A great deal of research is going into explaining deviations from instantaneous market clearing and the assumption of perfect rationality. The Keynesian explanation for temporary deviations from market clearing, used extensively to estimate New Keynesian Phillips curves (NKPCs), is that prices are sticky as it is costly to adjust them (Calvo, 1983). Other leading explanations include Lucas's (1972) signal extraction problem and the learning literature (Sargent, 1993; Evans and Honkapohja, 2001; and others).

In this chapter, the behavioural economics concept of rational inattention is used to modify the standard models, with the objective of modelling the actual data more accurately. The aim of adopting a different model is to improve our description of the process by which inflation expectations are formed, in order to overcome some of the troubling weaknesses of current macroeconomics models, which will be explored further on.

At this point, it is important to distinguish the connotations of the term „rational inattention’ as used by the behavioural economists from that used in the monetary literature. In the behavioural economics literature, rational inattention refers to a deviation from the standard rational expectations model, and it acknowledges that due to the costs involved in accessing and processing information, it is rational for economic agents to limit the time and resources devoted to the task.

In the monetary literature, two new forms of incomplete information have been developed to introduce rigidity into the monetary models. Christopher Sims (2005, 2007) has adopted ideas from engineering communications theory to model his suggestion that people have limited capacity to process and transmit information. In his models, economic agents have *partial* information (they receive noisy information), and he calls this „rational inattention’. Although Sims’ rational inattention is intuitively appealing, the technical challenge of incorporating it into macroeconomic and financial models is substantial. Sims himself describes its progress as „modest’ (Sims, 2010: 38), although he remains positive about its future potential.

In contrast, Reis (2004) adopted the term „inattentiveness’ to describe his modelling of economic agents who have *delayed* information because they have many competing needs that they devote their time and resources to, and who optimally choose to update their

information only sporadically. This form of incomplete information was used by Mankiw and Reis (2001a, 2001b, 2006, 2007) in their „sticky information Phillips curve’ (SIPC) models, which were developed as an alternative to sticky price models. Far more progress has been made in incorporating „inattentiveness’ into macroeconomic models than Sims’s „rational inattention’. Mankiw and Reis (2007) had already offered a DSGE model in 2007, in which information about prices, wages and consumption are all sticky (pervasive stickiness) rather than only price information. Following the earlier argument that policy decisions cannot wait for perfect theory or models, and given the applied nature of this study, Mankiw and Reis’s „inattentiveness’ will be adopted in this chapter. The aim is to provide microfoundations for the estimation of the South African SIPC.

Mankiw and Reis (2001a, 2001b) claim that sticky information is more consistent than rational expectations with mainstream views about the actual dynamics of the macroeconomic variables inflation and unemployment. The idea of inattentiveness also has intuitive appeal in the South African context. Ehlers and Steinbach (2010) investigated the expectation formation processes of different economic groups in South Africa. They found that the groups neither employed fully rational nor fully adaptive behaviour. Rather, the different groups appeared to adopt different combinations of rational and adaptive behaviour, which Ehlers and Steinbach (2010: abstract) describe as „non-homogenous learning’. The characteristics of South Africa’s inattentive general public are explored further in section 2.2 before the theory is formalised in section 3. This chapter focuses on using inattentiveness as an alternative explanation for the non-homogenous formation of inflation expectations by different groups in the South African economy, in an attempt to address the concerns raised by Mankiw (as discussed in section 3).

#### *4.2.2. South Africa’s inattentive general public*

A comparison of the inflation expectations of the financial markets with those of the general public presented in section 4.1 and represented visually in Figure 4.1 (in section 4.4) in that section shows that the inflation expectations of these two groups converged under stable economic conditions and were particularly highly correlated between 2005 and mid-2008. It can be argued that under these conditions the inattentive public considers the costs of actively searching for and processing information greater than the benefits, as Cukierman (2007) suggested. However, the economic and political contexts within which monetary policy is

implemented in South Africa (and indeed worldwide) has become more volatile in recent years, and the inflation expectations of the two groups diverged after mid-2008. It is even less appropriate now to focus exclusively on the financial market's perceptions of the central bank's communications.

Over the past few years, the South African economic environment has exerted pressure on the inattentive public. Rising interest rates between mid-2006 and mid-2008, rapid increases in food and energy prices, and the impact of the global financial crisis are some of the main sources of this pressure. An implication of the heightened uncertainty and economic burden on the inattentive public is that the benefits of actively participating in the monetary policy debate are rising relative to the costs.

Concurrent political power struggles within the African National Congress (ANC), beginning with the dramatic resignation<sup>28</sup> of former South African president Thabo Mbeki, and an apparent shift in power within the ruling ANC toward the left have added to the uncertainty in the economic environment. These political shifts have led to substantial lobbying to change the monetary policy framework. The New Growth Plan, which was announced on 26 October 2010, gives credence to these concerns, as it explicitly calls for looser monetary policy. Debate around monetary policy is in itself something that should be encouraged, but statements by the opponents of inflation targeting often reflect a misunderstanding of monetary policy. In order for the proponents of the current monetary policy framework to present their case convincingly amid the increasing political pressure against the system, they need to learn to communicate with this audience more effectively. If the case for inflation targeting (and prudent monetary policy in general) is going to be made successfully, and monetary policy is going to be effective in a climate of increased public awareness, policy makers need to understand the inattentive general public. It would be useful to explore how this audience assimilates information about monetary policy and how the SARB can improve its communication with them.

This issue should be viewed within the context of a wider and older concern, which Arthur Burns in 1979 dubbed „the anguish of central banking’. Burns lamented the failure of central banks to control inflation in the 1970s, despite the fact they had both the tools and the desire

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<sup>28</sup> Pressure was put on Thabo Mbeki from within the ANC to resign as president of South Africa before the end of his term.

to do so. He argued that “worldwide philosophic and political trends” (Burns, 1979: 15) since the Great Depression had limited the „practical capacity’ for the central banks to limit inflation. Similarly, in research considering whether a strict policy rule could ensure the credibility of monetary policy, Ferguson and Schularick (2008) concluded that „economic and political instability’ in poor economies undermined the credibility of the countries’ commitment to the strict policy rule. Using the gold standard as a natural experiment, they created a large new dataset to investigate the extent to which industrial and developing countries had been able to build credibility under the strict monetary rule. They found that industrialised countries were much more successful in this regard because they were less vulnerable to political and economic shocks, and the markets had less reason to be concerned that the monetary policy rule would be abandoned.

In both the case of the inflation of the 1970s and the gold standard, it appears that the unfavourable political environment limited the freedom of policy makers to use the tools at their disposal. This highlights an even broader scope for communication as a modern monetary policy tool. If a central bank can build credibility in the minds of the electorate, it will face less opposition.

The intuition presented in section 4.2 will be formalised in the following section by presenting a theoretical model to capture these ideas.

### 4.3. Modelling the inflation expectations of the inattentive general public

Mankiw (2001: 52) laments that the NKPC “cannot come even close to explaining the dynamic effects of monetary policy on inflation and output”. He identifies three empirical findings that he believes highlight its failure. The NKPC predicts that when monetary policy is fully credible, a disinflation can cause an economic boom, which is at odds with experience; and it does not generate the inflation persistence that we observe in reality. But Mankiw argues that it is the implausible impulse response functions that illustrate the weakness of the NKPC most clearly. They are not able to simultaneously capture two things on which there is wide consensus within monetary economics – that monetary policy has a temporary effect on employment and a delayed and gradual effect on inflation. Mankiw and Reis’s (2001) proposal to model economic agents as „inattentive’ stems from their frustration

with the inability of the NKPC to adequately represent the monetary transmission mechanism.

Although a substantial amount of research has been dedicated to modelling a Phillips curve that explains the observed data well, most of this effort has been focused on modifying or extending the NKPC. Mankiw (2001) argues that these modifications do not solve the underlying deficiencies of the model in a satisfactory manner. For example, to introduce inflation persistence, Fuhrer and Moore (1995) added some backward-looking expectations, which are not grounded in solid theoretical foundations.

Instead, Mankiw and Reis (2001) proposed that the Phillips curve be modelled using sticky information rather than sticky prices. They proposed that sticky information was the result of the fact that the general public are inattentive to short-term changes in inflation and that they only update their inflation expectations periodically. However, they did not formalise their proposed microfoundations.

Research by Roberts (1997) did focus some attention on the microeconomic reasons for the failure of the NKPC to explain observations of the economy. He argues that there are two deviations from the standard New Keynesian model, either of which provides a way to address the problematic „disinflationary boom’ prediction. Roberts refers to past studies (Phelps, 1978; Taylor, 1983; Ball’ 1991; Fuhrer and Moore, 1992, 1995) which show that a sticky price model does not guarantee sticky inflation. As discussed earlier, it is possible in a New Keynesian model for an increase in inflation to have no impact on output, if the central bank is credible. Fuhrer and Moore (1995) showed that the assumption of sticky inflation was able to explain the observed data better than that of sticky prices (conditional on rational expectations). However, Roberts (1997) argues that similar results can be achieved by assuming sticky prices and imperfectly rational expectations. He evaluates these two hypotheses and concludes that it is preferable to adjust the assumption of rational expectations (1997), because survey evidence shows that inflation is not sticky and supports the hypothesis that inflation expectations are less than perfectly rational.

Building on this survey-based evidence of Roberts that expectations are less than rational (1997, 1998) and the claims of Mankiw and Reis (2001a, 2001b) that the sticky information models better explain some of the macroeconomic dynamics, Carroll (2001, 2003) proposed a

way to represent the microfoundations of the aggregate behaviour that the SIPC models are producing. He adopted epidemiological models, particularly for their approach to studying the spread of contagious diseases, to represent the dissemination of information about inflation throughout a population of economic agents.

According to Carroll (2001, 2003), of the entire audience with which the central bank communicates, only the professional forecasters (which constitute a small fraction of the public) form their own expectations. The rest of the public form their expectations based on the media's explanation of the professional forecasts. In effect, Carroll proposes that the manner in which the inattentive general public collect information about monetary policy can be modelled in the same probabilistic manner as people in a population contract a contagious disease. An epidemiological model is employed in this chapter to capture the actual behaviour of the inflation expectations of the inattentive general public in South Africa.

#### *4.3.1. Theoretical model*

In line with Carroll (2001, 2003), a „common source’ epidemiological model was adopted, which relies on the following assumptions. A person has a fixed probability of contracting a disease if exposed to it for a given period, and once infected, he or she never recovers. In addition, the „common source’ assumption implies that the disease is caught from a common source (such as a central air conditioner in a building), so the people in contact with this source have a constant probability of catching the disease. Carroll assumes that the inattentive public update their inflation and unemployment expectations periodically based on exposure to newspapers which report the expectations of the professional forecasters. The common source of information is the professional forecast reported in the newspapers, and information is transmitted through the economy in a sluggish fashion, based on the probability that people adjust their inflation expectations to align with the professional forecasts.

We assume that in each period  $t$ , each member of the general public (called a price setter in the model<sup>29</sup>)  $i$ , has a probability  $\lambda$ , of being exposed to the relatively more rational inflation

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<sup>29</sup> In the model, members of the general public are referred to as the price setters, to reflect that this group consists of the majority of the public (it excludes only the financial market), including the business sector that sets the prices of goods and services, and labour that influences the price of wages.

expectations of the financial analysts<sup>30</sup>, via a media report. Conversely, each price setter faces a probability  $(1-\lambda)$  of not being exposed to this information and therefore retaining his or her inflation expectations from period  $(t-1)$ . The mean inflation expectations of the price setters as a group in time  $t$  are determined by the mean inflation expectations of the financial analysts in time  $t$  and the weighted average of past inflation expectations of the price setters, as follows:

$$\pi_t^{e.PS} = \lambda \pi_t^{e.FA} + (1 - \lambda) \left\{ \lambda \pi_{t-1}^{e.PS} + (1 - \lambda) \left( \lambda \pi_{t-2}^{e.PS} + \dots \right) \right\} \quad \dots (4.1)$$

$\pi_t^{e.PS}$  and  $\pi_t^{e.FA}$  represent the mean inflation expectations of price setters and of financial market participants respectively, for the following year, beginning at time  $t$ . Intuitively, equation 4.1 states that the current mean of the expected inflation of price setters for the following year is equal to the mean current newspaper forecast for that period and the weighted average forecasts of the price setters for the same period, as forecast in previous periods. The probability that price setters in time  $t$  will update their inflation expectations to that of the financial analysts for the same period is captured by coefficient  $\lambda$ . In this simple model, all price setters who update their inflation expectations to those of the financial analysts keep them constant at the level they expected at the start of the period, so there is a probability  $(1-\lambda)$  that price setters maintain their expectations from the previous period.

This model could be extended to capture other sources of inflation information, such as media reports of past inflation figures or social interaction between price setters. The empirical results presented further on in this chapter support the view that past inflation does play a significant role in the formation of inflation expectations of the general public in South Africa (OECD, 2010). When past inflation is added to equation 4.1, there is a probability,  $\lambda$ , that the price setters will align (update) their inflation expectations to those of the financial analysts. If not, there is a probability,  $\delta$ , that they will be exposed to information about past inflation and will align their inflation expectations to this figure and a probability,  $(1-\delta)$ , that they will retain their inflation expectations from period  $t-1$ .

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<sup>30</sup> Ehlers and Steinbach (2010) found that the inflation expectations of the financial analysts are more rational than those of the business sector or the trade unions.

Given this description of the process by which price setters update their inflation expectations with information from the financial analysts (via newspapers) and past inflation figures, it is possible to estimate the speed at which they update their expectations. Rearranging the equations into the error correction form is a natural way to isolate information stickiness from the speed of adjustment coefficient, which is employed for the empirical estimation in section 6. The speed of adjustment parameter,  $\lambda$ , which lies between 0 and 1, is used throughout this chapter to represent information stickiness. It captures the speed at which the price setters update their inflation expectations or the proportion of price setters who update their inflation expectations each period. Therefore, a value of  $\lambda$  close to 1 represents a small degree of information stickiness, whereas a value close to 0 represents a large degree of information stickiness.

#### 4.4. The data

The dataset comprises four series: inflation, past inflation, the inflation expectations of financial analysts and the inflation expectations of price setters. The data is at a quarterly frequency and the small sample size of 40 observations (2000Q3 – 2010Q2) is limited by the availability of inflation expectations data. The Bureau for Economic Research (BER) began conducting inflation expectations surveys for the SARB from September 2000, with the objective of providing information for the implementation of inflation targeting, and there is no comparable inflation expectations data for the general public obtained before this survey.

Following an announcement by the Minister of Finance in October 2008, the SARB began, in January 2009, to use the CPI rather than the CPIX as its official proxy for inflation<sup>31</sup>. Between 2005 and 2008 steps had been taken to improve the CPI basket, and by 2009 it was deemed to be the most comprehensive measure of the cost of living in South Africa and a more appropriate official proxy of inflation (Statistics South Africa, 2009a; Statistics South Africa, 2009b). The changes made to the CPI included routine adjustments to reflect changes with respect to expenditure patterns, technology and tastes, but they also reflected a change in the way in which the costs of accommodation were recorded. In its previous form, the CPI

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<sup>31</sup> Various measures of the cost of living are calculated each month (for example CPI, CPIX and PPI). These are used as proxies for inflation, but the SARB recognises that inflation is not perfectly captured by any one price index and considers a number of them when making policy decisions (Mohr, 2008).



included interest rates on mortgage bonds, whereas in its new form, it adopts „owners’ equivalent rent’, which accounts for the rent foregone when a person lives in the house he or she owns. In this study, the focus is on inflation itself, and the series used as a proxy consists of the CPIX up to the end of 2008 and the CPI thereafter, which can be viewed as the „targeted price index’.

As a consequence of this change, the BER surveyed the expectations of the CPIX up to the end of 2008 and the CPI thereafter. However, it is argued here that both actual inflation and the inflation expectations series can be treated as continuous variables (expectations of the *targeted price index*), and this need not be treated as a structural break. This proposition was tested by visual inspection of the series (Figure 4.1), stability tests (CUSUM and CUSUMSQ tests) conducted on the models used later in the chapter, as well as by comparisons of the results of regressions that include only the sample up to the change of target variable<sup>32</sup>. This assumption does not appear to bias the results of this study.

The model variables are constructed so that each has a constant horizon of one year. Using a combination of the South African Reserve Bank Quarterly Bulletins and the Statistics South Africa CPI series, a real-time<sup>33</sup> inflation series with a horizon of one year was constructed. Each observation of the inflation series represents targeted inflation from time  $t$  to  $t+4$ . Similarly, the past inflation series is a series of real-time observations of past inflation from periods  $t-1$  to  $t-5$ .

The inflation expectations series had to be manipulated to have a constant horizon of 1 year. The BER administers the inflation expectations surveys of three economic groups – financial analysts, business representatives and trade unions. Each quarter, members of each of these groups are asked to predict what they expect annual inflation to be in the current year, the following year, and the year after that. Therefore, the horizons of the predictions change from quarter to quarter, and the inflation expectations with a 1-year horizon had to be constructed

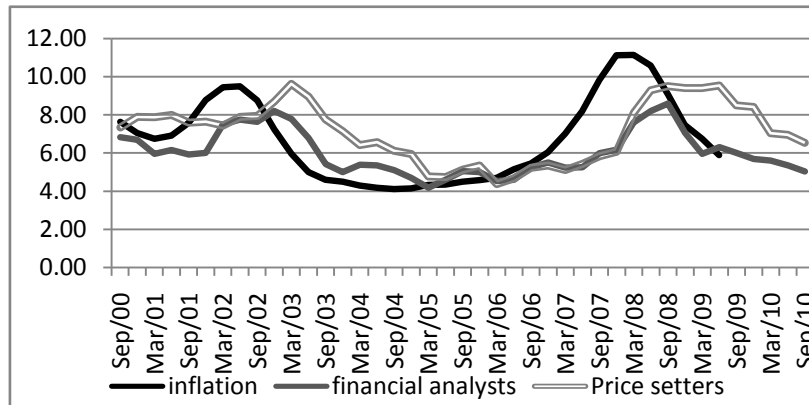
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<sup>32</sup> These results are available in Table A4.2 in appendix 4.2.

<sup>33</sup> To provide a more accurate representation of the economic decisions at the time, the data actually available in each period was collected. Final series for inflation, for example, those available on the SARB’s website, have often been revised as more information became available. To ensure that the real-time data was considered, the series were constructed by referring to the original CPI and CPIX data releases by STATSA, rather than to a final series.

from the original survey data<sup>34</sup>. These constant, 1-year horizon series are illustrated in Figure 4.1.

Figure 4.1: Inflation and inflation expectations



From Figure 4.1, it is clear that inflation leads the two inflation expectations series. It is interesting to note that the two inflation expectations series differ at the beginning of the sample (when inflation targeting was adopted) and slowly converge thereafter until they meet in mid-2005. They moved in concert between mid-2005 and mid-2008, and diverged again as economic pressures built domestically and the impact of the global financial crisis was felt. During times of uncertainty and economic instability, reliance on the inflation expectations of the financial analysts alone is a poor description of the inflation expectations of the broad South African public.

#### 4.4.1. Stationarity of the series

Before conducting any regression analyses the stationarity of the data series was investigated. Unfortunately, the small sample size available made it difficult to reach conclusions about the stationarity of the series. The augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests were used first, but the results were mixed (Table 4.1a). The ADF test is known to have low power, and the PP does not perform well in small samples (Davidson and MacKinnon, 2004).

<sup>34</sup>Crucially, in Q1 respondents are asked to forecast a larger proportion of the current year than in Q3 – the horizons of the forecasts change over the year. In order to construct a series with a constant one-year horizon, each quarter, a fraction of the current year is added to a fraction of the following year, depending on the quarter in which the survey is being conducted. For example, the one-year forecast in Q3 (for which the field work is conducted in August) consists of 25% of the current year's forecast and 75% of the following year's forecast.

Therefore Dickey Fuller Generalised Least Squares (DF GLS) and Ng-Perron tests were selected as they perform relatively better in small samples. These tests delivered robust results, suggesting that all the data series are stationary (Table 4.1b).

Table 4.1a: Augmented Dickey Fuller and Phillips Perron tests for data stationarity

Variables	ADF		PP		
	Levels	First difference	Levels	First difference	Second difference
$\pi_t^{c,FA}$	-2.531	-4.278***	-1.758	-4.103 ***	
$\pi_t^{c,PS}$	-1.883	-3.930 ***	-1.637	-3.930 ***	
$\pi_t$	-3.133 **		-1.830	-3.771 ***	
$\pi_{t-1}$	-3.577 ***		-1.744	-2.197	-3.795 ***

Note: Intercept, no trend. \*\*\*, \*\* and \* indicate that the statistics are significant at the 1%, 5% and 10% levels. The first column for each test shows the results of the test in levels. When this first statistic is insignificant, the result of the test in first differences is shown in the second column, and in second differences in the third column.

Table 4.1b: Dickey Fuller GLS and Ng-Perron tests for data stationarity

	DF-GLS	Ng-Perron			
		MZa	MZt	MSB	MPT
<b>Inflation</b>	-2.444**	Reject	Reject	Reject	Reject
<b>FA</b>	-1.884*	Reject	Reject	Reject	Reject
<b>PS</b>	-2.796 ***	Reject(5-10%)	Reject(5-10%)	Reject(5-10%)	Reject(5-10%)
<b>Past infl</b>	-2.668 ***	Reject	Reject	Reject	Reject

Note: Intercept, no trend. \*\*\*, \*\* and \* indicate that the statistics are significant at the 1%, 5% and 10% levels. The first column for each test shows the results of the test in levels. When this first statistic is insignificant, the result of the test in first differences is shown in the second column.

These stationarity test results should be considered in the context of a long debate in the literature about whether inflation is stationary. Juselius (2006) warns against treating stationarity as a property of a variable, but as a sample property instead. She suggests modelling inflation as an I(1) variable to allow the persistent and less persistent components of the variables to be identified by the technique. These conflicting results for the unit root tests are taken into account when selecting the modelling techniques in for the formal analysis that follows in sections 5 and 6.

#### 4.5. The dissemination of inflation information

Before attempting to estimate information stickiness, it is sensible to establish whether inflation information disseminates from the economy to the financial analysts to the price setters as hypothesised. This is necessary to justify the adoption of epidemiological models to represent the spread of inflation information. Visual inspection of the inflation and inflation expectations series in Figure 4.1 shows that adjustments in the inflation series are followed by similar but lagged adjustments to the inflation expectations of the financial analysts, followed by those of the price setters.

A simple contemporaneous pairwise correlation matrix also offers insight into the degree to which these different data series „share information’. Two features stand out. Firstly, the results in the top row of Table 4.2 reveal that the contemporaneous inflation expectations of financial analysts correlate with actual inflation to a much greater extent (0.684) than the inflation expectations of price setters do (0.400). Secondly, the contemporaneous correlation between the inflation expectations of financial analysts and price setters is strong (0.774).

Table 4.2: Contemporaneous pairwise correlation matrix

	<b>Inflation</b>	<b>Price Setters</b>	<b>Financial Analysts</b>
<b>Inflation</b>	1.000	0.400	0.684
<b>Price Setters</b>	0.400	1.000	0.774
<b>Financial Analysts</b>	0.684	0.774	1.000

Granger causality tests (Table 4.3) were used to investigate whether adjustments in one of the variables was informative about the likely future movements in the other variable. Although Granger causality does not prove that movements in the first variable induced particular movements in the second, it does show that they happened prior to and helped to forecast changes in the second. The hypothesis that the inflation expectations of price setters do not Granger cause the inflation expectations of financial analysts cannot be rejected for either 2 or 3 lags, and it is marginal for 1 lag. In contrast, the hypothesis that the inflation expectations of financial analysts do not Granger cause the inflation expectations of price setters is rejected at the 5% level of significance for lag lengths 1 to 3.

Table 4.3: Granger causality tests

Hypothesis	Probability (1 lag)	Probability (2 lags)	Probability (3 lags)
$\pi_t^{e.PS}$ does not Granger cause $\pi_t^{e.FA}$	0.088	0.724	0.584
$\pi_t^{e.FA}$ does not Granger cause $\pi_t^{e.PS}$	0.000	0.011	0.025

Therefore, exploratory data analysis provides preliminary evidence that there is „shared information’ between the three series and that changes in inflation tend to occur first, followed by similar adjustments in the inflation expectations of the financial analysts, followed by those of the price setters; hence, changes in the inflation expectations of financial analysts do help to predict changes in those of the price setters.

Finally, an examination of the forecasting accuracy of the two inflation expectations series can provide insight into which group is better able to use successfully the information they have at their disposal. The aim is not to test the rationality of the inflation expectations series, but rather to determine which is *relatively* more rational.

One way of evaluating the precision of the forecasts is by minimising the root mean squared error (RMSE) (Pindyck and Rubinfeld, 1998). This criterion compares the forecasted series with the actual series and allows the researcher to compare the ability of the two inflation expectations series to predict inflation. The RMSE is lower for the inflation expectations of the financial analysts than for the price setters, suggesting that financial analysts forecast with greater precision (Table 4.4).

Table 4.4: RMSE

	RMSE
$\pi_t^{e.FA}$	1.70
$\pi_t^{e.PS}$	2.16

In conclusion, financial analysts not only adjust their inflation expectations quicker, but more accurately than price setters. None of the exploratory data analyses discredit the proposed hypothesis about the spread of inflation information through the economy.

#### 4.6. Information stickiness

In this section, South African survey data is applied to an epidemiological model, to estimate how quickly South African price setters update their inflation expectations. This provides an estimate of information stickiness.

A correlation matrix (Table 4.5) is again adopted to examine the extent to which the inflation expectations of financial analysts, the inflation expectations of price setters and past inflation share information. We established in the previous section that there is a strong correlation between the inflation expectations of the financial analysts and the price setters, so what is interesting in this matrix is the exploration of the relationship between past inflation (average realised inflation over the past year) and each inflation expectations series (inflation expectations for the following year). This provides a first indication of the extent to which the inflation expectations of the group is backward-looking versus the degree to which the group looks to other (unspecified) sources of information to form its views.

Table 4.5: Pairwise correlation matrix

	<b>Financial Analysts</b>	<b>Price Setters</b>	<b>Past Inflation</b>
<b>Financial Analysts</b>	1.000	0.772	0.585
<b>Price Setters</b>	0.772	1.000	0.927
<b>Past Inflation</b>	0.585	0.927	1.000

The correlation between past inflation and the financial analysts is 0.585 and that between past inflation and the price setters is 0.927, which indicates that price setters rely to a much greater extent on past inflation than financial analysts do. By deduction, financial analysts use sources of information other than past inflation to a greater extent in the formation of their expectations. These correlations also suggest that it is important to include past inflation in a regression that attempts to explain the inflation expectations of the price setters, as will be done in the following section.

##### *4.6.1. Regression analysis*

Carrol (2002, 2003) estimated information stickiness for the US as approximately 0.27, using single equation models of the form implied by the epidemiological models he had proposed.

This allowed him to test restrictions using Wald tests such as  $\pi_t^{e,FA} + \pi_{t-1}^{e,PS} = 1$ , in order to examine the ability of the model to explain the actual data. His results were supportive of the model. Table 4.6, below, offers a brief summary of Carroll’s (2001, 2003) results, based on the following equation:

$$\pi_t^{e,PS} = \beta_0 + \beta_1 \pi_t^{e,FA} + \beta_2 \pi_{t-1}^{e,PS} + \beta_3 \pi_{t-1} + \epsilon_t \quad \dots (4.2)$$

Table 4.6: Carroll’s (2001) estimation of information stickiness for the US

Equation	$\beta_0$	$\beta_1$	$\beta_2$	$\beta_3$	$\overline{R^2}$	Durbin Watson	Std Err	Test
								p-value
1		0.36***	0.66***		0.76	1.97	0.43	$\beta_1 + \beta_2 = 1$ 0.178
2		0.27***	0.73***		0.76	2.12	0.43	$\beta_1 = 0.25$ 0.724
3	1.26***	0.50***	0.25**	0.01	0.84	1.72	0.35	$\beta_3 = 0$ 0.814

*NOTE: The results in this table correspond to equation 4.2 in the text above. Columns 2-5 report the coefficient values for different versions of the equation, and \*\*\* and \*\* indicate that these coefficients are significant at the 1% and 5% levels. Columns 6-8 report some diagnostics for each model, and column 9 the results of Wald tests (with the relevant p-values in brackets).*

Starting with model 1 (row 1 of Table 4.6), Carroll estimated the proportion of the inflation expectations of price setters in period t that could be explained by the inflation expectations of the financial analysts in period t, and the proportion explained by their own inflation expectations in the previous period. The sum of coefficients  $\beta_1$  and  $\beta_2$  is close to 1, and the Wald test conducted to test this formally (reported in the final column) cannot be rejected. Given these promising results, Carroll restricted the sum of the 2 coefficients to 1 and re-estimated the equation, which yielded an estimate of 0.27 for information stickiness. He also tested whether the inclusion of a constant and past inflation improved the fit of the model and found that only the constant had important explanatory power. He interpreted this as a sign that social interaction between price setters was important in the formation of their inflation expectations, while past inflation was not.

However, Carroll did not report any tests of weak exogeneity or comprehensive model diagnostics to support the appropriateness of his choice to use a single-equation model. In addition, the speed of adjustment (information stickiness) is easy to interpret when there are only two regressors (the inflation expectations of financial analysts and those of the price setters), but when the model is extended to include past inflation, for example, the speed of

adjustment is better estimated directly using a model in the error-correction form. Models of the kind used by Carroll were estimated for South Africa and are available in Table A4.1 in Appendix 4.1, but there was concern that the model variables were nonstationary, which would have undermined the results.

Peraran et al. (1999) suggested that the error-correction form of the ARDL model offers a number of advantages when modelling series that are potentially nonstationary. The ARDL method avoids uncertainty surrounding the order of integration of data series, as the variables included in the model can be  $I(0)$ ,  $I(1)$ , or cointegrated (Pesaran et al., 1999), and the method allows long-run and short-run components of the data to be estimated simultaneously. Peraran et al. (1999) developed the bounds test as a means to test for cointegration within the ARDL model, and Narayan (2004) went on to use Pesaran et al.'s (1999) programming code to estimate critical F-statistics for sample sizes between 30 and 80 observations, improving the accuracy of the results when using small samples.

A weakness of the ARDL method is that it assumes by construction that only one variable is not weakly exogenous. Therefore, it is vulnerable to the incredible restrictions of which Sims (1980) warned. In this regard, the VECM approach is favourable, although relies on pretesting. There remains uncertainty about whether the regression variables are  $I(1)$  or  $I(0)$ , but it is likely that they are integrated of the same order, given the very similar patterns of the series (Figure 4.1), which enable the use of the VECM. In addition, Juselius (2006) recommended treating inflation as an  $I(1)$  variable, despite the debate in the literature.

Given the uncertainty about the stationarity of the model variables and whether each is weakly exogenous, both the VECM and the ARDL models were used and their results compared in order to help identify any lack of robustness. Firstly, the interaction between the inflation expectations of price setters and financial analysts was modelled using a VECM (model 5 in column 2 of Table 4.7). The Johansen cointegration technique indicated that there is one cointegrating relationship, and LR tests concluded that  $\pi_t^{e,FA}$  is weakly exogenous (row 2). Therefore, only  $\pi_t^{e,PS}$  responded to disequilibrium between the two variables in the previous period. The results of the cointegrating equation (the long-run relationship) for model 5 (reported in the 4th row) are questionable. This may be the consequence of the fact that the VECM suffers from omitted variable bias through the omission of past inflation,



which according to the exploratory data analysis, plays such a substantial role in explaining the inflation expectations of price setters.

Table 4.7: Weak exogeneity and VECM results

Model	Model 5	Model 6	
Variables	$\pi_t^{e,FA}$ $\pi_t^{e,PS}$	$\pi_t^{e,FA}$ $\pi_t^{e,PS}$ $\pi_{t-1}$	
LR test stat	$\alpha_{FA}=0: \lambda = 0.094$ $\alpha_{PS}=0: \lambda = 13.152$	$\alpha_{FA} = 0: \lambda = 0.608$ $\alpha_{PS} = 0: \lambda = 0.036$ $\alpha_{\pi_{t-1}} = 0: \lambda = 15.776$	$\alpha_{\pi_{t-1}\&FA} = 0: \lambda = 2.478$ $\alpha_{\pi_{t-1}\&PS} = 0: \lambda = 4.448$ $\alpha_{\pi_{t-1}} = 0: \text{imposed}$
Weakly exog variables	$\pi_t^{e,FA}$	$\pi_t^{e,PS}$ $\pi_t^{e,FA}$	$\pi_{t-1}$ (imposed) $\pi_t^{e,FA}$
<u>Cointegrating Eq.</u>	D(PS) 1.000 FA(-1) -1.747*** Past Infl(-1) NA C 3.493***	D(PS) 1.000 -0.648*** -0.531*** -0.367	
<u>Speed of adjustment</u>	D(PS) -0.425*** D(FA) Set to 0.000 D(Past infl) NA	-0.690*** Set to 0.000 Set to 0.000	
<u>Short-run coefficients</u>	D(PS(-1)) 0.012 D(FA(-1)) -0.041 D(Past Inflation(-1)) NA D(PS(-2)) -0.123 D(FA(-2)) -0.221	0.218 0.221 -0.004	
<u>Model diagnostics</u>	Observations 37 $\chi_{JB}$ 0.496 LM stat $_{AC(2)}$ 0.781 $\chi$ stat $_{W,HS}$ 0.804 Q stat $_{PORTMANTEAU(2)}$ 0.533	38 0.951 0.442 0.534 0.488	

Note: \*\*\*, \*\* and \* indicate that coefficients are significant at the 1%, 5% and 10% levels. Values reported in the final horizontal section of the table are the p-values of the diagnostic tests.

Model 5 was then re-estimated in the ARDL-ECM form (column 2 of Table 4.9). Given the result from the VECM that  $\pi_t^{e,FA}$  is weakly exogeneous in this model, the ARDL form is well justified in this case. In order to estimate the ARDL in its error correction form, which is necessary to isolate the speed of adjustment parameter, the long-run equation was estimated first (row 2). The coefficient on  $\pi_t^{e,FA}$  is far more reasonable than the coefficient in the cointegrating equation of the VECM, despite the fact that past inflation is still not included in

the model. The full ECM-ARDL was then employed, where the speed of adjustment coefficient, representing information stickiness, was estimated to be 0.311. This estimate differs quite substantially from that of the VECM, which raises concern about its robustness.

The second model used to estimate information stickiness was model 6, which is an extension of model 5 in that past inflation was included, prompted by the findings of the exploratory data analysis. A single cointegrating relationship was again identified by the Johansen technique, but this time both  $\pi_t^{e,PS}$  and  $\pi_t^{e,FA}$  were classified as weakly exogenous, leaving past inflation as the dependent variable. This is not sensible because past inflation is predetermined, but in order to check that it was not, the forward-looking nature of inflation that was causing the result, past inflation was lagged progressively further into the past, and the relationship was retested. It was only after a lag of 6 or 7 quarters that  $\pi_t^{e,FA}$  and  $\pi_t^{e,PS}$  started to react to changes in past inflation, which is not reasonable.

Therefore, past inflation was modelled as weakly exogenous and then the other two variables were again tested for weak exogeneity, conditional on the weak exogeneity of past inflation. In this case,  $\pi_t^{e,FA}$  is weakly exogenous and  $\pi_t^{e,PS}$  is identified as the dependent variable. The results for the VECM, estimated under this assumption, are reported in column 3 of Table 4.7. The long-run coefficients on  $\pi_t^{e,FA}$  and  $\pi_{t-1}$  reflect that both these variables play a sizeable and significant role in determining  $\pi_t^{e,PS}$  in the long run, and the estimated speed at which the inflation expectations of the prices setters was updated is 0.690.

Döpke et al. (2008) estimated information stickiness for France, Germany, the UK and Italy, and found that information stickiness for Italy was between 0.5 and 0.6, while those of the other three countries ranged between 0.15 and 0.3. They argued that the level and uncertainty of inflation in Italy was much higher than in the other three and that it was therefore reasonable to expect inflation expectations to be less anchored. In order to explore this claim, OECD inflation data for the period studied by Döpke et al. (2008) was analysed (4.8). The mean for inflation in Italy is indeed about 50% higher than that of the other three countries in the study, although the standard deviation is not higher for the period. However, what are not observable from this data are the institutional features of the central banks in each of these countries and the level of credibility they have built over time. It is reasonable to suggest that in a country where the risks of inflation are greater, it is rational for the general public to pay

more attention to developments in inflation and therefore to adjust their inflation expectations more rapidly. This reasoning is clearly in line with the higher estimate of information stickiness that was found for South Africa. The mean and standard deviation of inflation (for the sample period used to estimate South African information stickiness) are both clearly much higher than for the other four countries.

Table 4.8: Comparison of inflation characteristics in France, Germany, UK, Italy and South Africa

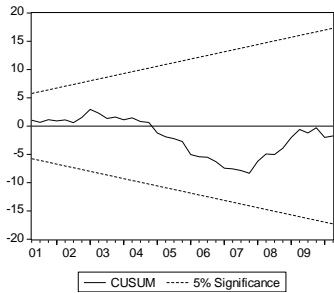
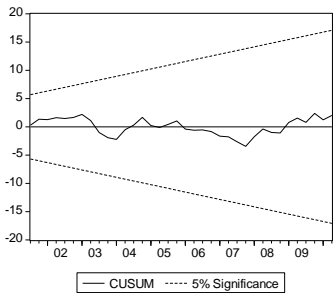
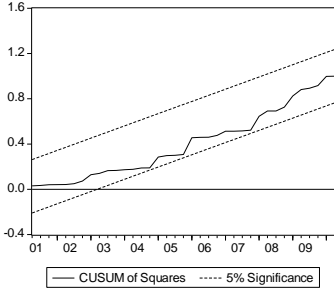
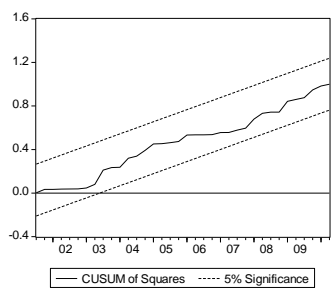
	Mean	Standard Deviation
<b>France</b>	1.701	0.621
<b>Germany</b>	2.094	1.420
<b>UK</b>	1.990	1.235
<b>Italy</b>	3.245	1.320
<b>South Africa</b>	5.495	3.694

Source: OECD (2011)

Note: The data sample periods for France, Germany, the UK and Italy is 1991Q4-2004Q4 (in line with the Döpke et al. (2008) study), whereas the data for South Africa is for the period 2000Q3-2010Q4. This was done in order to use the same data period as that used to estimate the information stickiness for each country.

Model 6 was then represented in the ARDL-ECM form, the results of which are reported in row 3 of Table 4.9. The results of this ARDL model are close to that of the VECM, with the speed of adjustment coefficient 0.679, compared with 0.690 from the VECM, and the long-run coefficient on past inflation was estimated to be only 0.044 higher. However the coefficient on  $\pi_t^{e,FA}$  did drop by 0.125, which changed the relative importance of  $\pi_t^{e,FA}$  and  $\pi_{t-1}$  in the long run  $\pi_t^{e,PS}$ .

Table 4.9: ARDL models

Model	Model 5	Model 6
Variables	$\pi_t^{e.FA}$ $\pi_t^{e.PS}$	$\pi_{t-1}$ $\pi_t^{e.FA}$ $\pi_t^{e.PS}$
<u>Long run Eq</u>	(Dep: PS)	(Dep: PS)
C	0.671	-
FA(-1)	1.068***	0.535***
Past Infl(-1)	NA	0.575***
<u>ECM-ARDL model</u>		
EC term	-0.311***	-0.685***
D(FA)	0.433***	0.544***
D(Past infl)	NA	0.432***
<u>Model diagnostics</u>		
Observations	39	39
$\chi^2_{JB}$	0.879	0.356
F stat <sub>BG,AC</sub>	0.244	0.860
F stat <sub>w,HS</sub>	0.197	0.028
F stat <sub>LM,ARCH</sub>	0.633	0.675
F stat(1) <sub>Ramsey Reset</sub>	0.176	0.380
CUSUM test		
CUSUMSQ test		

Note: The first horizontal section of the table indicates which variables are included in each model; the second reports the coefficients in the long-run equation of the ARDL model, and the third reports the results in the final ECM-ARDL model. \*\*\*, \*\* and \* indicate that these coefficients are significant at the 1%, 5% and 10% levels. Values reported in the final horizontal section of the table are the p-values of the diagnostic tests.

A range of diagnostic tests are reported for these ARDL models. The only result which raises any concern is that there is heteroskedasticity in model 6. This will not bias the coefficients, but will affect the standard errors. The model was re-estimated in two ways to confirm the results are still robust. Firstly, HAC standard errors were used and all the coefficients were still significant at the 1% level. Secondly, an ARCH model<sup>35</sup>(see Appendix 4.3 for results) was estimated, and the results were very close to those of the ARDL model, confirming that the results of ARDL model 6 are robust.

Modelling inflation expectations using a maximum of 40 survey-based observations is challenging. This difficulty was anticipated, and mentioned in the introduction to this chapter as the main reason that studies of this nature are limited. The VECM and ARDL models above offer reasonable estimates of South African information stickiness, supporting an estimate of between 0.65 and 0.70. Finally, agent-based models are used in the following section to approach an estimation of sticky information from the opposite direction and to test the robustness of these results.

#### 4.6.2. *Agent-based models*

According to Tesfatsion (2006: 863, italics added), “The defining characteristic of ACE (*agent-based computational economics*) models is their constructive grounding in the interactions of agents, broadly defined to include economic, social, biological, and physical entities.” Crucially for this study, agent-based models begin at the disaggregated level. Given some real-world data, initial conditions for the inflation expectations of the price setters, and algorithms to describe their decision-making process, the interaction of the agents yields the simulated aggregate economic outcome. The aim of using an agent-based model in this chapter was to assess whether the theory proposed to explain the formation of inflation expectations by the price setters is able produce an inflation series similar to that observed in reality.

Matlab was used to simulate an inflation expectations series for the price setters in aggregate ( $\pi_t^{e.PS}$ ), as illustrated in Figure 4.2. Beginning at the disaggregated level, 10 000 price setters (i) were created. At time period  $t=1$ , each price setter sets his inflation expectations

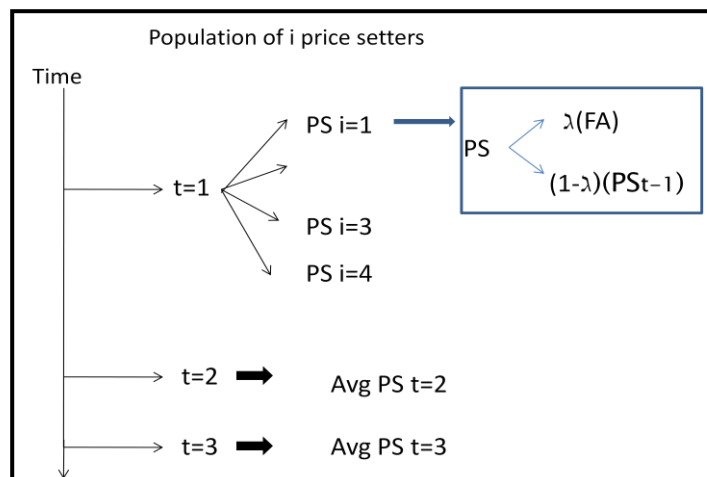
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<sup>35</sup> The ARCH model is only reported in Table A4.3 in the appendix as the VECM and ARDL models are more appropriate for this study (as discussed in the text).

based on the decision rule described in the theoretical model. Each price setter has a probability ( $\lambda$ ) of updating his inflation expectations to those of the financial analysts (observed real-world data for the inflation expectations of financial analysts) and a probability of  $(1-\lambda)$  of retaining his own inflation expectations (the initial conditions set)<sup>36</sup>. If the price setter does not update his expectations to those of the financial analysts, he also has a probability  $\delta$  of adjusting his expectations in line with past inflation (observed real-world past inflation data), and a probability  $(1-\delta)$  of retaining his own inflation expectations from the previous period. When a price setter updates his inflation expectations based on past inflation, it is assumed that he read the past inflation figures in a newspaper and updated his expectations based on this information.

Once each price setter has made his decision in period 1, the average inflation expectation of the 10 000 price setters is calculated, and this becomes the first observation of the simulated  $\pi_t^{e.PS}$  series. This is repeated for time periods  $t=1-40$  and yields a simulated series of inflation expectations for the price setters in aggregate.

Figure 4.2: The simulated model



<sup>36</sup> The inflation expectations of individual agents update separately, so the Matlab code keeps track of the inflation expectations of each price setter at each period. After the first time period, a decision by a price setter to retain his past inflation expectation means that a particular price setter retains the inflation expectation he had in the previous period.

The simulated series can then be compared with the observed series to help judge the extent to which the theory can model the actual inflation expectations of the price setters that are observed.

The results of the VECM and ARDL models used to estimate information stickiness in section 5, were used as a benchmark for setting the values of  $\lambda$  and  $\delta$  used in the decision-making algorithm of the price setters. Values of 0.37 for  $\lambda$  and 0.70 for  $\delta$  were selected as the starting points. The sensitivity of these two parameters were tested by varying the levels of each and then a range rather than a point was considered for each in order to test for heterogeneity.

The results of this sensitivity analysis are reported in Table 4.10. In each row, the values of  $\lambda$  or  $\delta$  are adjusted. Each row shows the results of the regression of a simulated series of  $\pi_t^{e,PS}$  on the actual observed  $\pi_t^{e,PS}$  series. The values of  $\lambda$  and  $\delta$  set are reported in columns 2 and 3. The estimated coefficient on the actual (true)  $\pi_t^{e,PS}$  in column 4 and the R-squared of the regression in column 5 are then used to judge the degree to which the simulated series matches the true series.

However, all the inflation expectations series are integrated of order 1, so there is a possibility that the regression results could be spurious. Therefore, the Engel-Granger test was used to establish whether the stimulated and actual inflation expectations series in each model are cointegrated. The results of this test for each of the models 1 to 10 are presented in column 6. Cointegration is found in all 10 models, confirming that the regression results are not spurious and allowing further comparison of the models.

Table 4.10: Agent-based model results

Model	$\lambda$	$\delta$	Coefficient (Actual PS)	R-squared	Test for cointegration
<b>Testing lambda (level)</b>					
1	0.31	0.70	0.915	0.934	Cointegrated
2	0.37	0.70	0.911	0.937	Cointegrated
3	0.43	0.70	0.907	0.934	Cointegrated
<b>Testing lambda (heterogeneity)</b>					
4	0.32-0.42	0.70	0.911	0.937	Cointegrated
5	0.27-0.47	0.70	0.911	0.937	Cointegrated
<b>Testing gamma (level)</b>					
6	0.37	0.60	0.906	0.937	Cointegrated
7	0.37	0.65	0.909	0.938	Cointegrated
2*	0.37	0.70	0.911	0.937	Cointegrated
8	0.37	0.75	0.913	0.936	Cointegrated
<b>Testing gamma (heterogeneity)</b>					
9	0.37	0.60-0.80	0.911	0.937	Cointegrated
10	0.37	0.50-0.90	0.910	0.938	Cointegrated

Note: Models 1-3 test the level of lambda and 4-5 the heterogeneity of lambda. Models 6-8 test the level of gamma, and 9-10 the heterogeneity of gamma. Note that model 2 is inserted a second time (between models 7 and 8) to ease comparison, but the model has not changed in any way.

Model 2 tested the fit of the simulated series when  $\lambda$  was set at 0.37 and  $\delta$  at 0.70<sup>37</sup>, and then the value of  $\lambda$  was adjusted upwards and downward in models 1 and 3<sup>38</sup>. Both the coefficient and the R-squared values are very high, suggesting that the simulated series is very close to the real series. The move upward to 0.43 delivered a poorer fit, but the adjustment downward to 0.31 gave an ambiguous result. In summary, it appears that a value for  $\lambda$  of approximately 0.31 to 0.35 is reasonable. Models 4 and 5 consider the impact of assuming that price setters have a narrow and then a wider range of  $\lambda$ s (heterogeneity). Intuitively, this tests whether an assumption that the  $\lambda$ s of the price setters within a range offers a superior description of their inflation expectations. There was no sign of improvement by adding heterogeneity. Next, the

<sup>37</sup>  $\lambda$  is set at 0.37 as this is midway between the two estimates of the speed of adjustment in model 5, and  $\delta$  is set at 0.70 as both speed of adjustment estimates for model 6 are close to 0.7.

<sup>38</sup>  $\lambda$  is adjusted 0.06 upward and downward in order to consider both the VECM and ARDL speed of adjustment estimates for model 5 in section 5.



initial level of  $\delta$  was adjusted upwards and downwards in models 6 to 8. Notice that model 2, with the original benchmark values of  $\lambda$  and  $\delta$ , is repeated in this section of the table to facilitate comparison. Lowering  $\delta$  from 0.70 to 0.65 did not offer a clear improvement, but a further adjustment to 0.60 reduced the model's fit. The adjustment of  $\delta$  upward produced an ambiguous result. In summary, the value of  $\delta$  appears to be approximately between 0.65 and 0.70. Finally, models 9 and 10 tested the impact of assuming that price setters have a range of different values for  $\delta$ . Again, even when a high level of heterogeneity is assumed, the results were almost unchanged, so the simpler model that does not include this heterogeneity is favoured.

In conclusion, the best estimates from the model are that  $\lambda$  is approximately 0.31 to 0.37 and  $\delta$  approximately 0.65 to 0.7. These ranges include the original values selected from the VECM and ARDL models and are not wide. Therefore, the agent-based models offer further support for the earlier estimates of information stickiness.

#### 4.7. Conclusion

This chapter explores the process by which South African price setters form inflation expectations. The aim is to understand this process better in order to communicate effectively with the general public as a group separate from financial analysts. Exploratory data analyses revealed that financial analysts adjust their inflation expectations quicker and more accurately than price setters. Then, survey data was applied to an epidemiological model (following the approach of Carroll (2001, 2003)) to model the dissemination of information about inflation through the South African economy and estimate information stickiness. Given the characteristics of the data and the nature of the research question, a combination of estimates of information stickiness from VECM and ARDL models were considered and an estimate of between 0.65 and 0.70 was accepted. Finally, agent-based models were adopted to approach the estimation of information stickiness from the disaggregated level upward and to test the robustness of the results. The agent-based models provided support for the earlier estimates.

## Appendix 4.1: Single equation model for South Africa

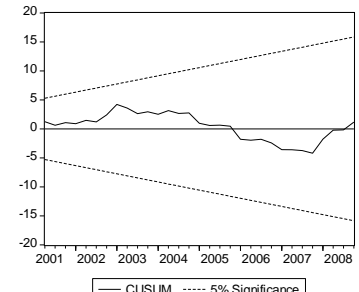
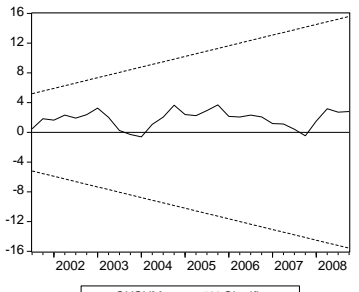
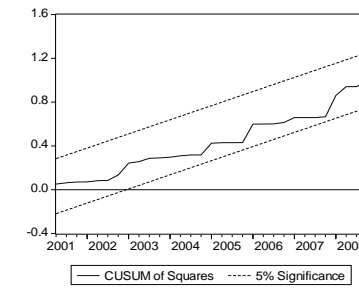
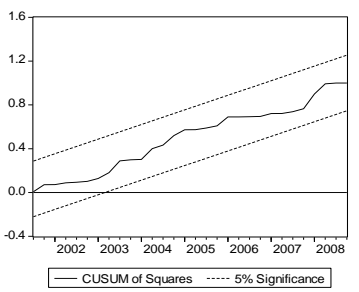
Table A4.1: Results for single equation models for South Africa  
(based on Carroll, 2001, 2003)

Eq	$\beta_0$	$\beta_1$	$\beta_2$	$\beta_3$	$\overline{R^2}$	DW	Std Err	Test
								p-value
1		0.418***	0.649***		0.919	1.727	0.450	$\beta_1 + \beta_2 = 1$ (0.000)
2	-0.317	0.473***	0.368***	0.293***	0.949	1.935	0.374	$\beta_1 + \beta_2 = 1$ (0.248) $\beta_1 + \beta_2 + \beta_3 = 1$ (0.030) $\beta_3 = 0$ (0.004)
3		0.444***	0.309***	0.336***	0.945	1.814	0.372	

*Note: The results in this table correspond to equation 4.2 in the text. Columns 2-5 report the coefficient values for different versions of the equation and \*\*\* and \*\* indicate that these coefficients are significant at the 1% and 5% levels. Columns 6-8 report some diagnostics for each model, and column 9 reports the results of Wald tests (with the relevant p-values in brackets).*

Appendix 4.2: ARDL models

Table A4.2: ARDL models (2000-2008)

Model	Model 5	Model 6
Variables	$\pi_t^{e.FA}$ $\pi_t^{e.PS}$	$\pi_{t-1}$ $\pi_t^{e.FA}$ $\pi_t^{e.PS}$
<u>Long run Eq</u>	(Dep: PS)	(Dep: PS)
C	0.273	NA
FA(-1)	1.092***	0.603***
Past Infl(-1)	NA	0.502***
<u>ECM-ARDL model</u>		
EC term	-0.415***	-0.640***
D(FA)		
D(Past infl)	0.453*** NA	0.568*** 0.429***
<u>Model diagnostics</u>		
Observations	33	33
$\chi_{JB}$	0.928	0.443
F stat <sub>BG,AC</sub>	0.139	0.418
F stat <sub>w,HS</sub>	0.314	0.318
F stat <sub>LM,ARCH</sub>	0.721	0.634
F stat(1) <sub>Ramsey Reset</sub>	0.147	0.276
CUSUM test		
CUSUMSQ test		

Note: The first horizontal section of the table indicates which variables are included in each model; the second reports the coefficients in the long-run equation of the ARDL model, and the third reports the results in the final ECM-ARDL model. \*\*\*, \*\* and \* indicate that these coefficients are significant at the 1%, 5% and 10% levels. Values reported in the final horizontal section of the table are the p-values of the diagnostic tests.

## Appendix 4.3: ARCH model

Table A4.3: ARCH model

	<b>Variables</b>	<b>Coefficient Values</b>
<b>Primary Equation</b>	D(FA)	0.507***
	D(Past Infl)	0.445***
	EC Term (-1)	-0.695***
<b>Variance Equation</b>	C	0.014
	GARCH (-1)	0.909***

*Note: \*\*\*, \*\* and \* indicate that these coefficients are significant at the 1%, 5% and 10% levels.*

## 5. SUMMARY

### 5.1. Introduction

Monetary policy is implemented in a strategic setting, between agents who are responsive to one another's actions because they impact on one another's utility. This mainstream view emerged as a result of both developments in the academic literature and practical experience since the 1970s. Once the strategic nature of monetary policy was understood, central banks were encouraged to become substantially more transparent and to make policy decisions in a more predictable manner. Greater predictability enhances coordination between the central bank and the public, benefitting both sides. The central bank builds credibility and improves the effectiveness of monetary policy, while its audience makes better economic decisions given clearer information about monetary policy.

Recognition of this strategic setting has influenced the modern approach to monetary policy. For monetary policy to be effective, it must affect interest rates at all horizons along the yield curve in order to influence the full range of economic decisions. Unfortunately, policy makers can only directly affect the short-term interest rate. However, the logic of the Fisher equation (that the nominal interest rate consists of the real interest rate plus inflation expectations) reveals that nominal interest rates can be influenced at longer horizons by managing inflation.

The desire to improve monetary policy effectiveness by managing inflation expectations in this strategic setting has promoted the role of communication as a monetary policy tool. An extensive literature has resulted, but it has focused mainly on the interaction between central banks and the financial markets, with little research dedicated to communication with the general public. Although financial analysts do influence the inflation expectations of the rest of the private sector, there is potentially considerable scope to improve the central bank's communication by studying the characteristics of the general public and how they form their inflation expectations. This dissertation aims to extend the academic literature by studying the communication of the SARB with the general public, who are responsible for the majority of the price and wage decisions which determine the inflation rate in the South African economy.

The general public is presented as being rationally inattentive to central bank communication, especially when the economic environment is stable and the central bank is credible, as it is costly to gather and interpret information about inflation. Under these circumstances, the costs to a member of the general public of processing this information outweigh the benefits. However, as the economic environment deteriorates or the central bank loses credibility, the benefits for the general public of devoting more resources to this task increase.

The SARB could benefit in a number of ways from improving its understanding of how its communication reaches the general public and impacts on its inflation expectations. This would allow the SARB to use communication more effectively to manage the inflation expectations of this vital group of price setters, and to build support for the institutional framework and prudent monetary policy in general. It was shown in Chapter 3 that under unstable economic conditions, the inflation expectations of the general public and financial analysts tend to diverge, so an evaluation of the inflation expectations of the financial markets is often not an accurate representation of those of the general public. It is precisely in these tumultuous periods that there is a great need for the SARB to manage the inflation expectations of these price setters in order to limit disruption to the economy. Communication, built on a foundation of credibility, is essential to the success of monetary policy under these circumstances.

Another benefit of understanding the communication of the SARB with the general public is that it will facilitate better modelling of the microfoundations that underlie some macroeconomic relationships. Empirical estimates of the speed at which the general public updates its inflation expectations could enhance the modelling of the Phillips curve, which is essential to analyses of the impact of monetary policy on inflation and output.

The communication of the SARB with the inattentive general public was studied in this dissertation by focusing on 3 elements of this interaction. The dissertation begins with an evaluation of the *consistency* of the SARB's communication (the degree to which its words matched its deeds), focusing on the SARB's monetary policy statements. Ehrmann and Fratzscher (2005) describe consistency of central bank communication as a *necessary condition* for greater predictability of monetary policy. However, even if the communication by the SARB is highly consistent, its impact is greatly reduced if its message does not reach the audience or is distorted *en route*. This concern motivated the second part of the

dissertation, which investigated the role of the media in transmitting and interpreting the SARB's communication for the general public. Finally, attention was focused on the manner in which the inattentive general public (the final recipients of the communication) form their inflation expectations. Epidemiological models were adopted to describe the process by which the inattentive general public form their inflation expectations, and to estimate the speed at which they update these expectations.

Collectively, these three components of the study aimed to provide a more comprehensive description of the role and effectiveness of the SARB's communication with the general public in South Africa. The objective was to study the SARB's communication with this part of its audience as well as to provide the microfoundations for a new approach to modelling the Phillips curve, which could potentially describe the observed data more accurately and offer better guidance for monetary policy decisions.

## 5.2. Loud and clear? Can we hear when the SARB speaks?

In the area of monetary policy, it is the Reserve Bank that communicates deliberately with its various audiences. It was, therefore, logical to start this investigation with the quality of the SARB's original communication (the monetary policy statements). The South African literature has focused on evaluating the predictability of monetary policy (Ballim and Moolman, 2005; Aron and Muellbauer, 2006), and on the sensitivity of financial markets to macroeconomic surprises (Reid, 2009) as an indication of how well anchored their inflation expectations are. These studies have examined the response of the financial markets to the *actions* of the SARB, without isolating the contribution that the SARB's *communication* makes to monetary policy effectiveness. In constructing an index to capture the nature of the forward-looking communication in the SARB's monetary policy statements, this research extends the South African literature by concentrating specifically on the SARB's *communication*.

The evaluation in Chapter 2 focused on the *consistency* of this communication since the adoption of inflation targeting. The term *consistency* was used in this context to describe the extent to which the SARB's actions matched its words, in the sense that communication about the likely future path of monetary policy was followed by compatible monetary policy

actions. Consistent communication is essential for building a reputation of credibility for the SARB. Credibility, in turn, improves monetary policy effectiveness and encourages support for monetary policy institutions as a whole.

The international literature, which considers the „signal-to-noise ratio’ of central bank communication, proved valuable in assessing the consistency of the SARB’s communication. This literature can be divided into two strands: research into the extent to which a central bank „creates news’ (has an impact on the financial markets), and research into the extent to which a central bank „reduces noise’ (improves the predictability of its policy actions) (Blinder et al., 2008). In Chapter 2 the second strand was followed, which allowed the researchers to evaluate both the magnitude and direction of the communication.

To facilitate a formal analysis of the informational content of the SARB’s communications, a subjective numerical index (the *policy inclination index*) was constructed. Two informed analysts independently read the monetary policy statement released at the end of each monetary policy committee meeting, and allocated an index value between -2 and 2 to describe the inclination toward monetary easing or tightening of the forward-looking components of each statement.

This index, capturing the *communications* of the SARB, was then compared with the SARB’s actual monetary policy *actions* to judge the consistency of the communication. An exploratory data analysis provided a first indication that the SARB’s communication was consistent. A visual inspection of the evolution of the policy rate and that of the index revealed that the two series have similar patterns, but that the actual policy rate clearly lags the index.

Transition matrices, comparing the index in time  $t$  with the policy action in time  $t+1$  were used to classify each policy decision as strongly consistent, mildly inconsistent or strongly inconsistent. The majority of these 60 monetary policy decisions in the sample period were classified as strongly consistent, whereas only 2 of the 60 policy decisions were classified as strongly inconsistent. One of the instances of strong inconsistency was further excluded because STATS SA acknowledged on 12 June 2003 that inflation figures had to be adjusted as they had previously been miscalculated.



The relationship between the rows and columns of the transition matrices were further evaluated using the Pearson test statistic, which tests for independence between the index values and subsequent interest rate decisions (i.e. communication and actions). The test consistently rejected the null hypothesis of independence, rendering implausible the argument that subsequent policy actions were independent from the SARB's prior communication over the sample period.

In cases where decisions were identified by the transition matrix as potentially inconsistent, the context of the decision was examined by referring to media reports and various forms of intermeeting communication available on the SARB's website. An important distinction was made between *inflation surprises*, where the SARB's deeds did not match its prior words because the macroeconomic environment changed and policy makers justifiably responded by changing their policy; and *policy confusion*, where the SARB did not communicate clearly.

Resulting from a total of sixty MPC meetings, twenty policy decisions were identified as inconsistent or unexpected. These were individually evaluated by referring to the Reuters Econometer forecasts<sup>39</sup> and changes in the Bankers' Acceptance rates<sup>40</sup> which reflect the extent to which analysts and the financial markets had correctly predicted the policy decisions. Using these criteria, 13 of the 20 decisions were judged not to have been considerable surprises in practice. The seven remaining instances of potential policy confusion were examined in their contexts by referring to media reports and intermeeting communications from the SARB. Three of these were classified as inflation surprises, leaving four occasions that were classified as instances of policy confusion. These results suggested that the SARB had communicated with considerable consistency.

The exploratory data analysis was followed by a formal regression analysis. OLS regressions of the index on the future changes of the policy rate (repo rate) showed that the index does indeed convey information about future changes in the repo rate. Coefficients capturing the extent to which the index (communication) corresponds with future policy actions at horizons

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<sup>39</sup> Reuters conducts a survey each month in which they ask a group of professional economists to forecast a range of macroeconomic variables. One of these variables is the policy instrument of the SARB, the repo rate.

<sup>40</sup> The Bankers' Acceptance rate is an overnight interest rate. A sudden, large change in this rate following the announcement of the policy decision is likely to reveal that the financial markets had not anticipated the decision.

of 2 to 6 months were all positive and significant, and the R-squared of the regressions ranges between 0.328 and 0.351. An index value of 2 (representing an imminent policy change) was associated with an average of 50 basis points after 2 months and 100 basis points after 4 months. The MPC typically meets every second month, and the most common magnitude of the repo rate adjustments is 50 basis points; therefore, these regression results again suggested that communications of imminent changes in monetary policy were consistent.

Substituting dummy variables for a continuous index variable in the regressions also revealed that the relationship between the index values was ordinal, not cardinal. Index values of -2, 0 or 2 were significant, showing that these values conveyed more reliable information than -1 or 1. The signs of the coefficients for -2 and 2 were as expected, but 0 had a negative coefficient, revealing a bias towards using hawkish language.

This, together with the discrete nature of the outcome variable, „the change in the repo rate’, prompted the use of an ordered probit model to test the robustness of the OLS results. To evaluate the predictive ability of the models, type I and II errors were identified. In none of the scenarios (when interest rates were increased, decreased, or held constant) were type I errors larger than 35% and type II errors larger than 32%, suggesting that the predictive ability of the model was reasonable.

In conclusion, the index was scrutinised in a number of ways, and all these confirmed that the communication of the SARB about the likely future path of monetary policy contained informational content. The communication of the SARB, which is complex in practice, was reduced in this study to a single-figure index. Even this informed simplification of the formal communication confirmed that the SARB’s MPC had succeeded in signalling its likely future policy actions with consistency since the advent of inflation targeting. However, in order to evaluate the effectiveness of the SARB’s communication, it is necessary to examine both the message that the SARB is sending and the message its audience is receiving, which are not necessarily equivalent.

### 5.3. Talking to the inattentive public: How the media translates the Reserve Bank's communications

For communication to be successful, the message sent must both *reach* the audience and be *perceived* as trustworthy. Chapter 3 explores the role of the print media in transmitting the SARB's communication to the general public. Although the SARB uses a range of communication tools, including monetary policy statements, monetary policy forums, the Monetary Policy Reviews and Quarterly Bulletins designed for different audiences, it is argued that very few members of the general public choose to pay attention to this communication. Engaging with the SARB's communications is costly for the general public in terms of time and the specialised skills required to interpret and evaluate them. It is therefore rational for the public to be inattentive. They minimise their costs by typically turning to the media, which is expected to filter and interpret the communication. The media decides what information is important (what news to put on the agenda) and then interprets and summarises this information so that it is accessible to non-specialists.

It follows that the SARB has limited control over the final message that reaches the general public. The message they ultimately receive is the result of the strategic interaction between the central bank, the media, professional economists often quoted in the media and the general public. For the SARB to optimise its use of communication, it needs to analyse the incentives facing each of these agents and to build relationships with them.

The SARB aims to persuade the general public (the price setters) to change their behaviour. It faces both incentives to provide accurate information in order to build credibility, and incentives to distort information, in response political pressure, for example. However, the SARB has limited control over the news report.

This news report can be viewed as the commodity provided by the media, which is created under the influence of supply and demand pressures. The media is driven by the profit motive to consider the demands of its target audience, but it is also influenced by factors such as pressure from advertisers on the supply side. According to the agenda-setting literature, introduced in Chapter 3, the „media does matter’ in that exposure to the media influences the opinions and behaviour of its audience.

If the media matters, then professional economists who are extensively quoted in the media also have the potential to influence the inflation expectations of the general public. They are viewed as specialists with the skills required to interpret the central bank's information, but are regarded as independent from the central bank and are therefore more likely to provide an unbiased assessment. However, the literature suggests that professional economists also face various incentives. They face the incentive to forecast accurately in order to build a reputation, but they may also face the incentive to strategically bias their forecasts in a way that serves their own self interest, for example to gain publicity. News reports are the observed outcomes, influenced by the incentives of each of the strategic agents.

In order to enable systematic analysis of the media's reporting on monetary policy actions, reports in the week following each MPC meeting are examined in Chapter 3. Two indices were created to characterise the quantity and quality of news coverage that each of the monetary policy statements received. The quantitative index *extent of coverage* (COV) captures the size and location (prominence) of each article, and the qualitative index *assessment* (ASMT) indicates whether the policy decision was assessed by the media as appropriate given the economic environment.

The exercise of reading critically through the media reports in order to construct the index allowed the researchers to make some preliminary observations. They noticed that on average the economic arguments in the media reports were of a poor quality. The articles tended to have a patchwork character, often containing many quotes by private sector economists, which remained undigested even when the quotes contradicted on another. On average, media reports viewed increases in the interest rates negatively and interest rate decreases positively, showing little critical assessment of the appropriateness of the decision given the economic environment.

Following these initial observations, frequency tables were used to analyse the information contained in the two series of index values. The actual decisions of the SARB were compared with the indices ASMT and COV. This exploratory data analysis revealed that over the period under review, most interest rate cuts were assessed favourably, decisions to hold the rate constant received a neutral or slightly positive assessment and decisions to raise the policy rate were mostly judged unfavourably. It was concluded that the assessment index reflects the popularity of the decision rather than its appropriateness given the economic

context. With respect to extent of media coverage, policy rate changes (either upwards or downwards) were granted more coverage than unchanged policy rate decisions, irrespective of the appropriateness of the decision. Neither of these initial observations reflected critical assessment of the MPC's decisions by the media.

Regression analysis was then employed to explore the factors that correlated with COV and ASMT. Ordered probit models were adopted and a number of factors were considered, capturing the macroeconomic conditions, nature of policy decisions and intermeeting communications from the SARB. The regression results again reflected an absence of critical assessment by the media, which contrasted with findings by Berger et al. (2006) for the European Central Bank (ECB). The regressions showed that changes in the repo rate were likely to receive greater coverage than decisions to hold the rate constant. The assessment of policy decisions appeared to be affected mainly by the direction of the policy decision. Besides the fact that rises in the repo rate were accepted more readily when the Federal Reserve Bank was also tightening monetary policy, the assessments by the media showed little or no response to variables reflecting the macroeconomic context of the decision or intermeeting communications from the SARB.

Chapter 3 concludes that even if the SARB succeeds in crafting good quality messages, it still faces the challenge of finding a way to contribute to the level of economic evaluation that the general public is receiving. This is going to involve monitoring the incentives facing the various role players in the communication process and building relationships with them.

#### 5.4. Inflation expectations of the inattentive general public

Chapter 4 deals with the ultimate recipients of the SARB's communication, the inattentive general public. It investigates the characteristics of the South African general public and how they process inflation information in order to form their own inflation expectations. The chapter uses the behavioural economics concept *rational inattention* as a way to better capture this process of inflation expectations formation.

It was assumed that the general public is inattentive to monetary policy and that this is a rational decision, especially under conditions of macroeconomic stability and central bank

credibility. Price setters have access to the inflation forecasts of the financial analysts via the media, and under stable conditions the benefits of searching for information beyond this do not justify the costs. Conversely, when the economic environment begins to put pressure on the general public, they are likely to judge the benefits of seeking more information as having risen relative to the costs.

A visual inspection of the inflation expectations of the financial analysts and the price setters since 2000 revealed that the expectations of the general public were not always accurately represented by those of the financial analysts. During the mid-2005 to mid-2008 period of macroeconomic stability, the inflation expectations of these two groups were similar, but during times of instability, such as 2002/2003 and 2007 onwards, the inflation expectations of the price setters diverged from those of the financial analysts. Political opposition to the SARB's policies also tended to increase during these periods of economic instability, further sensitising the general public. Therefore, there is a need to understand more about how the price setters form their inflation expectations.

Exploring the manner in which financial analysts and price setters form their expectations naturally leads a researcher to consider the standard rational expectations tradition of modelling. In Chapter 4, rational inattention is presented as a deviation from the standard assumption that agents make decisions under full information. It recognises that gathering and processing information is costly for the general public. In practice, monetary models are already being modified to better fit the observed data by incorporating uncertainty and learning. The standard model of the Phillips curve at present is the New Keynesian Phillips curve, which explicitly models microfoundations and commonly incorporates sticky prices (Calvo, 1983) to introduce rigidity. However, Mankiw (2001) argues that these extensions of the NKPC do not address the underlying weaknesses of the NKPC, especially its inability to capture the fact that monetary policy mainly impacts on real output in the short run, but prices in the long run.

In response, Mankiw and Reis (2001) suggest using inattentiveness to model a Sticky Information Phillips Curve (SIPC), which they argue is able to produce more reasonable impulse response functions. They assume that information about inflation disseminates through the economy in a sticky fashion (the spread of information about inflation

expectations through the economy is not instantaneous), but they do not formally model the microfoundations.

Carrol (2002, 2003) suggests adopting epidemiological models to model the microfoundations of the SIPC. Following the work of Carroll (2001, 2003), an epidemiological model was adopted in Chapter 3 of this dissertation to describe the spread of inflation information across South Africa in the same manner that the spread of a contagious disease is modelled. It is proposed that the inattentive public update their inflation expectations periodically, based on their exposure to relevant newspaper reports. In aggregate, the spread of inflation information through the economy is sluggish, based on the probability that members of the inattentive public are exposed to information and update their expectations. This sluggish spread of inflation information is referred to as sticky information.

The main objective of Chapter 4 is to improve our understanding of the inflationary process and to estimate this information stickiness for South Africa. This could provide the microfoundations for a new approach to modelling the South African Phillips Curve, inform policy decisions and enhance the SARB's ability to communicate with the price setters.

In order to explore the degree to which the proposed epidemiological model could represent the expectations formation process of the price setters, inflation data from STATS SA and the inflation expectations survey data of the BER were employed. The inflation expectations surveys began only in 2000 with the adoption of inflation targeting in South Africa; therefore, the dataset is limited to 40 quarterly observations. The fact that the empirical analysis relies on a *short* sample of *survey-based* data and that the stationarity of inflation data has long been debated in the literature provides an indication of the challenges that this kind of research faces and why it has largely been neglected. A range of formal stationarity tests were conducted, and unsurprisingly, the results were mixed. As a result, the econometric techniques selected to estimate a range for information stickiness have features which account for this uncertainty.

Prior to the formal estimation of information stickiness, an exploratory data analysis was used to judge whether information about inflation disseminates from the economy to the inflation expectations of the financial analysts and then to those of the price setters. A visual

inspection showed that the inflation expectations of both groups had similar patterns to that of actual inflation and that adjustments in inflation occur first, followed by those of the financial analysts and then those of the price setters. A contemporaneous pairwise correlation matrix showed that the inflation expectations of the financial analysts correlated more closely (0.684) with inflation than those of the price setters do (0.400) and that there was a strong correlation between the inflation expectations of financial analysts and price setters (0.774). In addition, it was found that the inflation expectations of financial analysts Granger-cause those of the price setters, but that the opposite is not true, suggesting that the inflation expectations of the financial analysts provide information about the likely future adjustments in those of the price setters. Finally, estimates of the root mean squared error (RMSE) for the financial analysts were substantially lower than those of the price setters. In conclusion, this exploratory data analysis revealed that the financial analysts adjust their inflation expectations quicker and more accurately than other price setters do.

None of these data analyses cast doubt upon the suitability of the epidemiological models proposed, so formal analysis to estimate information stickiness was conducted next. Another pairwise correlation matrix suggested that past inflation is important in the formation of the inflation expectations of the two groups, so it was included in the formal regression analysis.

In the regression analysis, both VECM and ARDL models were used, as they each offer different advantages. This allowed the estimation of a robust range for information stickiness by taking advantage of the strengths of each type of model. Both models allow the estimation of long-run and short-run characteristics, but the ARDL model offers some important advantages. It allows one to estimate regressions without pretesting the data series for order of integration. Data series can be included regardless of whether they are integrated of the order of 0, 1 or 2, and they do not have to be integrated of the same order. In addition, the model also performs well in small samples such as this one. However, the ARDL model is a single-equation model, assuming by construction that all the dependant variables are weakly exogenous, and it is therefore open to Sims' (1980) „incredible restrictions' criticism. On the other hand, the VECM does require pretesting, but it also explicitly tests for weak exogeneity rather than assuming it.

A VECM which includes only the inflation expectations of the financial analysts and price setters was estimated first, but the results of its cointegrating equation were questionable.



Both the short sample and the possibility of omitted variable bias (due to the omission of past inflation) were offered as potential reasons for the poor results. When the same series were regressed using an ARDL model, the results were more reasonable, as expected, but the estimate of information stickiness was substantially different from that of the VECM, so the results were not yet robust. VECM and ARDL models with both the inflation expectations series and past inflation were estimated next, and their results were very similar and sensible. Information stickiness was estimated as 0.679 by the VECM and 0.690 by the ARDL-ECM. This estimate was much higher than the estimate by Carrol (2002, 2003) for the USA, but it was argued that it is logical that inflation expectations would adjust more quickly in countries where inflation itself is higher and less stable, as the benefit for price setters of monitoring inflation is higher. This is in line with the higher estimate of inflation stickiness (0.5-0.6) found for Italy (Döpke et al. (2008)).

Finally, agent-based models were adopted to test the robustness of the regression results by considering the problem from the disaggregated level upward. A series for the aggregate inflation expectations of the price setters was simulated, beginning with some real-world data, initial conditions for the inflation expectations of the price setters, and an algorithm to describe their decision-making process.

This simulated series was then compared with the actual series to assess the extent to which the model was able to mimic the true process. Both the estimated coefficient and R-squared values were consistently greater than 0.900, suggesting that the agent-based models were able to simulate a series that closely resembled the observed one. In addition, the ranges of values for  $\lambda$  and  $\delta$  that delivered the best results included those estimated by the VECM and ARDL models, which provided a further indication that these estimates were robust.

## 5.5. Conclusion

Blinder et al. (2008) referred to a lack of consensus about what constitutes optimal central bank communication. This may be a result of the fact that an optimal communication policy is conditional on the particular economic and political environment within a country and that this will therefore differ across countries. This dissertation represents an effort to explore aspects of the SARB's use of communication, with a specific focus on its communication

with the general public. Old tools were extended and new ones developed to offer fresh insights in order to enhance the evaluation of the South African economy and improve the design of policy tools. The main findings of this dissertation reveal that although the SARB has communicated consistently over the inflation targeting period, the media has reported uncritically on monetary policy, limiting the impact of the SARB's communication on the inflation expectations of the general public. Epidemiological models were used to represent the process by which price setters form their inflation expectations and to find a range of between 0.65 and 0.70 for information stickiness. The modelling of some of the macroeconomic relationships such as the Phillips curve could be enhanced through an improved understanding of these microfoundations, especially because they explicitly incorporate the inflation expectations of the price setters, which have received relatively limited attention.

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