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**MONETARY POLICY, INFLATION, UNEMPLOYMENT AND THE PHILLIPS
CURVE IN SOUTH AFRICA**

BY

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**A DISSERTATION SUBMITTED IN FULL FULFILLMENT OF THE
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ABSTRACT

Inflation and unemployment are perhaps the two most important challenges that face the South African economy of today. Firstly, the study examines the relationship between monetary policy and the two economic fundamentals (inflation and unemployment), using the VEC modeling technique. The model regresses the monetary policy variable against inflation and unemployment growth over the period 1980-2008. The results suggest that (1) there is a long run relationship between inflation and unemployment (2) monetary policy reacts more to variations in inflation compared to variations in unemployment. Secondly, the relationship between inflation and unemployment as explained by the Phillips curve is investigated. The results show that there is a positive relationship between inflation and unemployment.

Key words: Inflation, Unemployment, Monetary Policy, Phillips Curve.

DECLARATION AND COPYRIGHT

I, the undersigned Aaron Chicheke, hereby declare that this dissertation is my own original work and that it has not been submitted, and will not be presented at any other University for a similar or any other degree award.

Signature

Date/...../.....

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DEDICATION

Them, a far better people than I, without whom this paper would not be there-neither I suspect would I.

So here goes the dissertation, dedicated to, Mr. and Mrs. Chicheke, Lue, Baba Letty naAmai Letty, Baba Takura na Amai Takura vacho, the entire family members and friends, with love and admiration.

LIST OF ACRONYMS

AD	Aggregate demand
ADF	Augmented Dickey Fuller
ARMA	Auto Regression Moving Average
AS	Aggregate supply
CLRM	Classical Linear Regression Model
CMA	Centred Moving Average
CPI	Consumer Price Index
CPIX	Consumer Price Index excluding mortgage interests
DF	Dickey Fuller
DW	Durbin Watson
ECT	Error Correction Term
EG	Engle and Granger
EME	European Economic Union
GDP	Gross Domestic Product
GMM	Generalized Method of Moment
HP	Hendrik-Prescott
H-M	Huizinga and Mishkin
IS	Investment and Savings equilibrium
LM	Liquidity preference and Money supply equilibrium
M	Money supply
MC	Multi-Country
MPC	Monetary Policy Committee
NAIRU	Non Accelerating Rate of Inflation
NKPC	New Keynesian Phillips Curve
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
P	Price

PVECM	Parsimonious Vector Error Correction Model
SARB	South African Reserve Bank
UK	United Kingdom
USA	United States of America
V	Velocity
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
SVAR	Structural Vector Auto Regression
Y	Income

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Monetary policy can be defined broadly as any policy relating to the supply of money. The South African Reserve Bank defines monetary policy as the measures taken by the monetary authorities to influence the quantity of money with a view to achieving stable prices, full employment and economic growth. In South Africa, the Reserve Bank is the main agency concerned with the supply of money. Hence, monetary policy can also be defined in terms of formulation and execution of policies by the Reserve Bank, aimed at guiding bank lending rates to levels consistent with aggregate supply elasticity, all of which are set on the attainment of low inflation and high sustainable economic growth. The primary objective of the SARB, as embodied in the Constitution of the Republic of South Africa Third Amendment Act 26 of 1996 and the South African Reserve Bank Act 90 of 1989, is to protect the value of the currency in the interest of balanced and sustainable economic growth.

The effect of monetary policy on inflation and unemployment and other real variables has been the subject of macroeconomic research and debates for quite a long time. Some studies have analyzed how monetary policy affects nominal and the real economy (Aron and Muellbauer (2001), Ludi and Ground (2006), Burger and Marinkov (2006), Hodge (2002), Nell (2000) and Du Plessis and Burger (2006)). Their focus was mainly on different channels of the transmission mechanism through which monetary policy affects the economy. The study, instead of analyzing each of these many channels, aims to investigate the relationship between monetary policy changes, inflation and unemployment. The connection between policy instruments and its targets is crucial to our understanding of what monetary policy can and cannot accomplish (Friedman). Without a clear idea of what is within the reach of a central bank in terms of controlling economic activity, it is not possible to make sensible choices regarding monetary policy (Satyajit, 2002). Thus, good policy-making requires an appreciation of the dynamic relationship between the monetary policy instrument and the final objectives of policy-inflation and unemployment (Gruen *et al.*, 1997). And today, virtually everyone studying monetary policy acknowledges that,

contrary to what many modern macroeconomic models suggest central bank actions often affect both inflation and measures of real economic activity, such as output and unemployment. But the nature and magnitude of these effects are not yet understood (Solow and Taylor, 1998). In order to determine which goals are most suitable for monetary policy, one must therefore understand the effects of monetary policy and what monetary policy can and cannot achieve.

Over the last decade, many countries have been successful in implementing monetary policies that have reduced inflation to within a fairly narrow corridor relative to earlier periods that were characterized by high and variable inflation rates (Laxton and N'Diaye, 2002). In this regard, South Africa had undergone a considerable number of monetary policy regime shifts from the 1980s to date. Firstly, there was liquid asset ratio-based system with quantitative controls over interest rates and credit over the period (1960–1985). Under this system interest rate played a minor part as a corrective instrument whereas the main form of monetary control was achieved through liquid asset requirements. Performance of monetary policy was poor during this period and inflation remained high and volatile. However, the monetarist approach to monetary policy in South Africa during the 1980s did not imply that the Reserve Bank was absolutely resolute in its policy initiatives (Smal and Jager, 2001).

Secondly, the cost of cash reserves-based system with pre-announced monetary targets (M3) was introduced in 1986 up to 1998. Pre-announced monetary targets were used for the first time, with the main policy emphasis on the central bank's discount rate in influencing the cost of overnight collateralized lending and hence market interest rates. These money targets worked very efficiently while South Africa was in a period of economic isolation during the 1980s and early 1990s, but were very difficult to control in the 1990s when the South African economy gradually began to “open up” (Ludi and Ground, 2006). By the end of the 1990s, it was evident that targeting monetary aggregates was an ineffective guide for monetary policy.

Thirdly, daily tenders of liquidity through repurchase transactions (repo system), plus pre-announced M3 targets and informal targets for core inflation was introduced for the period 1998-1999. This was the beginning of a movement towards a market-oriented monetary policy system where interest rates are determined by market forces. This strategy was, however, abandoned during the mid-1990s, partly because of the perception that the relationship between money and prices was unstable and unpredictable.

Since the mid-1990s monetary policy has slowly converged toward an inflation-targeting regime. Formal inflation targeting was adopted in February 2000 as the principal objective and focus of monetary policy. This was done because of the proposed advantages such a framework was expected to have. The expected benefit, according to SARB (2000), was that inflation targeting “helps to anchor the public’s inflation expectations, thereby improving planning for the economy, as well as providing an anchor for expectations of future inflation to influence price and wage setting.”¹ In addition, inflation targeting enables monetary policy to focus on domestic considerations and to respond to shocks to the domestic economy and as such it is the best way to achieve price stability because it specifies a precise target inflation rate and indicates a clear commitment by the monetary policy authority to achieve the target.² As a result, South Africa had witnessed lower long-term interest rates as economic agents gained confidence over the credibility of the Reserve Bank.

Following these regime changes, the South African economy has changed in some important ways: from 1980 until the early 1990s, inflation averaged about 14 percent. Since the early 1990s, however, inflation has exhibited a downward trend and averaged 7% between 1994 and 2002. Unemployment rose significantly from 9.8 % in 1980 to 25.5% in 2007 and averaged 21% over the period.³

1.2. Statement of the problem

As far as macroeconomics and the conduct of monetary policy are concerned there are areas where there is disagreement, as well as puzzles about how the economy functions and how monetary policymakers should seek to achieve their ends. While a relatively large number of central banks have adopted a formal inflation target, it is by no means universal. One of the charges sometimes imposed against having an inflation target is that it pays insufficient attention to economic objectives other than inflation. This is coupled with doubts on the mechanisms to decide on how much weight a central bank faced with a dual mandate should put on each mandate. It could still be argued that, by failing to specify the

¹ Mboweni T.T., “The objectives and importance of inflation targeting.” *Business Day*, November 13, 2002.

² This section draws on Aron and Muellbauer (2000a). However, the deviations are our contributions.

³ Statssa, (2007).

relative weight the central bank is supposed to place on deviations of inflation from target and output from potential, the agreement between the government and the Monetary Policy Committee has been left incomplete. Outstanding puzzles are on how expectations are formed. Macroeconomic theories and policy makers have stressed the importance of expectations in their models but in practice we actually know very little about how agents form their expectations. And, one of the most striking empirical features of recent history has been the apparent flattening of the Phillips curve as inflation has subsided. In practice no satisfactory explanations have been given as to why today's relationship between unemployment and inflation can be different from two decades back.

In addition, confusion remains on what the role monetary policy should play in reducing both unemployment and inflation. The last two decades witnessed several monetary policy regime shifts. Hence, low unemployment and inflation still remain a challenge in South Africa and it raises the question on the significance of monetary policy on the unemployment and inflation relation? One would also ask: To what extent does inflation and unemployment vary in response to monetary policy shocks? This question is one of the most important and controversial in macroeconomics.

Thus, this study examines whether changes in monetary policy can account for the changes in inflation and unemployment experienced in the South African economy. This is done by adopting a Vector Error Correction model that allows simultaneous determination of the long run and short run relationship between dependent variable and independent variables in a model.

1.3. Objectives of the study

The objectives of this study are to:

- Examine the impact of monetary policy on unemployment and inflation in South Africa.
- Investigate the existence of the Phillips curve in South Africa.
- Make recommendations on the conduct of monetary policy in South Africa.

1.4. Rationale of the study

In order to address the issue of monetary policy relevance to the problem of unemployment and inflation, there is need for an appropriate framework that serves as a reference point. It is important to understand the underlying interrelationships between monetary policy instruments and targets in order to understand the relevant policy variables needed to address the problems at hand. In addition, an understanding of how monetary policy impacts the economic environment is very crucial for the choice of policy variables in dealing with both of inflation and unemployment in South Africa. This study is intended to contribute to the growing body of research about South Africa's past experience with monetary policy regimes. The outcome provides guidelines and lessons for South Africa. It establishes empirical uniformity that can guide researchers who build models of South Africa. It is also important for policy economists with interest in the South African economy as well as an interest in monetary policy effects on both inflation and unemployment. Finally, it offers a good basis for further research.

1.5. Organization of the study

The study will be divided into five chapters. Following this introductory chapter, Chapter 2 deals with the overview of the South African macroeconomic environment, the main features of monetary policy; the analysis on how monetary policy impact inflation and unemployment, and alternative monetary policy options. Chapter 3 will explore theoretical literature and empirical evidence surrounding the impact of monetary policy on inflation and unemployment. The methodology to be employed in the study, empirical model specification, the theoretical background of the model and the empirical analysis of the adopted tests on South African data will be presented in Chapter 4. Chapter 5 gives a presentation of results on the effects of monetary policy in South Africa. The existence of the Philips Curve in South Africa is covered in Chapter 6. Finally, Chapter 7 gives the general summary of the study, major findings, policy recommendations of the study, and a sub-section on areas for further research.

CHAPTER TWO

THE SOUTH AFRICAN MONETARY SYSTEM

2.1 Introduction

This chapter provides an overview of the evolution of South Africa's monetary policy and the underlying macro-economic framework. The importance of monetary policy will be discussed first. Then a discussion on the evolution of monetary policy and the transmission mechanism and its various channels will follow. Thereafter, trends in inflation and unemployment in line with monetary policy regimes are analysed. Various monetary policy indicators and targets which have a bearing on monetary policy are considered. The chapter closes by giving other monetary policy options the monetary authorities in South African can consider.

2.2 The importance of Monetary Policy in South Africa

The Reserve Bank provides an enabling environment for the economy to expand in line with its full production potential without giving in to inflationary pressures. The gains associated with the economy operating at full potential are employment, high incomes and rise in living standards. As a result, the Reserve Bank provides fundamentals to boost confidence on economic agents. A stable financial environment is characterized by an effective regulatory infrastructure, effective financial markets and, effective and sound financial institutions. These characteristics signal the Reserve Bank's commitment to financial stability.

Monetary policy can prevent changes in money supply to contribute to aggregate demand fluctuations. In the short run, the Reserve Bank reduces volatility in output and employment. Thus, monetary policy can smooth out fluctuations associated with business cycles to stabilize the economy. The Monetary Policy Committee takes action (interest rate policy to bring inflation up, or down), when the inflation rate bounces outside the targeted range, currently (2008) between 3% and 6%. South Africa is currently experiencing inflation rates above its targeted range due to, among other factors, food and fuel costs. Ultimately,

the Monetary Policy Committee (MPC) has tightened monetary policy by further increasing interest rates since June 2007.

On the other hand, interest rates represent the cost of borrowing. Raising interest rates discourage borrowing by the private sector, especially in the manufacturing or service industry that heavily relies on borrowed funds to finance their production activities, but increasing price does not stop people from spending. Consumers, other than cutting their spending following a tight monetary policy, resort to their past savings. Producers, on the other side, can simply pass the cost of borrowing to customers by increasing their prices and as a result the process will transform into a circular fashion. This is a situation where the Reserve Bank continuously feels the pressure to further increase the interest rate.

In addition, in the long run, money supply growth has its primary effect only on the rate of inflation with no lasting impact on unemployment. The unemployment rate is largely independent of the amount of money or its growth rate. According to Friedman (1968) monetary policy can not peg interest rates and the rate of unemployment for more than very limited periods. One would argue that inflation targeting gives the SARB too little flexibility to stabilize growth and employment in the event of an external economic shock. Moreover, inflation targeting is an untested framework, as no major adverse shocks have put strain on the achievement of low inflation in many inflation-targeting countries. But this is not true as many of those countries are small open economies that have been subject to the severe shocks in the aftermath of the 1997 Asian crisis⁴.

Another criticism is that an explicit target might turn central bankers to concentrate on the inflation target to the detriment of stable growth, employment and exchange rates⁵. More so, monetary policy influences inflation directly by affecting the cost of credit. Therefore, there is an inherent tension between the objectives of achieving low inflation and the goal of reducing unemployment. Monetary policy affects investment indirectly as well by constraining domestic credit as a means of controlling inflation. In 2000, the South African Finance Minister Trevor Manuel stated that high domestic credit extension is an obstacle to economic development and a constraint to monetary policy. He put it as follows: “Living

⁴ Address by Mr Mboweni, T. T, Governor of the South African Reserve Bank, at the Bureau for Economic Research Annual Conference, Cape Town, 7 November 2002.

⁵From Wikipedia, the free encyclopedia. [online]. Available: http://en.wikipedia.org/wiki/Inflation_targeting.

beyond our means has become part of the national psyche. It is saddening. We would like to bring down interest rates, but as long as private credit extension is so high, that counteracts development". The problem with this orientation of monetary policy is that by constraining credit expansion, contractionary monetary policy reduces aggregate demand, which constitutes a constraint to investment and output expansion.

Tight monetary policy associated with high interest rates and a strong currency also hurt the export sector, undermining international competitiveness. Achieving low inflation is therefore potentially costly in terms of reduced investment, employment and output. Thus, inflation targeting framework lack flexibility because it focuses on inflation rates at the expense of other monetary policy objectives such as full employment (Bergevin, 2007).

Also, monetary policy can not roll back the price increases of food and fuel. It heavily relies on forecasts and in the event that such forecasts are not accurate it will result in the Reserve Bank's objectives being obscure and reduce its credibility. When compared to other monetary policy frameworks, there is the risk that monetary policy could lead to inefficient output stabilization. This can occur particularly in the event of significant supply shocks such as sharp changes in the price of oil⁶.

2.3. The evolution of monetary policy in South Africa

Several articles by Aron and Muellbauer (2000, 2001, and 2004) distinguish three main monetary policy regimes in South Africa since the 1980s. These are the liquid asset ratio-based system with quantitative controls over interest rates and credit, pre-announced monetary targets and inflation-targeting regime. These regime changes are explained in detail in the sub-sections below.

2.3.1. Monetary policy during the period 1980-1985

From 1967 to 1980, the Reserve Bank implemented a series of direct controls such as a ceiling on advances, deposit rate controls, exchange controls, import deposits and some direct consumer credit controls in an effort to contain the persistent increases in money

⁶ Address by Mr T.T. Mboweni, Governor of the South African Reserve Bank, at the biennial Congress of the Economic Society of South Africa, Pretoria, 1999.

supply and the inflationary pressures. These monetary controls of the 1960s and 1970s gave way in the 1980s to a general recognition of the need to abolish as many restrictions as possible and a move towards a market-oriented policy (Moolman and Du Toit, 2004). Afterwards, the momentum was raised by the De Kock Commission of Inquiry into the Monetary System and Monetary Policy in South Africa. The commission laid the foundation of monetary policy implementation during the 1980s (Smal & de Jager, 2001). Over this period there was a liquid asset ratio-based system which spelt out quantitative controls over interest rates and credit. Under this system interest rates played a minor part as a corrective instrument, whereas the main form of monetary control was achieved through liquid asset requirements.

Commercial banks were required to hold specific assets called “liquid” as a minimum proportion of deposits. The reasoning at the time was that the limited supply and low yields of these assets would limit bank lending and money supply growth. Performance of monetary policy was poor during this period and inflation remained high and volatile. The corrective effect of interest rates was largely neglected by the regulatory authorities. The increasing dissatisfaction with the liquid asset ratio system result in a move towards a mixed system during transition in which credit was reformed gradually towards a cash reserve-based system from early 1980 to about 1985. The transition was characterized by financial liberalization which involved the dismantling of some direct controls such as deposit rate controls and bank credit ceilings.

2.3.2. Monetary policy during the period 1986-1999

The recommendations of the De Kock Commission led to the introduction of monetary targeting in 1986. The Reserve Bank started to align its policies with developments in markets, rather than to try to force markets in a pre-determined direction. More emphasis was placed on interest rate adjustments rather than direct credit extension restrictions. Then pre-announced monetary targets were used for the first time. The main policy emphasis was on the Reserve Bank’s discount rate in influencing the cost of overnight collateralized lending and hence market interest rates. Daily tenders of liquidity through repurchase transactions (repo system), plus pre-announced M3 targets and informal targets for core inflation. Although the monetary policy approach still remained market-oriented in this period, there were dramatic socio-political changes. The abolition of sanctions and the

scrapping of exchange controls on foreigners by the South African government exposed South Africa to world financial market movements (Moolman and Du Toit, 2004).

Mishkin (2007) reiterated the advantages accrued from the use of monetary targeting. According to him, monetary targets can send almost immediate signals to both the public and markets about the stance of monetary policy and intentions of the policymakers to keep inflation in check. Thus, the signals reduce inflation expectations and result in low inflation. In addition, monetary targets promote immediate accountability for monetary policy to keep inflation low.

However, the success of monetary targeting depends on whether there is a strong and reliable relationship between inflation and monetary aggregate. Thus, if velocity of money is not stable, then the relationship between the goal and target variables becomes weak and monetary policy will definitely fail to achieve its objectives. In South Africa, monetary aggregate targeting failed because velocity of money was not constant. The credit growth which followed the financial liberalization soon lessened the usefulness of monetary targets, thus leading, from 1998, to a new regime.

2.3.3. Monetary policy during the period 2000–2008

Since the mid-90s, monetary policy slowly moved toward an inflation-targeting regime. Formal inflation targeting was formally adopted in February 2000 as the principal objective and focus of monetary policy, under Governor Tito Mboweni. The move was done because of the proposed advantages such a framework was expected to have. The change aimed at enhancing policy transparency, accountability and predictability. The target range for inflation set by the National Treasury after consultation with the Reserve Bank was between 3 and 6 percent per year. Thus, the aim was to achieve a rate of increase in the overall consumer price index, excluding the mortgage interest cost (CPIX) to within this range. This was an ambitious target given the history of inflation in the country. Since 1970 the five-year moving average of the annual consumer price inflation rate had never fallen below 6 percent, notwithstanding the efforts by successive Ministers of Finance and Governors of the Reserve Bank to fight inflation (Hodge, 2002).

A desirable change in the South African monetary policy is enhanced by focusing attention on a goal the SARB can achieve, making monetary policy more transparent and increasing public understanding of the Reserve Bank's strategy and tactics, creating institutions that

foster good policy, and improving accountability. Thus, according to Mishkin (2007), inflation targeting encompasses five main elements which are outlined below⁷:

- 1) *The public announcement of medium-term numerical targets for inflation.* The announcement of explicit inflation targets for the SARB would provide a clear monetary policy framework that would focus attention on what the bank can actually achieve. Bad monetary policy often has resulted from demands that central banks attempt to achieve the unachievable. Most notably, few macroeconomists believe that monetary policy can be used to lower the average rate of unemployment permanently, but central banks often are pressured to achieve just that through expansionary policy; such policy instead only results in higher average inflation without leading to a systematically lower average rate of unemployment. In contrast, implementing explicit inflation targets would help to insulate the Reserve Bank from such political pressure.
- 2) *An institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated.* An overriding principle of the reserve bank is to make price stability a fundamental goal of monetary policy. Thus, the goal of price stability immediately follows from the benefits of low and stable inflation and hence the promotion of higher economic output.
- 3) *An information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used for deciding the setting of policy instruments.* Although monetary aggregates play a very modest role in the policy process, they are the only variables that the SARB is required to set target ranges. Inflation targets would focus discussion on what the SARB actually could achieve. Furthermore, an inflation target provides a clear yardstick by which to measure monetary policy. Given forecasts of future inflation, it is easy to compare them to the announced inflation target and hence judge the appropriate tightness or looseness of current monetary policy. Also, on a retrospective basis, an explicit target allows SARB's performance to be easily monitored. Thus, Congress and the public will be better able to assess the bank's performance and hold it accountable for maintaining low inflation.
- 4) *Increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary*

⁷ This part is drawn from Mishkin (2007), any variance the author's contribution.

authorities. Transparent inflation targets in the South Africa would help anchor inflation expectations in the economy. Inflation targets would provide a clear path for the medium-term inflation outlook, reducing the size of inflation “surprises” and their associated costs. Inflation targets also likely would boost the SARB’s credibility about maintaining low inflation in the long run, in part, because they mitigate the political pressure for expansionary policy. Since long-term interest rates fluctuate with movements in inflation expectations, targeting a low rate of inflation would lead to more stable and lower long-term rates of interest. Together, the reduced uncertainty about future, medium-term and long-term inflation, would have beneficial effects for financial markets, for price and wage setting, and for real investment.

- 5) *Increased accountability of the central bank for attaining its inflation objectives.* Accountability is important in that it helps to promote efficiency in government. Making policymakers subject to punishment makes it more likely that incompetent policy makers are replaced by competent ones and create better incentives for policy makers to do their jobs well Mishkin (2007:40).

2.4. Indicators and targets of Monetary Policy in South Africa⁸

In the monetary policy process, variables play important roles, namely as instruments, goals, indicators and targets. It is very important that before one begins a discussion on indicators and targets, to make a distinction among their various roles. An instrument variable is a variable that can be directly controlled by the relevant monetary authorities. Currently, the South African Reserve Bank (SARB) employs short-term interest rates and some quantity measure of monetary base. Goal variables represent the ultimate objectives of monetary policy. In South Africa, the first goal variable is low inflation or price stability subsequently with low unemployment, as of the year 2000 to date.

A target variable is a variable whose value the Reserve Bank seeks to control directly by the use of the tools at its disposal. It is neither an instrument nor goal but serves as an operational guide for policy. The process involves two processes as McCallum (1989) put it. The first stage involves the monetary authorities choosing a time path for some target

⁸ Theoretical illustrations on targets of monetary policy have been adopted from Handa (2005: 287-292). However deviations are author’s contributions.

variable(s) that promises to lead to considerable outcomes for the goal variables. In the second stage, policy efforts are focused on an attempt to achieve the designated path for the target variable.

The formulation of monetary policy by the monetary authorities requires appropriate variables on which it can focus as indicators of the need for such a policy (Handa, 2005: 285). Such variables should provide information on the current and future state of the economy, especially of goal variables, also known as policy guides. A monetary policy indicator, since it reflects the state of the economy, its value must also change if a policy changes that state so that the indicators are directly or indirectly functions of the policy instruments.

The appropriateness of a variable as an indicator of the need of monetary policy depends upon the structure of the economy and the policy maker's perception of the structure of the economy. For example, in the Keynesian setup, interest rates in the money market are a major determinant of spending and hence a major indicator of the condition of the economy. Thus, a variable can only serve as an indicator or operating target if it has a close and predictable relationship with the ultimate goal variable of the policy maker⁹. It is important to distinguish between the usages of a variable for controlling the economy from its use as an indicator, with both uses leading to it being called a target. Sometimes, the variable will be used to perform both of these purposes, while in other cases different variables will be used to perform these distinct functions (Handa, 2005:287).

There are many indicators and targets of monetary policy at the Reserve Bank's disposal, but this study is limited to only those that have a history in the South African economy. History tells us that extensive financial liberalization from the 1980s, and a more open capital account from 1995, has implied that the broad money supply (M3) targets implemented from 1986 became even less achievable. A broader set of indicators began to supplement M3 targets, such as the exchange rate, asset prices, the output gap (the deviation of output from capacity), the balance of payments, wage settlements and the fiscal stance (Aron and Muellbauer, 2001).

⁹ See Handa (2005) and McCallum (1989) for a detailed analysis.

2.4.1. Money supply growth

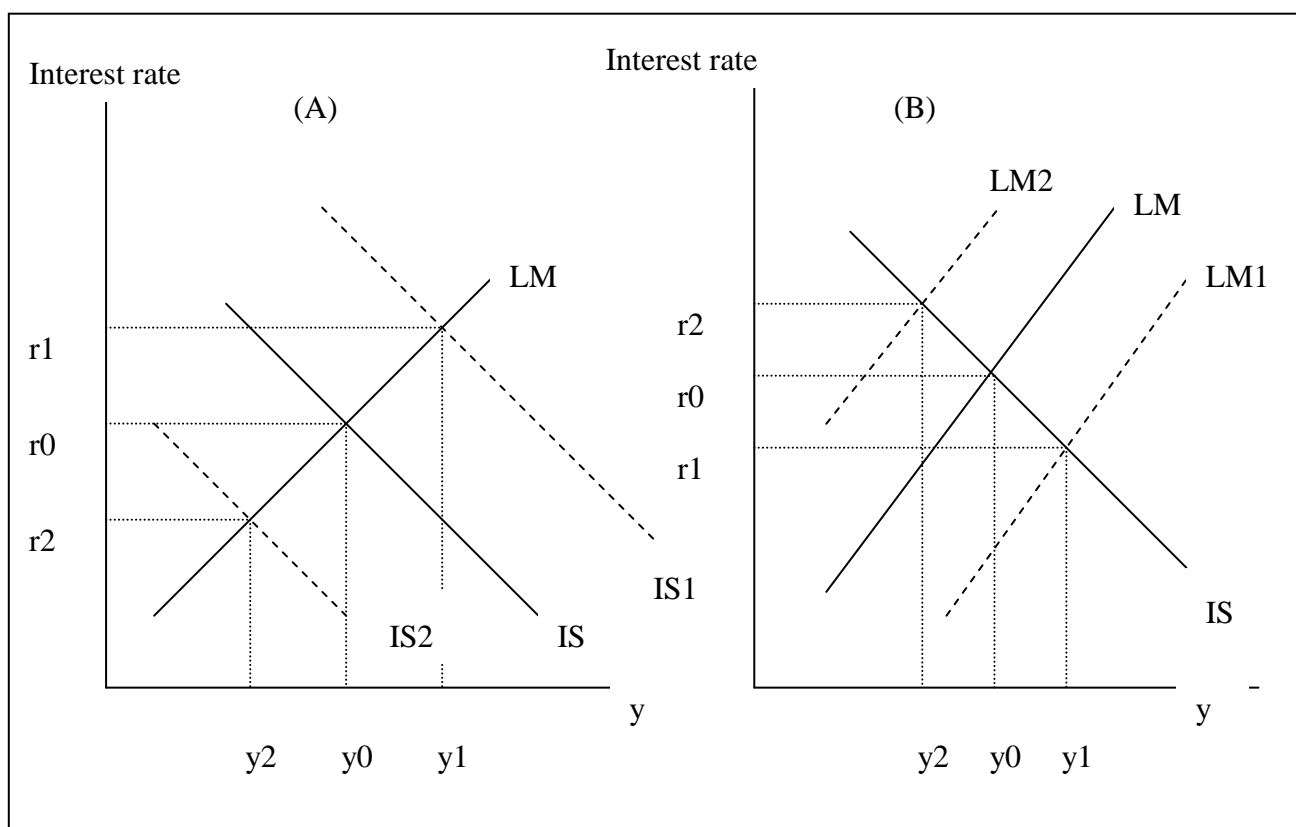
It would be logical to measure the stance of monetary policy by the growth rate of the supply of money. This is because the growth in aggregate demand depends heavily on the growth in the supply of money. That is, by using money growth as a measure of monetary policy, and if the supply of money is changed, it will be possible to predict its effect on money spending. Monetary policy is said to be tight when the rate of money growth is low or falling relative to a trend. On the contrary, if you increase money supply faster than your economy grows, you will have too much money chasing too few goods. The prices of goods will therefore increase.

Credit and general liquidity conditions can be gauged by the extent to which money supply growth (M3) exceeds the nominal growth in GDP. In South Africa, 21% more new money is being pumped into the economy. The only effective way to contain inflation in the long run is therefore to restrict the growth in the money supply.¹⁰ The Reserve Bank has a menu of options at its disposal to bring inflation under control as described above. An easy way out for the Reserve Bank when it feels inflation rate is high and hence a need to reduce money supply is to raise the repurchase rate. Conversely, when indicators show that the inflation rate is below the targeted band, it would reduce the repurchase rate. In addition, the monetary authorities can use the open market operations or play around with its cash reserve requirements. Nevertheless, under money supply growth targeting, money demand shifts that are not correctly identified, as such it could lead to excessively tight or loose monetary stance.

The IS-LM tools, are therefore employed to illustrate the implications of targeting monetary aggregates when shocks arises from both the commodity market (IS curve) and the money market (LM curve). Figure 2.1 below shows the IS-LM diagrams with aggregate real demand y on the horizontal axis and the real interest rate (r) on the vertical axis. The IS curve shows the commodity market equilibrium while LM curve shows the money market equilibrium.

¹⁰SARB (2008), How to fight inflation?, [Online], Available: www.reservebank.co.za

Figure 2. 1: Targeting money supply growth



Part (A) of the figure shows the effect of shock arising from the goods market, with money supply as a target. The initial equilibrium in part (A) is at the intersection of the IS and LM curves, which has (r_0, y_0) . A positive shock shifts the IS curve to IS1, aggregate demand will increase from y_0 to y_1 and interest rates rise from r_0 to r_1 . In the same way, a negative shock shifts the IS curve to IS2 lowering aggregate demand to y_2 , and interest rates to r_2 .

Part (B) of Figure 2.1 shows the implications when the shock emanates from the money market. Assuming the demand for money decreases and money supply as a target. The decrease in the demand for money causes the LM curve to shift to LM1 and an increase in aggregate demand from y_0 to y_1 . An increase in money demand shift the LM curve to LM2 the interest rates fluctuate from r_1 to r_2 .

South Africa is one of the many countries that introduced money supply targeting as an anchor for monetary policy during the course of the 1980's. Initially, the policy served the country well (Stals, 1997). The rate of money growth has often been promoted as such a leading indicator for inflation. Although there is high correlation in the long run between money growth and inflation, there is little or no empirical evidence in favor of money-

growth as a leading indicator for inflation for the horizons relevant to practical monetary policy (say 1-3 years) (Svensson, 2000).

2.4.2. Interest rates

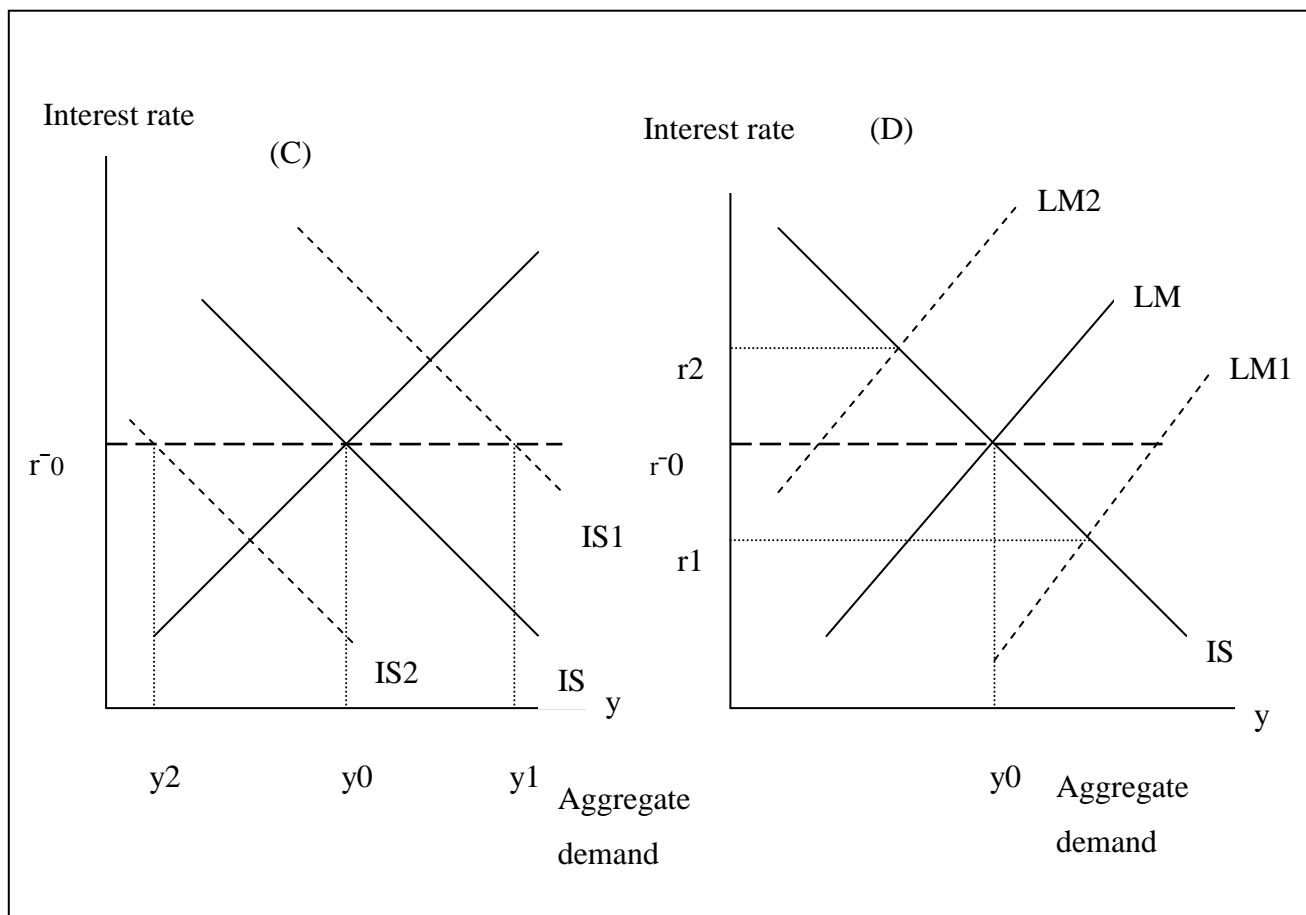
A traditional indicator of monetary policy stance is the level of interest rates. Interest rates are an important link by which changes in the money supply are transmitted to the real economy. This provides a logical reasoning for focusing on interest rates in judging monetary policy. Choosing interest rates rather than money growth allows central banks to shortcut the monetary policy transmission mechanism. This is so because the mechanism acts-at least in part-via the effect of interest rates on aggregate demand. Thus, changes in money supply growth lead to changes in market interest rates. These changes then influence households in their decisions to buy consumer durables and businesses in their decisions regarding inventories and plant and equipment purchases¹¹. Such an approach reduces confusion arising from shifts in money demand when assessing the appropriateness of the monetary stance. In fact, with interest rate targeting, money demand shifts would simply affect money supply and could simply be neglected. Moreover, since information on interest rates is continuously available, the prevailing monetary policy stance is more apparent.

Real interest rate changes are expected to have an effect on future inflation with some time lag. The real interest rate is defined as the nominal rate less inflation expectations. Rising real rates are interpreted as a sign of tight monetary policy while falling real rates supposedly signal a move toward an easier monetary policy. Caution should be taken since these movements in real interest rates might also be due to movements in the supply and demand for money. Moreover, inflation targeting requires flexibility in setting the interest rate, as the latter may need to adjust in order to offset shocks. A positive change is associated with restrictive monetary policy and a negative change is associated with expansionary monetary policy. The value of interest rates as an indicator of monetary policy has been reduced by the advent of inflation. More so, interest rates incorporate an inflation premium. That is why it is difficult to judge whether high interest rates are due to a tight monetary policy or a high level of inflation expectation. Nonetheless, it may be

¹¹ A detailed discussion is given in the following section under the transmission mechanism.

possible to estimate the level of inflation expectations, and in that case interest rates can be used as an indicator of monetary policy (Barber and McCallum 1980:22).

Figure 2.2: Targeting interest rates



Part (C) of Figure 2.2 illustrates the effects of targeting interest rates when the shock arises from the goods market. In the case of interest rates as a target, Figure 2.2 (C) shows the interest rate is held constant at \bar{r}_0 . Shifts in the IS curve first to IS1, and then to IS2 will cause movements in the aggregate demand, first to y_1 , and then to y_2 . Part (D) of Figure 2.2, however, shows the implications of targeting interest rates when the shock is coming from the money market. It shows that a reduction in the money demand would shift the LM curve to the right to LM1. Now given that interest rates are targeted by the monetary authorities, interest rates remain targeted at \bar{r}_0 , thus the aggregate demand y_0 is determined at the intersection of the IS and the horizontal line at the targeted interest rate \bar{r}_0 . This happens because the exogenous shift in the LM curve to LM1 produces an

accommodative money supply increase which shifts the curve back to LM. Thus, aggregate demand remains at y_0 and interest rate at r_0 .

Monetary policy primarily affects the economy through its effects on nominal interest rates in the short term. Nominal interest rates have two components: the expected inflation rate and the real interest rate. In the short run, the Reserve Bank can drive down nominal interest by increasing money supply. The problem of this is that inflation will rise when there is persistence in targeting interest rates by increasing the money supply at low levels. But this triggers a circular knock out effect, where an increase in money supply triggers inflation expectations, and again the increase in money supply by the monetary authorities. Thus, targeting nominal interest rates leads to monetary instability and economic fluctuations (Knoop, 2004:70).

2.4.3. Exchange rate

Interest rate changes have an almost direct influence on the exchange rate (Faure, 2005:239). These direct exchange rate effects, coming through import prices, may result only in price level shifts, depending on how agents form expectations of future inflation (Conway *at al.*, 1998). According to Faure¹², the main sources of these influences are changes in interest rates having an influence on capital flows that have an influence on exchange rate. An appreciation of the exchange rate will reduce the prices of exports in foreign currencies; a reduction in the price of imports will reduce local input costs. And, an increase in the price of exports in foreign currencies will dampen demand for exports-weakening aggregate demand. Following the inception of the inflation targeting framework, South Africa adopted a flexible exchange rate, most probably to avoid conflicts between monetary and the exchange rate policies. According to Mboweni (2007), the currency has been affected by various factors including movements in the dollar, perceptions that the current account deficit on the balance of payments could widen, and increased risk aversion in global financial markets.

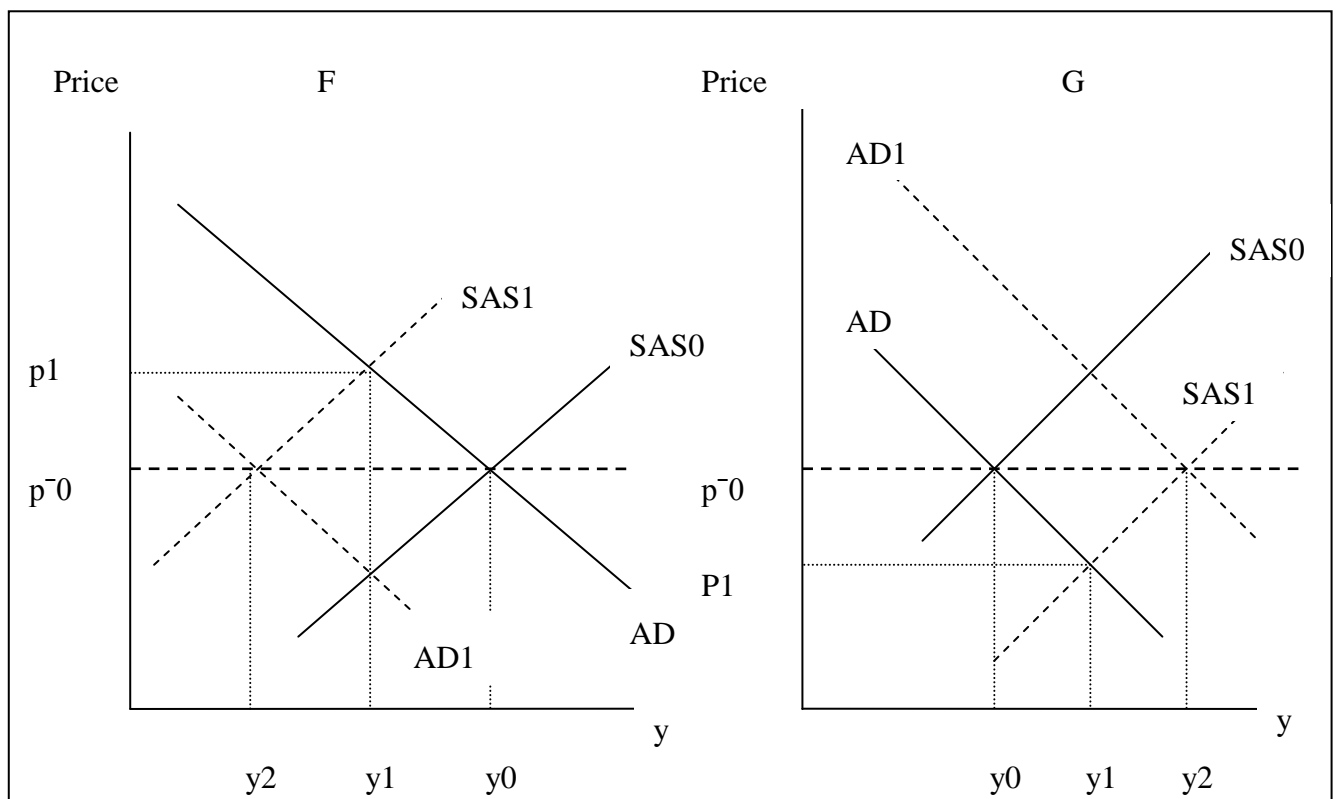
¹² Chapter 12, p239-240

2.4.4. Price stability or Inflation rate

Central banks in several industrialized countries have made price stability the primary goal of monetary policy in recent years (Saxton, 1997). South Africa is not an exception. For illustrative purpose, the aggregate demand (AD) and aggregate supply (AS) tools will be employed to show the economic implications of targeting prices (or inflation rate) by the monetary authorities in South Africa.

Assuming that the exogenous shock is coming from the real sector of the economy, Figure 2.3 shows the consequences of maintaining price stability. For example, suppose that they are such that the aggregate supply decreases so that part (F) of the figure exhibits the short run aggregate supply curve SAS curve shifts to SAS1. The result is an increase in the price from p_0 to p_1 and a decrease in output from y_0 to y_1 . To maintain price stability, the monetary authorities have to trigger changes in either money supply or interest rates, sufficient enough to offset the impact of supply shocks on price stability.

Figure 2. 2: Targeting prices



Now that the SAS curve is at SAS1, maintaining price stability at p_0 would require a reduction in aggregate demand through a reduction in money supply such that AD shift to AD1. Output will however, due to supply shocks, decrease from y_0 to y_1 at prices p_0 and p_1 respectively and then further to y_2 , due to the reduction in the money supply and its implied shift of the AD curve to AD1. Thus the fall in output is much pronounced with monetary policy in place than without.

Part (G) of Figure 2.3 similarly shows the effects of a positive aggregate supply shock. The SAS curve shift to SAS1, this result in an increase in output from y_0 to y_1 , and a decrease in prices from p_0 to p_1 . To stabilize the price level at p_0 , expansionary monetary policy has to pursue. This will shift the AD curve to AD1 and further increases output to y_2 . Fluctuations in output, therefore, have increased under price stabilization. The conclusion that can be drawn from the above illustration is that the pursuit of price stability in the face of supply side shocks, has the cost of increasing instability in output, and, therefore, of unemployment in the economy

However, targeting price stability is not without criticism. Some critics argue that price stability mandate for monetary policy removes the only remaining government economic policy tool capable of stabilizing the macro economy over the inflation and unemployment fluctuations. The costs of pursuing price stability outweigh its benefits and a proxy for price stability (the CPI) also faces measurement bias.

Notwithstanding the condemnation, Saxton (1997) addressed a number of criticisms that have been directed at this strategy of mandating price stability as the primary goal for monetary policy. According to Saxton, price stability remains a viable policy goal. In particular:

- Price stabilizing monetary policy not only retains a good deal of flexibility so that other policy goals are achievable, but this policy itself works to stabilize economic activity.
- Inflation is not necessary to foster labor market adjustment and may work to remove existing wage flexibility. Price stability, on the other hand, likely would work to promote such flexibility.
- An environment of price stability and low interest rates does not constrain monetary policy; central banks can pursue stimulative policy via a variety of

channels under stable prices. Price stability, however, does minimize the need for such stimulative policy.

- The CPI remains a viable price index measure suitable for use as an inflation target. Despite some measurement bias, the CPI has many advantages which outweigh its disadvantages.

In addition, inflation rate have a number of distinct advantages over competing intermediate indicators of monetary policy. Inflation data is easy to understand, timely, and readily available. They are accurate, less subject to sampling error, and unaffected by revision, seasonal adjustments, or shift-adjustments that sometimes plague quantitative data. Furthermore, they are forward-looking and can signal future changes in inflationary expectations (Saxton, 2000).

In summary, the monetarist believe that instead of being a source of stabilization, monetary policy can be a destabilizing force that might lead to greater inflation. This can be corrected, according to Friedman (1968), when the Reserve Bank controls what it can control and target money supply, not interest rates, unemployment, or any other variable. This can be done by adopting a money growth rule that specifies that the money supply increases at a constant rate (for example 5% each and every year) the Reserve Bank will be able to achieve three important goals: (1) avoidance of sudden swings in policy, which will stabilize economic growth, (2) inflation can be kept at low levels, reducing the distortions created by inflation thereby increasing economic efficiency, and (3) inflation can be kept steady, eliminating a large source of uncertainty in the economy, which also increase economic efficiency (Knoop, 2004:71). Thus, this will induce improved employment in the economy.

2.5. The transmission mechanism in South Africa

The channels through which changes in monetary policy instruments can generate the desired policy are called the transmission mechanism. It describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact on real variables such as aggregate output and employment. The monetary authorities simply set in motion a series of economic events in line with the desired outcome. The process begins with the initial influence on the financial markets, which in turn work its way through to changes in current expenditure levels. Then changes in domestic demand influence the

current production levels, wages and employment, and in the process eventually lead to a change in the rate of inflation.

The SARB has the view of many central banks that the transmission operate through interest rates, exchange rates, or other asset prices, which directly affect some component of output, and employment is determined implicitly, as firms adjust output. Some channels instead work through credit markets, affecting the supply of credit directly. Although the neoclassical view of the long run neutrality of money appears to be widely accepted, monetary policy is thought to influence economic activity in the short to medium term through changes in interest rates or money supply, either because of the presence of nominal price rigidities (Keynesian view) and/or owing to a number of wealth, income, and liquidity effects, and by its impact on inflationary expectations (Norris and Floerkemeier, 2006).

The SARB's main instrument of monetary policy is the repurchase rate (repo rate) since the formal adoption of the inflation targeting framework was introduced. It is expected that a change in the repo rate has direct effects on interest rates in the interest rate channel, on equity prices and the exchange rate in the other asset price channel, and on bank reserves and bank-lending in the credit channel (Ludi *et al.* 2006). Thus, changes in the repo rate affect the demand for and supply of goods and services which ultimately determines output fluctuations and inflationary pressures. The above linkages are briefly illustrated in Figure 2.4.

Faure (2005) identifies six stages in the transmission process. The stages are:

Stage 1: transmission of central bank lending rate to the private bank-to-bank interbank market

Stage 2: transmission of interbank rates to other market interest rates

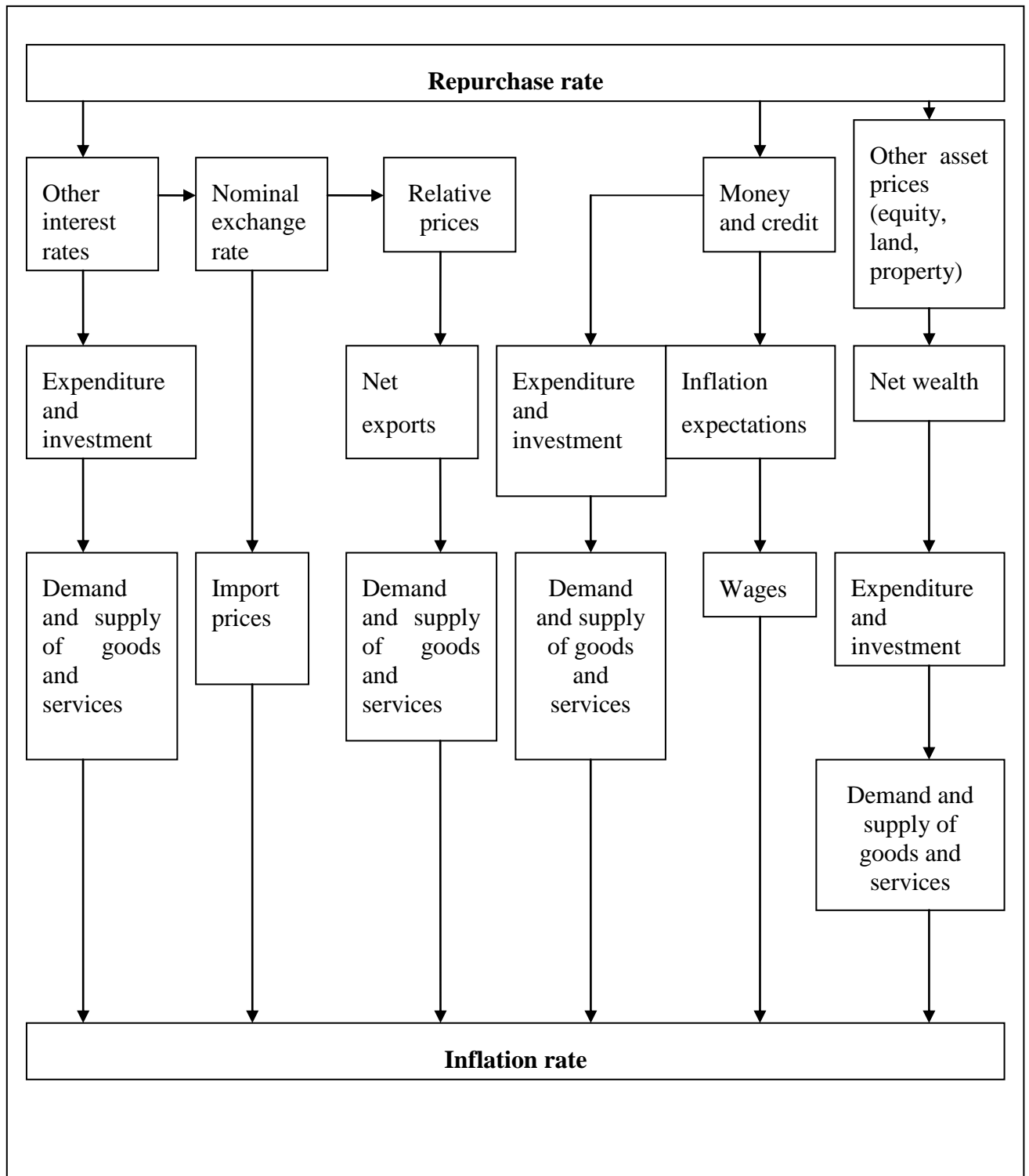
Stage 3: transmission of interest rate changes to asset prices, expectations and the exchange rate

Stage 4: transmission of changes in asset prices, expectations and the exchange rate to aggregate demand

Stage 5: transmission of changes in aggregate demand to money

Stage 6: transmission of changes in aggregate demand and money to prices

Figure 2. 3: The transmission mechanism



Source: Faure (2005)

Basically, from literature, four aspects of the transmission process can be identified, namely, the stages, channels, magnitude and speed of the transmission process. Given the complexity of the transmission process, there is no consensus of views on the different stages or on the different channels (De Angelis *et al.*, 2005). However, this study focuses mainly on those channels that have received greater acceptance in the literature. Although the specific classification varies at times, the following five channels of monetary policy transmission are generally distinguished: (1) interest rate channel; (2) broad money channel; (3) credit channel; (4) exchange rate channel; and (5) other asset prices channel

2.5.1. The Interest Rate Channel

The interest rate channel of transmission of monetary policy was clearly defined in Keynes' General Theory (Uanguta and Ikhide, 2002). The Keynesian traditional interest rate channel shows that a policy-induced increase in the short-term nominal interest rate leads to an increase in longer-term nominal interest rates. This is so because investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities as described by the expectations hypothesis of the term structure (Ireland, 2005). This also influences the relative price of domestic goods in comparison with foreign goods, particularly in terms of long-term interest rates and the exchange rate. As a result, changes in short-term interest rates are transmitted to the real cost of capital. The optimal capital-output ratio is changed in the process, and the required return from investment projects, as well as the rate of business investment. When this happens, firms finding that their real cost of borrowing over all horizons has increased, react by cutting back on their investment expenditures. Similarly, households react by reducing their purchases of homes, automobiles, and other durable goods. Thus, the traditional interest rate channels can be summarized as follows:

$$M \uparrow \Rightarrow RIR \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Where:

$M \uparrow$ =expansionary monetary policy leading to a fall in real interest rates ($RIR \downarrow$), which leads to a reduction in the cost of capital, causing a rise in investment expenditure ($I \uparrow$), thereby leading to a rise in aggregate demand and increase in output ($Y \uparrow$).

The interest rate channel of the transmission mechanism applies equally to consumption and also applies emphasis on short-term interest rate than long-term interest rate. But, it is long-term, rather than the short-term interest rate that is viewed as having a major impact on consumption and investment. Thus, an important feature of this model is its emphasis on the real interest rate as a driver of business and consumer decisions, rather than nominal interest rate. This emphasis also provides an important mechanism on how monetary policy can stimulate the economy even if nominal interest rates are at zero (Faure, 2005:226). On the unemployment front, if the short term interest rate increase is large enough, with the dominant income effect, spending declines on both non-durables and services. Eventually, this whole process can result in a rise in aggregate unemployment and a decline in aggregate output.

2.5.2. Broad Money channel

By controlling base money growth, the Reserve Bank can influence interest rates, which in turn affect aggregate demand and inflation (see Figure 2.4). Through the interest rates, the bank signals to the market its stance of monetary policy, influencing expectations regarding the term structure of interest rates. Thus, in South Africa, changes in short-term interest rates provide the signal to changes in the desired level of interest rates. As a result, the response depends on whether a change in monetary policy was anticipated or not, whether the changes are expected to persist and the change is expected to be reversed.

2.5.3. Credit Channel

There are two versions of the credit channel: the bank lending channel and the balance sheet channel. The bank lending channel focuses on the impact of shocks to banks' balance sheets on the cost and availability of finance for borrowers who depend on these banks as lenders. Under the balance sheet channel it is the balance sheet of borrowers, rather than lenders, which matters for finance costs. Thus, the credit channel relates to asymmetric information in financial markets and works firstly, through effects on bank lending and secondly, through effects on the balance sheets of firms and households.

The balance sheet channel focuses on the supply of funds from all financial intermediaries and markets and has no special role for banks. The channel arises from the presence of asymmetric information problems in credit markets. An expansionary monetary policy, by causing a rise in financial and physical asset prices, increases the net worth of firms and hence the value of collateral, company cash flow, and firms' creditworthiness. In addition, a rise in asset prices increases the ratio of liquid financial assets to household debt and reduces the probability of financial distress, and therefore increases consumption and housing investment (Mishkin (cited in Norris and Floerkemeier, 2006)). The inability of banks to properly assess credit risk due to both insufficient risk management expertise and solid corporate accounting practices increases banking spreads and reduces the effectiveness of the balance sheet channel. The functioning of this channel is also in a weak position due to practices related-party lending (Norris and Floerkemeier, 2006).

The bank lending channel operates via the influence of monetary policy on the supply of bank loans, that is, the quantity rather than the price of credit. It relies on the dual nature of banks as holders of reserve-backed deposits and as originators of loans. Banks play a special role in the financial system because they are especially well suited to solve asymmetric information problem. In the absence of banks in the financial system certain borrowers will not have access to the credit markets unless they borrow from banks. Thus, a contractionary monetary shock reduces bank reserves and therefore the total amount of bank credit available, leading to a fall in investment by bank-dependent borrowers and possibly in consumer spending. However, for the bank lending channel to exist, the volume of bank lending must decline following actions by the monetary authorities to increase reserves. The banks should not be able to compensate this by rearranging the portfolio of other assets and liabilities. Also, a bank-lending channel requires that some firms cannot replace losses of bank credit with other types of finance at no cost, but rather must cut back their investment spending.

2.5.4. Exchange Rate Channel

For a small, open economy such as South Africa, the exchange rate plays an important role in domestic price developments and for the economy in general. In this regard, the Reserve Bank is therefore obliged to continue monitoring the exchange rate closely and respond to changes as it sees necessary in order to achieve its goals. In South Africa, the exchange regime follows the flexible policy, but still remains with the scope to use foreign exchange

interventions if it deems necessary in order to contribute to achieving the inflation target or if it considers currency fluctuations a threat to financial stability.

Foreign exchange acts as a channel for the transmission of monetary effects. South Africa is increasingly integrated into the global economy and has adopted a flexible exchange rate. As a result, monetary policy has an effect on exchange rate, which in turn affects net exports and overall output in the economy:

$$M \uparrow \Rightarrow RIR \downarrow \Rightarrow ER \downarrow \Rightarrow NX \uparrow \Rightarrow Y \uparrow$$

Where:

$M \uparrow$ = expansionary monetary policy leading to a fall in real interest rates ($RIR \downarrow$), which leads to deposits dominated local rates being attractive to deposits dominated in other currencies, the exchange rate falls ($ER \downarrow$) making domestic goods cheaper compared to foreign goods, net exports increases ($NX \uparrow$), thereby leading to an increase in output ($Y \uparrow$). Further, another important consequence of the depreciation of the rand is that it directly increases the cost of imported goods and therefore a negative effect on the domestic price level and hence inflation.

In addition, Aron *et al.* (2004) identified three main routes for the interest rates effect through the exchange rate equation: The first is the direct effect via the interest rate differential between South Africa and the U.S.A rise in domestic interest rates. This helps appreciate the currency via this channel. The second effect, in the same direction, operates via the current account surplus. A rise in domestic interest rates, by curbing demand, will increase the surplus and so appreciate the currency. In the third route, if the expected producer price inflation is reduced by a rise in interest rates, the currency will appreciate.

However, at this junction, it is important to point out that the adoption of the inflation targeting framework has been associated with exchange rate volatility. In the short run, the impact of short-term exchange rate fluctuations on domestic prices is likely to diminish with increased flexibility of the exchange rate and the development of domestic financial markets. Thus, short-term exchange rate fluctuations have relatively little impact. In the long-term, however, it is unclear whether exchange rate fluctuations will increase. If the

inflation target is credible and inflation remains close to it, this price stability will contribute to greater exchange rate stability¹³. A permanent depreciation of the currency will lead to a permanent rise in prices in the long run. Inflation will rise as prices adjust towards the new long run equilibrium, but it will only be temporary during the adjustment process and in the long run the inflationary impact disappears.

2.5.5. Other asset prices

Monetary policy can also affect the economy through its effect on the valuation of equities as explained by the Tobin's q theory. The theory states that monetary policy can affect the economy through its effect on the value of equities such as shares, or stock (where q is the market value of companies divided by the replacement cost of capital). If q is high, the market price of companies is high relative to the replacement cost of capital. Therefore new plant and equipment capital is cheap relative to the market value of companies. Companies are able to issue shares at a higher price and acquire capital goods cheaply for production expansion. Thus, as interest rates fall, equity prices rise, making capital goods cheaper, leading to a rise in investment spending:

$$M \uparrow \Rightarrow ir \downarrow \Rightarrow Ps \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

An expansionary monetary policy ($M \uparrow$) leads to a fall in rates ($ir \downarrow$), leading to higher share prices ($Ps \uparrow$); this leads to higher q and higher investment spending ($I \uparrow$) that adds up to output ($Y \uparrow$). In other words, as monetary policy is relaxed, the public finds it has more money to spend and one potential place for spending this money is the stock market. The higher demand for stocks leads to a subsequent rise in their prices.

In the modern, dynamic and global economy like South Africa, it would be implausible to talk of the monetary policy transmission mechanism without mentioning the role played by banks and other non-banking financial institutions. With the improvement of the Reserve Bank interest rate system, the Reserve Bank is now better able to guide the market interest

¹³ Central Bank of Iceland, Monetary Bulletin 2001/2,

rate using monetary policy instruments. Financial institutions can make better pricing, and market participants are more sensitive to interest rate changes.

For example, financial innovation in South Africa could affect the monetary transmission mechanism, either by changing the overall impact of policy or by altering the channels through which it operates. Thus, the operation of monetary transmission channels varies systematically across countries due to differences in the extent of financial intermediation; the size, concentration, and health of the banking system; the development of capital markets; and structural economic conditions (Checetti in Norris and Floerkemeier, 2006). This shows the importance of the interest rate in resource allocation and in transmitting monetary policy has become more apparent.

2.6. Financial markets in the monetary policy transmission process

The financial market and monetary policy are inherently linked. Monetary policy involves affecting financial market prices (interest rates). The price in the financial markets is the instrument manipulated by the Reserve Bank. Thus, the effect of monetary policy on inflation and unemployment in South Africa is affected by activities in the financial markets. Financial markets play an important role for the achievement of financial stability in the economy. It is one aspect that helps achieving some of the important goals in the economy such as low inflation and low unemployment. A stable financial environment contributes to economic growth and hence low levels of unemployment. Even though financial sector supports economic growth, their developments comes with risks and uncertainty and as result there is need for careful assessment. Careful consideration should be given to prudential risk reduction, transparency, and uniform application of rules and regulations.

Financial development brought with it a wide range of new financial products, greater competition, and a notable increase in securitisation activities, disintermediation, and a consolidation process in the banking sector (Weber, 2008). This has brought new perception on how financial market participants react to shocks. The invention of sophisticated products in the financial system (e.g. derivatives) has reduced systematic risk. Increased competition can enhance the development of new products which not only reduce systematic risk but also a diversified range of products. These products can be

market-based instruments for financial investment which has a likely amplified effect for monetary policy changes on inflation and unemployment in the economy.

Priorities should be on improving monetary policy instruments and develop market based monetary policy framework. This will require supporting the development of the payment system and money/interbank markets including short term government securities. This monetary development should be accompanied by increasing confidence in the domestic currency and its use. On this basis, a fiscal incentive framework will be implemented, including payment of government salaries and other expenditures through bank accounts and the payment system. Thus, in establishing a basic framework for monetary policy; the legal frameworks and regulatory apparatus for central banking, banking and microfinance supervision, and banking business need enhancement.

Monetary policy works primarily through expectations (Hildebrand, 2006). Financial market activities affect the way the economic agents interpret monetary policy changes hence inflation expectations. Market expectations can and should influence the setting of monetary policy. Therefore, it is very important for the monetary authorities to have an understanding on how agents form expectations about inflation. The stance of monetary policy is reflected by how financial market participants expect the future path of short-term interest rates to be, as well as the consequences of that path on financial markets and ultimately on the real economy (Hildebrand, 2006).

2.7. Inflation in South Africa

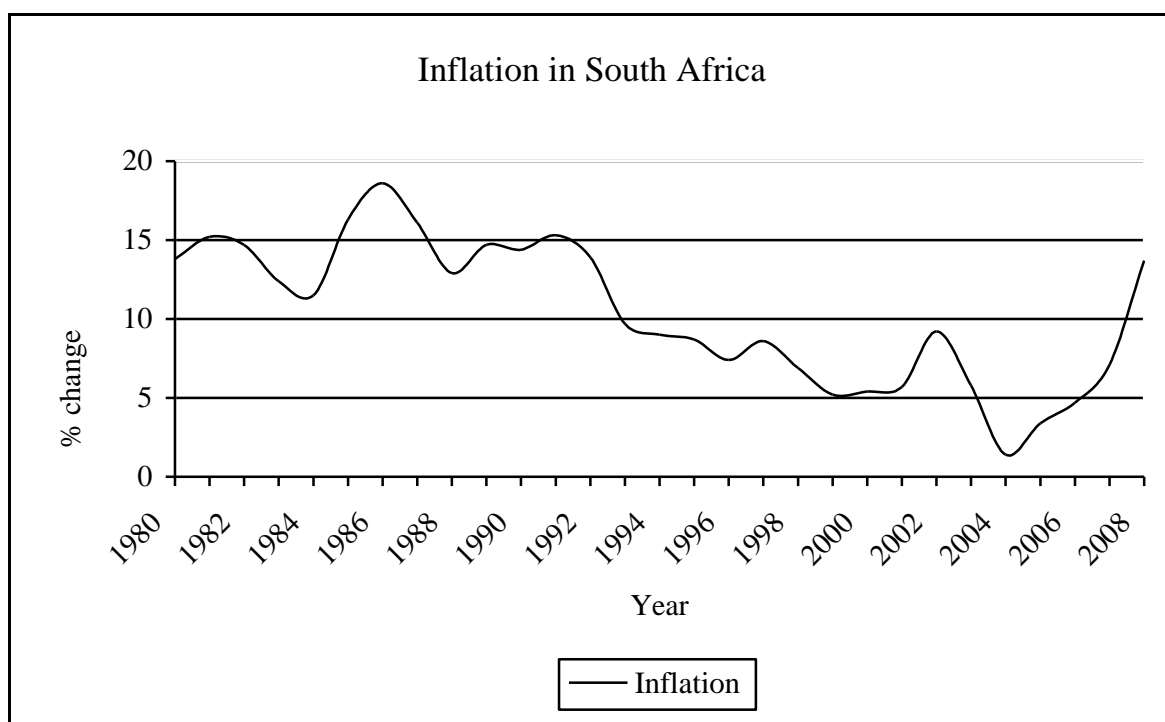
Monetary policy's objective in South Africa is to maintain price stability through maintaining inflation at low levels. Price stability is reflected by the inflation target followed by the monetary authorities and this objective is entrenched in the monetary policy formulation and implementation of the SARB. Currently, the inflation targeting have been set between three and six percent expressed in the annual rate based on CPIX, which excludes interest payments on mortgage. Thus, once the inflation rate is within this range, we have price stability in the economy.

In South Africa inflation is determined by domestically produced goods and services as well as oil prices (Wakeford, 2006). Given the unemployment gap, monetary policy affects inflation through a number of channels: aggregate-demand channel, the production-cost channel and the expectations channel. Unemployment gap is the difference between the

hypothesized potential level of employment and the actual level of employment. The increase in aggregate demand and the output gap will then lead to an increase in domestic inflation because increased production increases the costs of production, and increased demand allows firms to increase prices.

Moreover, an increase in production costs (wages and costs of imported intermediate inputs such as oil and raw materials), the fall in the exchange rate, increases the cost of imported final goods, and the reduced purchasing power of wages may trigger increased wage demands. The increase in these wage demands will eventually translate to high inflation. Finally, increased inflation expectations caused by the lowering of the instrument rate and the resulting increase in activity will then independently add to the effect on domestic inflation. Movements in the expected future price level are the obvious starting point for individual price and wage setting. Hence, price and wage setting are strongly affected by expectations of future inflation.

Figure 2. 4: Inflation in South Africa 1980-2008



Source: Own compilation based on data obtained from the SARB (2008)

Inflation in South Africa was significantly high and persistent during the 1980s despite disinflation with her major trading partners (Figure 2.5). This can be explained by the

weaker monetary policy stance; growth in broad money which was substantially higher in South Africa than in its trading partners during this period. From 1980 until the early 1990s, it averaged about 14 %. CPI inflation reached a peak of 18.6% in 1986. Since the early 1990s, however, inflation has exhibited a downward trend and averaged 7 % between 1994 and 2002. The decline was a reflection of a stronger monetary discipline of the inflation targeting just introduced. The increase in inflation in 2002 can be attributed to exogenous factors such as the decline in the value of the rand during the second half of 2001, the rise in the price of oil and the increase in administered prices (Van der Merwe, cited in Koller, 2005). Other possible explanations to these high inflation rates were high food prices, increasing energy prices, and increases in the price of domestic services such as medical and education services and water rates. CPI soared to a five-year record of 9.4% year-on-year in February 2008.

Inflation can be good and also can be bad for the economy. High inflation has a negative effect on economic performance. Generally, inflation reduces the information content of price changes, so that when households and businesses observe a price change, they find it more difficult to tell the difference if it is a relative or absolute price change. Total factor productivity, via a reduction in efficiency of the allocation of resources, and capital accumulation, via a decline in investment due to the lower productivity, can be affected as a result. Also, the rate of growth is adversely affected.

From an investor's perspective, inflation can be a serious problem for many types of investments. Those whose investments are on fixed-income (bond) are most affected by inflation. This is because when inflation rises; interest rates generally rise as well, which in turn drives down bond prices. Bonds with longer maturities are hit the hardest. In addition, as the prices of goods and services rise, the purchasing power of interest paid on the bonds also declines. Over the long term, government bonds have lagged stocks in providing inflation protection.

High rates of inflation have served to reduce the South Africa's competitiveness in relation to its trading partners and competitors (Cawker and Whiteford, 1993:32). Inflation affects the current account deficit. This is because price increases makes South African exports expensive relative to competitors. Thus, the demand for exports falls as prices rise. Imports become more competitive if import prices fall relative to those of domestic competitors. Persistent inflation tends to cause a currency to depreciate. This happens because there is less demand for that country's goods. Usually, depreciation assists exporters because prices

paid by overseas buyers fall. However depreciation means that prices of imports rise, which is inflationary. The net effect of depreciation on inflation therefore depends upon the relative price elasticities of imports and exports.

2.8. Unemployment in South Africa

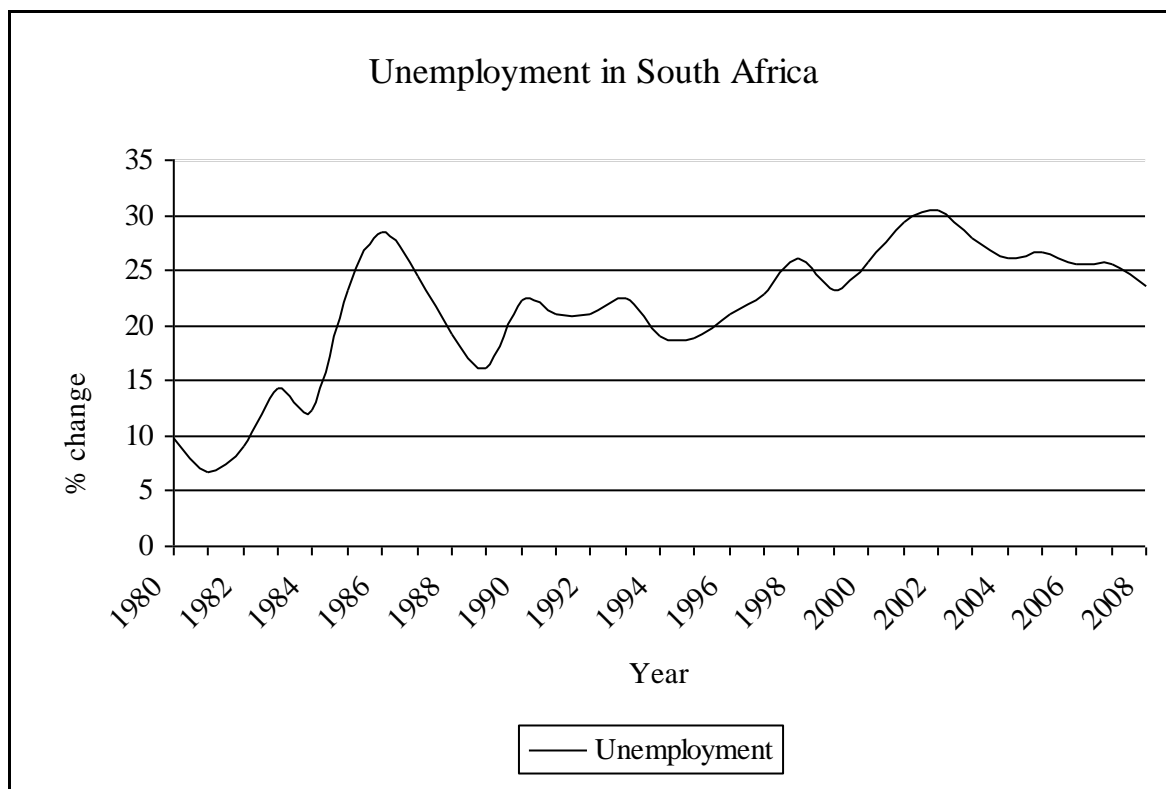
Unemployment in South Africa has reached a crisis level if one takes into consideration the persistent high levels of unemployment and the pace at which unemployment has been increasing since the beginning of the 80's (Schoeman and Blaauw, 2005). Unemployment is extremely high that it is now a centre stage in the policy arena. It can either be described in terms of narrow (strict or official), or broader (expanded) definition. Under the narrow definition, a person is regarded as unemployed if that person did not work in the previous week, wants to work, is available to begin work within a week and has taken active steps to look for employment or self-employment in the previous four weeks. Accordingly, the broader definition, a person is regarded as unemployed if that person did not work in the previous week, wants to work and is available to begin work within a week.

It is difficult, when one has to take into consideration the complexity of the South African labour market and the nature of unemployment facing the nation. Kingdom and Knight (2005) suggested that it has become a matter of practicality that the limits of what the government can do about unemployment are acknowledged, and priorities set for which section of the unemployed policy should target. For example, the structural nature of unemployment automatically sideline non-youth unemployed workers who lacks the necessary skills due to long duration of unemployment. Poswell (2003 in Kingdom and Knight, 2005) concludes that it is important to distinguish between the unemployed in terms of future employability and advises that for the unemployable, the appropriate policy would be in terms of poverty alleviation whereas for those who have a greater probability of finding employment, the most helpful form of government assistance would be in targeted skills development and job creation.

In accordance with most of the theory and in line with Ball (1999) and Ball (1997) it has been assumed that monetary policy affect structural unemployment. This is because of the hysteresis effect. Changes in short-run unemployment would immediately and completely feed through to long-run unemployment. Consequently, the demand would also directly affect the latter. We have hence considered it inappropriate to choose structural

unemployment as our unemployment measure given that the monetary policy periods we observe are relatively large.

Figure 2. 5: Unemployment in South Africa 1980-2008



Source: Own calculations based on data obtained from the Labour Force Survey (2009)

Figure 2.6 clearly indicates that unemployment is extremely high and rising. Unemployment rates rose from 9.8% in 1980 to 30.4% in 2002. Thus, unemployment reached its highest in 2002. On the broad definition, which includes the ‘discouraged’ workers, the unemployment rate rose from 29% to 42%, an increase of 13 percentage points over an eight year period (Kingdom and Knight, 2005). South Africa suffered a sharp rise in unemployment rate between 1984 and 1986 by 16 percentage points from 12.4% to 28.4% but slowly dropped to 21% in 1992.

Between 1984 and 1992 unemployment rate averaged 20.9%. During the pre apartheid era, unemployment rate averaged 17, 9% compared to the average of 24.9% in the post apartheid era. In line with the changes in monetary policy regime period unemployment expressed in average terms shows an upward trend. Between 1980 and 1985 unemployment

was 12.6%, on average; between 1986 and 1999 it averaged 21.8% and 27.1% between 2000 and 2007.

The economic history of South Africa for the past two decades provides us with some insight into the causes of unemployment changes. These causes of unemployment in South Africa are largely believed to be structural in nature (Dias, 2002). Structural unemployment simply means that individuals lack the relevant skills to fill jobs available in the economy. According to Van Seventer (2002) the build up of unemployment in South Africa over the past decades can most accurately be attributed to the demise of jobs in traditional resource based industries in agriculture and mining, without a concomitant employment take-up in more advanced industrial sectors, as would be expected in a process of structural change and development. This demise is explained by commodity price trends, technical conditions (in mining) and domestic market deregulation and fear of potential land tenure claims and labour rights (in agriculture). The structural factors have been problematic part of the economy and have limited South Africa's growth potential.

In this regard, the ultimate aim of the economic policy is on unemployment at the natural rate level, maximisation of welfare of the nation's people and low inflation. Most economists believe that the later is a prerequisite of the former (Faure, 2005:104). However, the monetarists with their belief of long run money neutrality despise the idea of intervention in markets; they believe the invisible hand will do wonders and the market will clear in the event of exogenous shocks or short term disturbances such as oil price shock. Accordingly, the rational hypothesis postulates that the authorities have no discretion in policy because wages and prices are sufficiently flexible to restore short-term imbalances. Hence, people are rational beings who are able to make rational forecasts that render monetary policy powerless.

On the contrary, the activists argue that wage and price adjustments are generally slow and the economy requires active management (Faure, 2005:105). In this regard, Van Seventer (2002) put forward that the solutions in South Africa will reside in a range of microeconomic policy interventions. There is no magic button or lever that can be switched. Interventions may be related to both the lifting of supply constraints and demand stimulation. Thus, any scenario that has the potential to make inroads into the unemployment problem will necessarily have substantial implications for macroeconomic policy. So, if the 'first order' macroeconomic targets are inflation and public sector borrowing, then the status quo will remain, and the economy may generate some jobs as a

result of supply side interventions resulting in export expansion. In this way, one should not expect employment growth of more than 0% to 1% per annum.

To cure unemployment, economic growth has to be a cornerstone of any employment creation policy as it is only by expanding the level of economic activity that sustainable job opportunities can be created (Cawker and Whiteford, 1993:23). To achieve this, economic policies can be focused on eliminating the structural factors that constrains growth. These structural factors are the balance of payments, lack of investment, poor exports growth and inflation. Economic growth can be attained by focusing on favourable international trade which offers conditions for a health balance of payment. South Africa heavily relies on its exports for growth and hence employment creation. In the past however, the country's growth potential was constrained by large foreign debt, high import prosperity and limited earnings of foreign exchange. Until these constrains are dealt with, it will be difficult to fully reap the benefits from trade.

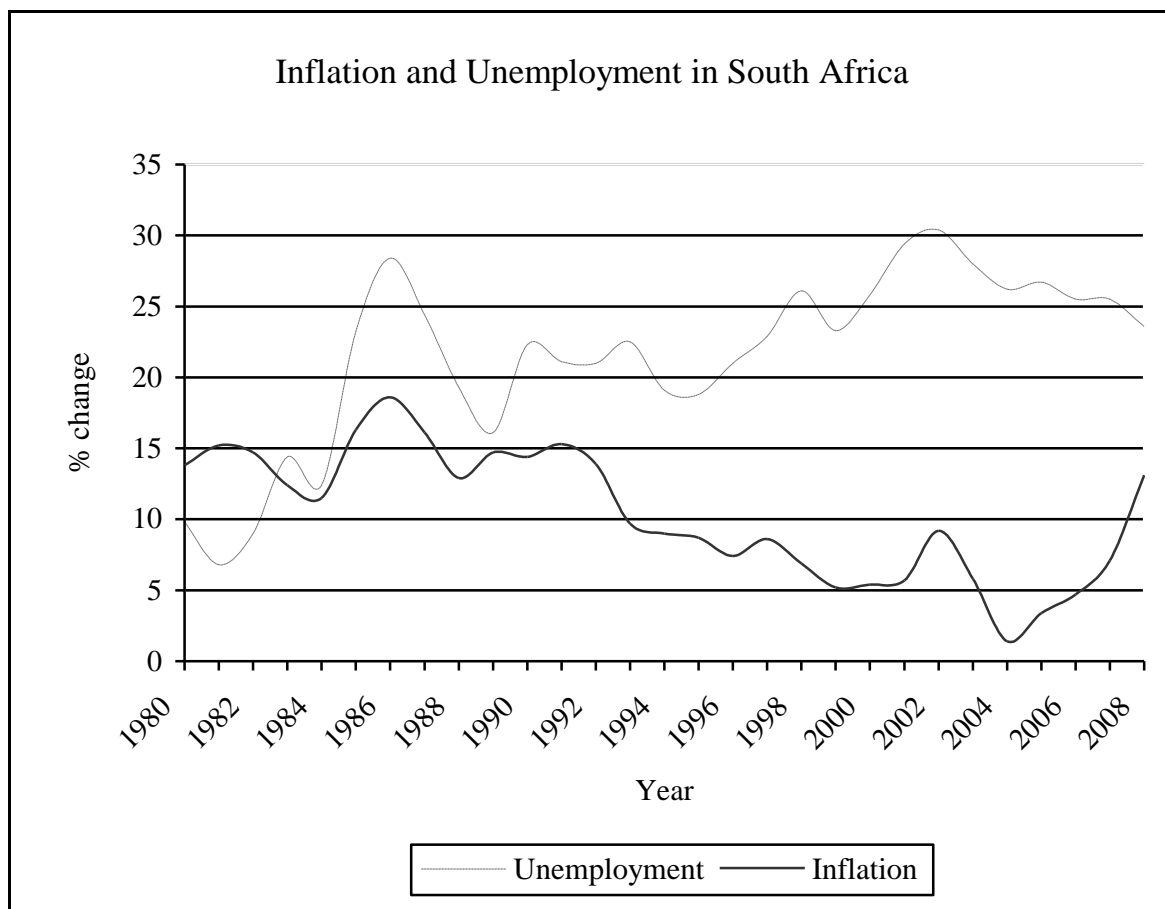
2.9. Inflation and unemployment in South Africa

The relationship between inflation and unemployment has been long debated. Generally, there is a view that there is trade-off between the two and that low unemployment cannot be achieved if high inflation persists. Monetary policy must balance the competing objectives in the presence of a shock that normally implies more inflation, more unemployment, or a combination thereof. In this case, the choices become more difficult, and the public perceptions of how well stabilization policy is doing will inevitably decline.

The data for South Africa shows that there is an inverse-kind of relationship between inflation and unemployment. From until the early 1990s, inflation averaged about 14 percent. Since the early 1990s, however, inflation has exhibited a downward trend and averaged 7% between 1994 and 2002. Surprisingly, CPI soared to a five-year record of 9.4% year-on-year in February 2008. On the other hand, unemployment rose significantly from 9.8 % in 1980 to 25.5% in 2007 and averaged 21% over the period.¹⁴ Thus, even though inflation now increases considerably less; unemployment is exceptionally high.

¹⁴ Statssa, (2007).

Figure 2. 6: Inflation and Unemployment 1980-2008



Source: Own calculations based on data obtained from the SARB (2008) and the Labour Force Survey (2009)

In figure 2.7, from 1980 to mid 1981 inflation was on an increase whilst unemployment was declining. It indicates that there is a negative relationship between inflation and unemployment. But from 1981-83, inflation was decreasing with unemployment on the rise. These two variables seem to be fluctuating in the same direction from 1983-90. However, from 1990 onwards, inflation is showing a downward trend and unemployment of the other hand showing an upward trend.

Even though the current framework of inflation targeting proves to be successful in the recent years, its success, however, is increasingly becoming doubtful. Its effectiveness is being waned by the failure of the monetary authorities to maintain inflation rate within the targeted band for almost two years. This sums to the observed ills of the inflation targeting framework which placed doubt on its effectiveness and hence increasing pressure for the

adoption of alternative monetary policy options such as employment targeting, among others.

2.10. Monetary policy rules versus discretion

Discretion in monetary policy is when a monetary authority is free to act in accordance with its own judgment. For example, if the Reserve Bank is directed by legislation to do its best to improve the economy's performance and gave the monetary authority the instruments that it has, the Reserve Bank would have a discretionary monetary policy. On the other hand, a rule involves the exercise of control over the monetary authority in a way that restricts the monetary authority's actions. Rules can directly limit the actions taken by a monetary authority. For example, one simple possible rule would be that the monetary authorities hold the monetary base constant. This clearly restricts the use of judgment. Rules can attempt to limit the objectives pursued by the monetary authority. For example, one possible rule would be that the monetary authorities announce a target for monetary base growth over some period to further some well-defined goal and then to hit the target unless predetermined exceptional circumstances arises.

The main aim of the monetary authorities in South Africa is to achieve a stable financial environment. To achieve this, the monetary authorities have been striving to adopt a monetary policy regime that insures zero inflation on the average over long periods, small variations in the price level over short periods, and either a stabilizing effect on fluctuations in real output and employment during business cycles. This entails adopting policies that involve slow growth of the money stock on the average over long periods. This is to avoid inflation, and that involve only small and gradual changes in the rate of growth of the money stock over short periods. Once inflation is under control, so are fluctuations in the business cycle. It is also suggested that the Reserve Bank cannot, and hence should not try to, permanently reduce the long-run average unemployment rate by monetary policy (Christ, 1983).

Even though the current framework of inflation targeting proves to be successful in the recent years, its success, however, is increasingly becoming doubtful. Its effectiveness is being waned by the failure by the monetary authorities to maintain inflation rate within the targeted band for almost two years. This sums to the observed ills of the inflation targeting framework which placed doubt of its effectiveness and hence increasing pressure for the

adoption of alternative monetary policy options such as employment targeting, among others.

2.11. Alternative monetary policy options

Inflation targeting framework has been criticized on the ground that: firstly, it merely focuses monetary policy on inflation and in the process reduces the flexibility of monetary policy, especially with respect to other policy goals such as unemployment. Secondly, monetary policy requires a careful balancing of competing goals of financial stability, low inflation, and full employment, in an uncertain world. There is, however, uncertainty about the contemporaneous state of the economy, the impact policy actions will have on future economic activity and inflation, and the evolving priority to be given to different policy objectives. Thirdly, inflation targeting actually could reduce the SARB's overall accountability by allowing it to avoid responsibility for damping short-run fluctuations in real economic activity and unemployment. Finally, with regard to the transparency and public understanding of policy, inflation targeting highlights the inflation objective of central banks but tends to obscure the other goals of policy.

In many countries (e.g. the Euro, Brazil and Sweden), inflation targeting has generated significant costs: slow growth, slow employment generation and high real interest rates-while, yielding, at most, minor benefit (Epstein, 2003). Inflation targeting, even without imposing a rigid rule, would excessively reduce the flexibility of the SARB to respond to new economic developments in an uncertain world. Furthermore, publicly committing solely to an inflation target would not enhance overall accountability or transparency given the multiple objectives of monetary policy. Thus, according to Epstein (2003), an alternative macroeconomic policy framework which attempts to tackle the ills of poverty, high unemployment and slow economic growth in South Africa must develop a feasible and efficient framework for conducting monetary policy that is oriented to these variables, while, keeping inflation and other problems in check. In this approach, central banks choose a real target that is appropriate for that particular country-it will normally be poverty levels, employment growth, investment, or real economic growth-and choose a set of monetary policy instruments to achieve that target (Epstein, 2003).

Given South Africa's major problems with unemployment and underemployment, an alternative framework for monetary policy is badly needed (Epstein, 2008). We therefore,

discuss some of the alternatives to inflation targeting that can be utilized by the South African monetary authorities to eliminate the ills associated with the current framework: real targeting and employment targeting.

2.11.1. Real targeting

According to Epstein (2008), a real targeting framework for monetary policy should adhere to the following principles:

- *Context appropriate monetary policy.* Central bank policy goals and operating procedures must be based on the structure and needs of South Africa: no generic, one-size fits all approach, is likely to be appropriate to every situation.
- *Real economy oriented monetary policy.* Policy makers should recognize that very high rates of inflation can have significant costs, but short of that, policy must also be oriented toward promoting investment, raising employment growth and reducing unemployment.
- *Transparency and accountability.* Taking a leaf from the inflation targeting approach, the Reserve Bank should be made more accountable to the public by making its objectives and approaches more transparent. It should tell the public what its targets for monetary policy are, describe the economic assumptions underlying its plans to reach those targets, and if not reached, explain why, while also describing its plans for achieving them in the next period. Most importantly, a democratic process should determine the goals of the Reserve Bank.
- *Policy flexibility.* A fundamental fact is that there is a great deal of uncertainty concerning the underlying structure of the economy and about the nature of national and international shocks at any particular time. Hence, adherence to any target has to be somewhat flexible.
- *Sufficient tools to reach the targets.* Monetary policy has been stripped by financial liberalization and neo-liberal conceptions of tools needed to achieve a multiplicity of targets: credit allocation techniques, which used to be very important components of central bank policy in many countries, have been systematically eliminated. Capital controls (capital management techniques) likewise, which in the

past have been part of the arsenal of monetary policy, have been dramatically liberalized. These techniques need to be revitalized and modernized so that, where and when appropriate they can be used as instruments to help central banks reach their goals.

- *Supporting institutions.* Reserve Bank policy is no panacea. Other important supporting institutions are also required, including strong tax institutions to enable the government to raise the revenue it needs to fund important public investments, and public financial institutions to channel credit in support of productive investment.

2.11.2. Employment targeting

This framework for monetary policy attempts to incorporate some of the advantages normally claimed for a targeting framework—namely, enhancing transparency and accountability while focusing the goals of monetary policy more directly on critical macroeconomic problems facing the South African economy, for example employment. In addition, the employment targeting should incorporate a goal for inflation stabilization. Thus, the advantages associated with this framework are the accumulation of new knowledge about the connections between monetary policy and employment, and about the implementation of new policies to generate more employment and economic growth. The Reserve Bank should endeavor to achieve this by focusing on the key issues of employment growth such as human and financial resources.

Thus, the success of the employment targeting framework ranges from its initial implementation to the commitment of the Reserve Bank to this policy. To this end, the Reserve Bank should set its interest rates to achieve an overall real growth rate consistent with the plan that has an employment target at its core. After that, it should try to keep inflation below a constraint that is mutually decided upon as part of the overall program. In addition, the Reserve Bank would manage some of the credit allocation programs that are part of the targeted components of the overall employment targeted macroeconomic policy. Lastly, the Reserve Bank would manage the capital account as needed to maintain the exchange rate level and exchange rate stability needed to implement the program (Epstein, 2008).

Finally, institutional commitment is necessary for the long term success of the employment targeting framework. The Reserve Bank should work closely with financial institutions to develop instruments and programs to facilitate the allocation of credit for effective employment generating activities. In addition, the Reserve Bank should launch a set of research programs both within the bank and outside to improve understanding of the relationship between monetary policy tools and employment growth, both in the formal sector and informal sector.

2.12. Conclusion

This chapter stresses the evolution of monetary policy framework and the importance of monetary policy in South Africa. It is, however, very difficult to measure and compare the effectiveness of these monetary policy regimes, since each regime was effected under different macroeconomic conditions and subjected to different shocks. This might have undermined its effectiveness as well as its relevance. In the monetary policy process, there are variables which play very important roles namely: as instruments, goals, targets, and indicators. The main variables are money supply growth, interest rates, exchange rates, and inflation rate or price stability and a distinction among these various roles of variables has been made. The chapter also shows that monetary policy actions can be transmitted to affect the targeted variables through various transmission channels, such as the interest rate channel, the broad money channel, the credit channel, the exchange rate channel and other asset price channel. Thus, monetary policy affects the economy with a lag and the time it takes to hit the targeted variable depends on the channel of the transmission mechanism. The interest rate channel is believed to be the fastest channel through which monetary policy actions can be felt in the economy. However, a sound and efficient financial system is required for a smooth transmission process. Also, revealed in this chapter is the performance of the monetary policy regimes gauged by inflation and unemployment rate trends since 1980.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter presents various theories and empirical studies on the effects of monetary policy on inflation and unemployment. It considers literature on the Phillips curve which explains the relationship between and unemployment in South Africa. The first part of this Chapter deals with the theoretical literature. The second part reviews the various empirical researches on the effect of monetary policy in both developed and developing countries, and South Africa in particular.

3.2. Theoretical literature

The aim of this section is to review theoretical exposition on the conduct of monetary policy and its relationship with inflation and unemployment. These theoretical underpinnings are from the classical, the monetarists and the Keynesian economists who used the four major functions of money to formulate theories of money. The theories are the quantity theory of money, the Phillips curve, the augmented Phillips curve and the Non Accelerating Inflation Rate of Unemployment (NAIRU).

3.2.1. The classical quantity theory of money

The classical economists' (Alfred Marshal, Edgeworth F.Y, and Arthur Pigour) view of monetary policy is based on the quantity theory of money. According to this theory, an increase in the quantity of money leads to a proportional increase in the price level and vice versa. All markets for goods continuously clear and relative prices adjust flexibly to ensure that equilibrium is reached. Therefore, the economy is assumed to be always at full employment level, except for temporary deviations caused by real disturbances. The role of money is simply to serve as the unit to express prices and values. Money facilitates the exchange of goods and services. Its use satisfies double coincidence of wants, that is, it acts as medium of exchange. Money is neutral; it does not influence the determination of relative goods prices, real interest rates and aggregate real income. The role of money as a store of value is regarded as limited under the classical assumption of perfect information and negligible transaction costs. The classical economists,

still, recognized that some particular quantity of real money holdings would be needed by the economic entities under certain special circumstances. This consequently led to the formulation of the quantity theory of money. The quantity theory of money explains the role of money as a medium of exchange. In the classical work, it is stated that money affects nothing but the price level (Ritter *et al.* cited in Tsheole, 2006). The theory postulates a direct and proportional relationship between the quantity of money and the price level.

The clearest exposition of the classical quantity theory approach is found in the work of Irving Fisher in his influential book: *The Purchasing Power of Money*, published in 1911. He examined the relationship between the total quantity of money M (the money supply) and the total amount of spending on final goods and services produced in the economy $P \times Y$, where P is the price level and Y is aggregate income for the economy. Velocity (V) of money provides a link between M and $P \times Y$. It simply represent the average number of times per year that a unit currency is spent in buying the total amount of goods and services produced in the economy. The linkage is shown below:

$$V = \frac{P \times Y}{M} \dots\dots\dots 3.1$$

Conversely, the quantity theory of money is usually discussed in terms of the equation of exchange, which is given by the expression:

$$M \times \bar{V} = P \times \bar{Y} \dots\dots\dots 3.2$$

In this expression, P denotes the price level, and Y denotes the level of current real GDP. Hence, PY represents current nominal output; M denotes the supply of money over which the Reserve Bank has some control; and V denotes the velocity of circulation, which is the average number of times a dollar is spent on final goods and services over the course of a year. The classical economists believe that the economy is always at or near the natural level of real output. As a result, classical economists assume that \bar{Y} in the equation of exchange is fixed, at least in the short-run. Furthermore, classical economists argue that the velocity of circulation of money tends to remain constant so that \bar{V} can be regarded as fixed. They believe that causation runs from money to price. Assuming that both Y and V are fixed, it follows that if the Reserve Rank were to engage in monetary policy, the effect of an increase in money supply can only increase the price level. An increase in M , only affects an increase in the price level P in direct proportion to the change in M and the opposite is true with a decrease in M . In other words, expansionary monetary policy can only lead to inflation. And, contractionary monetary policy can only lead to

the deflation of the price level. Thus, as far as the stabilization policy is concerned, fiscal policy has no role. It has no influence whatsoever on the price level. The only effect is felt on the interest rate and real magnitudes. The role of monetary policy is also limited. It has no influence on the real side of the economy but it exerts influence on the price and nominal magnitudes.

However, the quantity theory has a number of weaknesses. Firstly, the quantity theory does not explain unemployment because it assumes away adjustment problems. It assumes that production is determined by resources, and since money is not a resource, changes in money should not change production. It is widely accepted that a well anticipated monetary changes has no effect on unemployment but only affect prices. While in actual fact the adjustment process of monetary disturbances also affect unemployment not just prices.

Secondly, the classical quantity theory assumes that there is a correlation between changes in the amount of money and changes in spending. In this case, the changes in money supply are the cause of spending. Critics of the quantity theory have suggested that this correlation exists because changes in the amount of money in circulation are caused by, rather than the cause of, changes in business activity. In other words, the critics argue that changes in money are the effect, not the cause.

Finally, the quantity theory assumes that changes in the amount of money in circulation do not alter velocity. The assumption was dismissed by the Keynesians, who instead, come out with an alternative assumption, that changes in money tend to be offset by changes in velocity.

3.2.2. The Keynesian Phillips curve

Keynesians do not believe in the direct link between the supply of money and the price level that emerges from the classical quantity theory of money. They reject the notion that the economy is always at or near the natural level of real output so that Y in the equation of exchange can be regarded as fixed. They also reject the proposition that the velocity of circulation of money is constant. However, they do believe in an indirect link between the money supply and real output. They believe that expansionary monetary policy increases the supply of loanable funds available through the banking system, causing interest rates to fall. With lower interest rates, aggregate expenditures on investment and interest-sensitive consumption goods usually increase, causing real output to rise. Hence, monetary policy can affect real output indirectly.

Keynesians, on the other hand, remain doubtful about the effectiveness of monetary policy. They point out that expansionary monetary policy that increase the reserves of the banking system need not lead to a multiple expansion of the money supply. This is because banks can simply refuse to lend out their excess reserves. Furthermore, the lower interest rates that result from an expansionary monetary policy need not induce an increase in aggregate investment and consumption expenditures. Firms' and households' demands for investment and consumption goods may not be sensitive to the lower interest rates. For these reasons, Keynesians tend to place less emphasis on the effectiveness of monetary policy and more emphasis on the effectiveness of fiscal policy. They regard fiscal policy as having a more direct effect on real output. Keynesian positions are that inflation is a cost-push phenomenon independent of demand pressure (at least until output reaches its full-employment level). This is whereby higher inflation could permanently buy lower unemployment. It shows that there is a trade-off between inflation and unemployment. Any attempt by governments to reduce unemployment is likely to lead to increased inflation. This relationship was seen by Keynesians as a justification of their policies. They treated it as a menu from which the monetary authorities could choose.

Phillips developed the relationship between inflation and unemployment in 1958 on the basis of statistical observations for the UK. The results proposed a negative relationship between the rate of nominal wage growth and the rate of unemployment and have been subsequently extended to show a negative relationship between the rate of inflation and the rate of unemployment. Thus, the plotted Phillips curve was of the form:

$$\dot{W} = f(u) \dots\dots\dots 3.3$$

Where:

\dot{W} =the rate of increase of the nominal wage rate

and $f' < 0$

The expression 3.3 explains that unemployment (u) represents the degree of labour market tightness, so that the higher the level of unemployment, the smaller will be the increase in nominal wage.

To provide a link between the nominal wage rate and inflation equation 3.3 is shown as follows:

$$u = g(\pi) \dots\dots\dots 3.4$$

Where $g' < 0$

Nominal wages represent the main element of the cost of production so that an increase in nominal wages will induce firms to increase their prices. On the other hand, an increase in prices causes labour to ask for compensation in the form of wage increases. But critics say that the effect is temporary and that unemployment would bounce back but inflation would stay high.

The Phillips curve was challenged by Milton Friedman and the Monetarists in the 1960s and 1970s. They dispute the Keynesian view that monetary policy is relatively ineffective. Monetarists argue that the demand for money is stable and is not very sensitive to changes in the rate of interest. For this reason, expansionary monetary policies only serve to create a surplus of money that households will quickly spend, thereby increasing aggregate demand. Unlike classical economists, monetarists acknowledge that the economy may not always be operating at the full employment level of real output. Thus, in the short-run, monetarists argue that expansionary monetary policies may increase the level of real output by increasing aggregate demand. Nevertheless, in the long-run, when the economy is operating at the full employment level, monetarists argue that the classical quantity theory remains a good approximation of the link between the supply of money, the price level, and the real output. In the long-run, expansionary monetary policies only lead to inflation and do not affect the level of real output and hence unemployment.

3.2.3. The monetarism theory

Monetarists are particularly concerned with the potential abuse of monetary policy and destabilization of the price level. They believe that persistent fluctuations are purely monetary phenomena brought about by persistent expansionary or contractionary monetary policies. As a means of combating persistent periods of inflation or deflation, monetarists argue in favor of a fixed money supply rule. They believe that the Reserve Bank should conduct monetary policy so as to keep the growth rate of the money supply fixed at a rate that is equal to the real growth rate

of the economy over time. Thus, monetarists believe that monetary policy should serve to accommodate increases in real output without causing either inflation or deflation.

If the monetarist theory of inflation is true, the following relationships should hold in the long run:

$$\log P_t = \beta_0 + \beta_1 \log M_t + \beta_2 \log Y_t + e_t \dots\dots\dots 3.5$$

$$\beta_1 = 1, \beta_2 = -1(1)$$

Where:

P = consumer price index

M = money supply

Y = real output.

The constant term, β_0 can be interpreted as the (logarithm of the) income velocity of money.

From the above equation one can obtain the basic inflation equation:

$$\Delta \log P_t = \beta_1 \Delta \log M_t + \beta_2 \Delta \log Y_t + (e_t - e_{t-1}) \dots\dots\dots 3.6$$

First, the interest rate or the expected rate of inflation is often used to measure the cost of holding money. In expression 3.6, if inflation is perfectly anticipated, the labour contracts would reflect it so that the nominal wage would increase by the expected rate of inflation. As a result, the expected rate of inflation would not affect the real wage rate, employment or output. Unanticipated rate of inflation would cause deviations in the natural rate by reducing the real cost of labour and other inputs.

The monetarist has focused much attention on money and monetary policy. There is however, a wide spread doubt that velocity is constant to make monetary targeting desirable (Eatwell et al,

1991: 455). In addition, financial innovation has resulted in many substitutes of money. This makes it difficult to have a clear definition of money for the monetary authorities. Thus, financial market developments are a source of instability between monetary base and the targeted variables.

3.2.5. The New-Keynesian augmented Phillips curve

Stanley Fischer (1977) and John Taylor (1979) constructed alternative models in which nominal rigidities interacted with rational expectations. This was in such a way as to deliver conclusions about the effects of policy that were much more Keynesian in flavor, hence the “new-Keynesian” macroeconomics. The New Keynesian Phillips Curve (NKPC) is currently the most popular theory of inflation and seems to become the cornerstone in monetary policy analysis for inflation targeting central banks. New Keynesian Phillips curves describe how past inflation, expected future inflation, and a measure of real marginal cost or an output gap drive the current inflation rate. The common formulation of the model is presented below:

$$\Delta p_t = E_t \Delta p_{t+1} = c_0 + \lambda y_t + \varepsilon_t \dots\dots\dots 3.7$$

Where ε is a residual error term, which may be serially correlated, and λ is a positive constant.

Equation 3.7 has some common features of the Taylor model: because unemployment rate is strongly serially correlated, current unemployment is an adequate proxy for current, lagged, and future unemployment. The Taylor’s model implies that residual in equation 3.7 has a moving average component. In addition, the new Keynesian model is similar to the expectations-augmented Phillips curve of Friedman and Phelps. Thus, the contribution of the new Keynesian models to interpreting the Phillips curve is to emphasize the role of explicit nominal rigidities in interpreting the model. The outcomes in the labour and production markets would be classical in the absence of rigidities.

For comparison purposes, the Friedman-Phelps Accelerationist Phillips Curve is represented below:

$$\pi_t = \gamma(U_t - U^*) + \pi_t^e \dots\dots\dots 3.8$$

Where inflation, π_t , is (negatively) correlated with deviations of the unemployment rate from its natural rate U^* , and where the entire curve is shifted up or down one-for-one with changes in π_t^e (the rate of inflation that agents had expected to prevail in time t).

In the above expression (3.8), there is no permanent trade-off between the level of inflation and the unemployment rate in the long run, $\pi_t^e = \pi_t$ and the Phillips curve is vertical at $U_t = U^*$. However, to the extent that agents' expectations were slow to catch up to reality, a policymaker could keep unemployment below the natural rate by constantly boosting the inflation rate, thus accelerationist hypothesis.

The idea behind the Phillips Curve is that the Keynesians believe that a government can lower the rate of unemployment if it were willing to accept a higher level of inflation. However, critics say that the effect is temporary and that unemployment would bounce back up but inflation would stay high. Thus, the natural or equilibrium rate is the lowest level of unemployment at which inflation remains stable (also known as the “non-accelerating inflation rate of unemployment” (NAIRU)). This concept follows naturally from any theory that says that changes in monetary policy and aggregate demand more generally, push inflation and unemployment in opposite directions in the short run. Once this short-run trade-off is admitted, there must be some level of unemployment consistent with stable inflation (Ball and Mankiw, 2002).

3.2.4. The Non-Accelerating Inflation Rate of Unemployment

The Non Accelerating Inflation Rate (NAIRU) concept when married to the rational expectation concept, an increase in expected inflation is associated with an equal increase in actual inflation. The reason why expected inflation plays such a role depends on the theory of short-run non-neutrality. Thus, the model:

$$\pi = \pi^e - a(u - u^*) \dots\dots\dots 3.9$$

Where π^e is the expected inflation and u^* is the parameter called the natural rate of unemployment, the natural rate of unemployment that prevails when inflation expectations are confirmed.

Monetary policy makers use the NAIRU as a forecasting tool. The monetarists believe that real output and unemployment are determined by real factors and relative price rather than the level of money demand. When unemployment is below the NAIRU, inflation can be expected to rise, and when it is above the NAIRU, inflation can be expected to fall. Thus, even if the policy regime were one of inflation targeting, monetary policymakers should keep an eye on unemployment and the NAIRU. Monetary disturbances can exert a powerful influence in either direction. An excessive monetary expansion leads to accelerating inflation while a sharp monetary contraction can produce depreciation, exerting downward pressure on wages and prices.

The monetary policy and the Phillips curve related theories reviewed have the general conclusion that monetary policy is very important for stabilizing the economy. Through the use of various levers for monetary policy such as interest rates, monetary targets, exchange rate, among others, monetary policy can quickly cure the ills facing the economy. Thus, monetary policy is increasingly becoming popular relative to fiscal policy. Theorists however differ in their perception on how monetary policy can be used to achieve the desired outcomes. Some suggest that a rule should be followed on the conduct of monetary policy but some advocate for discretion. The conflicting views by the competing schools of thought have left non conclusive results about what monetary policy can and can not do. The next section review how these theories have been empirically tested.

3.2.4 The Taylor rule

Taylor (1993) developed some important and useful monetary policy rules. According to Taylor rules, there are reactive rules that change the interest rate policy instrument such as repo rate in response to changes in both inflation and unemployment. In other words the monetary policy reaction function depicts the upward relationship between the inflation rate and the unemployment rate. When the inflation rate rises, a Reserve Bank wishing to fight inflation will raise interest rates to reduce output and thus increase the unemployment rate. The hypothetical model which acts as representative model is given as follows:

$$i_t = r^* + \pi_t + \alpha_1 y_t + \alpha_2 (\pi_t - \pi^*) \dots \dots \dots 3.10$$

r^* – Long run equilibrium real interest rate

i_t – Short interest rate taken as monetary policy instrument

π_t – Previous four quarters (including the current one) average inflation

y_t – Output gap calculated as percentage deviation of actual output from the normal level.

π^* – Long run inflation target of the central bank

The value of the above four parameters are:

$$r^*=2\%, \pi^*=2\%, \alpha_1=0,5 \text{ and } \alpha_2$$

According to Taylor, the above equation (3.10) has the feature that the repo rate rises if inflation increases above a target of two percent or if real GDP rises above the trend GDP. If both inflation and real GDP are on target, then the Repo rate would be equal to 4 percent or 2 percent in real terms.

3.3. Empirical literature

The effect of monetary policy on inflation and unemployment is not well documented. However, as a result of the dynamic environment in which monetary policy operates, monetary policy approaches have responded to changes in economic environment. These changes in economic platform have stimulated a lot of econometric investigation on the effects of monetary policy on inflation and unemployment. The purpose of this section is to review relevant empirical studies on the effects of monetary policy on inflation and unemployment. There are limited studies on the effects of monetary policy regime changes on these variables, worse still for the African countries. As a result, the study reviews closely related literature on the effects of monetary policy on inflation and unemployment.

3.3.1. Literature from Developed countries

Some empirical studies in developed countries have contributed to the debate on the effect of monetary policy on inflation and unemployment, and the empirical test of the Phillips curve. These studies includes Kakes and Pattanaik (2000), Alexius and Holmlund (2008), Abrams *et al.*

(1980), Iwata and Wu (2006), Arestis and Sawyer (2002), Cecchetti and Groshen (2000), Rodgers (2002), Huchet (2003), Mihov and Scott (2001), Friedman (1995) and Svensson (2002), among others.

Kakes and Pattanaik (2000) employed a Vector Auto Regression (VAR) methodology in analysing the impact of monetary shocks on the Euro zone economies. They used aggregated data over the sample period 1984Q1-1998Q4. The results indicate that a monetary contraction, represented by a shock to the short-term interest rate, has a negative impact on unemployment. Monetary policy hardly influences inflation, while aggregate money (M3) shows initially a positive response. In addition, changes in the effective exchange rate and the long-term interest rate have a substantial impact on real activity, while a real appreciation is quickly translated into inflation. However, as the long-term interest rate and the effective exchange rate hardly respond to shocks in the short-term interest rate, these variables have limited importance in the transmission of monetary policy. Nevertheless, the results imply that the effective exchange rate is an important information variable. Finally, they make a comparison with a Vector Auto Regression (VAR) estimated with US data. Interestingly, the impact of monetary shocks on real activity was similar in both economies.

Alexius and Holmlund (2008) studied the Swedish experience of unemployment and monetary policy. They found out that around 30 percent of the fluctuations in unemployment were partly driven by a series of adverse macroeconomic shocks such as contractionary monetary policy and institutional factors¹⁵. The effects were quite persistent. In the preferred Vector Auto Regression (VAR) model, almost 30 percent of the maximum effects of a shock still remained after ten years.

Abrams *et al.* (1980) estimated monetary policy reaction functions for the 1970-77 periods using monthly data. The estimates shed light on several questions regarding monetary policy during the Burns era. The results indicated that past deviations of growth rate of M1 from the Federal's target was found to influence significantly the setting of the federal funds rate throughout the period under study. The inflation rate had a significant influence on the Federal rate setting. The reaction function estimates show that monetary authorities react in a systematic way to the major macroeconomic goal variables.

¹⁵ Comparing the Swedish economy to the US, monetary policy appears to have slightly larger and much more persistent effects on unemployment in Sweden than in US, these differences, however, account for the differences in labour market institutions rather than monetary policy.

Iwata and Wu (2006) carried out a study on the impact of exogenous monetary shocks for Japan. They employed a nonlinear structural VAR approach to estimate the effects of exogenous monetary policy shocks in the presence of a zero lower bound constraint on nominal interest rates. In addition, they examined the impact of such a constraint on the effectiveness of counter-cyclical monetary policies. The findings were that when interest rates are at zero, the output effect of exogenous shocks to monetary policy is cut in half if the central bank continues to target the interest rate. The conditional impulse response functions allow them to isolate the effect of monetary policy shocks operating through the interest rate channel when other possible channels of monetary transmission are present.

Arestis and Sawyer (2002) investigated the approach to monetary policy in the Euro zone, the U.S. and the UK. In their analysis, they reviewed the theoretical underpinnings of monetary policy and the channels of monetary policy. Much emphasis was on the channels through which changes in interest rate may affect the ultimate goal(s) of policy. They made a very important contribution on the conduct of monetary policy. That is, changes in the conduct of monetary policy along with financial innovation and the evolving behaviour of firms have altered the channels through which monetary policy affects the economy. The findings were that a recognition of the transmission channels means that the chain from the Reserve Bank discount rate to the final target of the rate of inflation is long and uncertain. In addition, the relationship between the exchange rate and interest rate expressed in the interest rate parity approach have constraints on the degree to which the domestic interest rate can be set to address the domestic levels of aggregate demand and inflation. The results point to a relatively weak effect of interest rate changes on inflation and suggested that based on their results, monetary policy can have long-run effects on real magnitudes. This however, does not comfortably fit with the theoretical basis of the new monetary policy approach.

Cecchetti and Groshen (2000) noted that the United States of America face both real and nominal shocks. Price and wages are rigid in response to monetary policy changes. They investigated how optimal monetary policy is affected by differences in the combination of shocks that an economy experiences and the rigidities it exhibits which explains the relevance of monetary policy. In their study they made it clear that shocks can be predominantly real, affecting relative prices, or primarily nominal-moving general price level. These shocks may also be big or small, frequent or rare. Similarly, some nominal rigidities are symmetrical, affecting both upward and downward movements equally. While others are asymmetrical, restricting decreases more than increases and hence the implications for monetary policy are diverse.

Rodgers (2002) employs a VAR model to identify monetary policy's different impacts on the labor market outcomes of teenagers, minorities, out-of-school youth, and the less-skilled in America. The series span from January 1948 to September 2002. The results indicated that disinflationary monetary policy increases the length of unemployment at all segments of the distribution. As a share of total unemployment, the increase is greatest among those with fewer than 5 weeks of unemployment.

Walsh (1987) revisited Huizinga and Mishkin (1986)'s proposal that a simple method for testing whether monetary policy regime changes have affected the ex-ante real rate of interest. However, the study failed to distinguish between shifts in the real rate process and shifts in inflation process in America. Walsh cautioned that care be taken in choosing the set of variables on which to project the ex-post real rate if inferences about the ex-ante rate are to be drawn. The study carefully scrutinized the method used by Huizinga and Mishkin (H-M methodology) and come with two alternative approaches: one approach treats the real rate as a function of fundamental determinants and the other define the ex-ante real rate process as a projection equation. The results were that procedures for identifying process shifts are sensitive to the choice of variables to include to the right hand side of the projection equation. Moreover, the analysis showed that the problem of omitted variables can lead to incorrect inferences if "process shift" is interpreted to mean "projection coefficient shift". Problems created by including nominal interest rate in a regression for the real rate of interest are the same problems created by inclusion of any variable that affect the rate of inflation. Also, lagged rates of inflation are likely to give rise to similar problems. Thus, according to Walsh's empirical results, care must be exercised in testing for real rate shifts.

Huchet (2003) reconsiders the empirical evidence on the possible asymmetric effects on real activity of changes in short term nominal interest rate. The paper concentrated on the effects of positive and negative monetary policy shocks. The contribution of the paper was to test formally the empirical predictions of Ball and Mankiw's model for the effects of monetary disturbances on real activity in France and Italy for the period 1970:1-1998:4. The data supported the hypothesis that monetary shocks display asymmetric effects. Also found, was a strong support for the empirical predictions of Ball and Mankiw's model after accounting for the behaviour of average inflation on real activity in both countries. The results imply that monetary authorities must take into account not only the behaviour of the inflation process but also the fact that all European countries can not react in the same way to positive and negative shocks.

Mihov and Scott (2001) bring the data for ten OECD countries, eight US regions, and the regions of France, German, and Italy. This was to bear the difficulties on whether a common monetary policy can be appropriate for the countries in the European Economic Union (EMU). They employed the VARs through the transmission mechanism. They found out a low correlation of output fluctuations between German and Italy which they reasoned to have been explained by differences in monetary and fiscal policies. The larger heterogeneity in output and inflation variability could have been caused by significant differences in economic and financial structures across member countries which inevitably translate into differences in output responses following a change in monetary policy stance.

Friedman (1995) attempted to address the conceptual issues that account for the question of whether monetary policy has real effects. He analyzed the existing evidence, assembled using each of three different empirical methodologies: partial equilibrium structural models, vector autoregressions based on observed prices and quantities, and vector autoregressions incorporating non-quantitative information. The results suggest that the real effects of monetary policy are systematic, significant, sizeable and economically important.

Svensson (2002) used New Zealand, Canada, and the United Kingdom as referral points to examine the extent to which monetary policy can be directed at both “monetary stabilization”, stabilizing inflation at low level and “real stabilization”, stabilizing output or, rather, the unemployment gap. And, whether there are limitations on the use of monetary policy for real stabilization purposes. The outcome was that in the long run, monetary policy can only control nominal variables such as inflation and nominal exchange rate. Monetary policy cannot increase the average level, or growth rate of real variables such as GDP and employment, or affect the average level of real exchange rate. In the short and medium term, monetary policy has effects on both nominal and real variables. However, the complex transmission mechanism of monetary policy prevents any fine-tuning. There is general international support for a regime of flexible inflation targeting. This is where inflation is stabilized around a low inflation target in the medium term. As a result, a gradual and measured policy response avoids creating unnecessary variability in the real economy. Monetary policy can achieve average inflation equal to a given inflation target and, at best, a good compromise between inflation variability and unemployment variability. Monetary policy cannot completely stabilize either inflation or the unemployment gap. Increased credibility in the form of inflation expectations anchored on the inflation target will reduce the variability of inflation and the unemployment gap.

Karanassou *et al.* (2007) argues that there is a nonzero inflation-unemployment trade-off in the long run due to frictional growth. That is a phenomenon that summarizes the relationship between nominal staggering and money growth. They estimated an interactive dynamics model for the US that includes wage-price setting and labour market equations. Then they evaluated the inflation-unemployment trade-off. Furthermore, they assess the impact of productivity, money growth, budget deficit, and trade deficit on the unemployment and inflation routes during the nineties using the Generalized Method of Moment (GMM) and Structural Vector Auto Regression (SVAR) econometric techniques. The results show that frictional growth has major implications for the slope of the Phillips curve. The natural rate of unemployment and the increase in money growth put upward pressure on inflation and substantially lowered unemployment. On the other hand, the rise in productivity growth, the budget deficit reduction, and the increase in the trade deficit put downward pressure on inflation and had a modest impact on the unemployment rate.

Karanassou and Snower (2007) showed that the New Keynesian Phillips Curve (NKPC) approach is an empirical failure by every measure ranging from methodological failure in time-series econometrics to the absence of a wage equation in New Keynesian Phillips Curve (NKPC). They despised the reliance on the New Keynesian Phillips Curve (NKPC) by literature and most other research on inflation dynamics on measures of goodness of fit, which can be misleading when most of the explanatory power is contributed by the lagged dependent variable. To this end, they suggest that the NKPC can be nested within the mainstream approach, and that its empirical validity can be assessed both by statistical exclusion tests on the significance of mainstream variables that are omitted from the NKPC, and also by post-sample dynamic simulations. In a similar study, Eller and Gordon (2003) supported the view that the NKPC approach is an empirical failure by every measure. In dynamic simulations, its error over the 1962-2002 sample period, is between three and ten times that of the mainstream model. They support the contrary view that the Phillips curve is still “alive” in the United States of America.

Furthermore, the differences in fit and in simulation performance between alternative models can be decomposed in a simple and transparent way among the contributions both of blocks of variables and of lag lengths. In this line of argument, Karanassou and Snower (2007) loathed the staggered nominal contracts arguing that they give rise to the so called “persistence puzzle” of the NKPC - although they generate price inertia, they cannot account for the stylized fact of inflation persistence. Relying on the exogeneity of the forcing variable (e.g. output gap, marginal costs, unemployment rate) and the assumption of a zero discount rate can be highly misleading.

The sources of movements in unemployment have been studied using variance decompositions in several papers, including Dolado and Jimeno (1997), and Carstensen and Hansen (2000). Dolado and Jimeno analyze Spanish unemployment and conclude that the main source of unemployment variability is productivity shocks (37 percent), while labor supply shocks and demand shocks account for 25 percent each.

Carstensen and Hansen (2000) find that technology shocks and labor supply shocks account for most long-run fluctuations in German unemployment but that goods market shocks are important in the short run. Similar results are found for Italy by Fabiani et al. (2001). Maidorn (2003) on the other hand find that demand shocks account for 40 percent of the ten year fluctuations in Australian unemployment and Gambetti and Pistoiesi (2001) find permanent effects of demand shocks on Italian unemployment that account for almost 60 percent of the ten-year fluctuations. These papers do not identify shocks to monetary policy separately but the total results for demand shocks can be interpreted as an upper bound for the influence of monetary policy.

Karanassou *et al.* (2005) and Christoffel and Linzert (2005) among others document persistent effects on European unemployment rates using other approaches than VAR models. Jacobson et al. (2003) actually document permanent effects of monetary policy on Swedish unemployment, but they model the rate of unemployment as an I(1) process whereby all shocks automatically have permanent effects. Algan (2002) finds that the standard model works well for the U.S. but fails to capture the rise of French unemployment. Amisano and Serati (2003) conclude that demand shocks have persistent effects on unemployment rates in several European countries. In their Structural Vector Auto Regression (SVAR), the effect of a demand shock dies out in 13-17 quarters in the investigated European countries, compared to 7 quarters in the U.S.

Barro and Gordon (1983) developed a positive theory of monetary policy and inflation-a simple Keynesian model. According to these authors, a discretionary policy maker can create surprise inflation, which may reduce unemployment and raise government revenue. But when people understand the policy maker's objectives, these surprises can not occur systematically. In equilibrium, people form expectations rationally and policy maker optimizes in each period, subject to the way people form expectations. They found out that (1) the rates of monetary growth and inflation are excessive; (2) these rates depend on the slope of the Phillips curve, the natural rate of unemployment rate, and other variables that affect the benefits and cost from inflation; (3) the monetary authority behaves counter cyclically, and (4) unemployment is independent of monetary policy.

The noted weaknesses of the studies is that they suffer set back on the methodological aspect. Fundamentally, wrong variables have been included in the monetary policy models. For example, the inclusion of lagged rate of inflation and nominal rate of interest in place of real rate of interest. The problem of excluding such variables is that it will be difficult to distinguish between the shifts in the real rate process and shifts in the inflation process.

In conclusion, the reviewed studies in the developed countries have a general perception that monetary policy contraction has a negative effect on unemployment. In other words, unemployment is driven by contractionary monetary shocks. Monetary policies react differently to macroeconomic shocks. Some react in a systematic way but some exercise discretion. This has made it very difficult to have a common monetary policy in many developed nations. Moreover, the impossibility of a common monetary policy is the differences in economic and financial structures across the developed countries. This translates into different response to shocks.

3.3.2. Literature from developing countries

Monetary policy is increasingly becoming an important tool for the control of inflation and other macroeconomic variables such as unemployment. Its importance, particularly in developing countries has led several studies to investigate the effect of monetary policy on these important fundamentals. These studies include Shansuddin and Holmes (1997), Hossain (2005), Fumitaka (2007) and Djivre and Robon (2000), among others.

Shansuddin and Holmes (1997) conducted both the cointegration test of the monetary theory of inflation and the Granger-causality test between the variables in the system. They developed a univariate and multivariate time series models to forecast inflation rates using quarterly time series data for Pakistan, from 1972-2 to 1993-4 for empirical investigation. The results suggest no cointegrating or long-run relationship between the variables in the monetary model and that there is some evidence of Granger-causality running from inflation to output growth. Comparison of out-of-sample quarterly forecasts for the 1988-1 to 1993-4 period are made for univariate and vector Auto Regressive Moving Average (ARMA) models of inflation. The results state that the forecasting accuracy of the multivariate ARMA model is not statistically different from that of the univariate ARMA model.

Hossain (2005) used annual data for the period 1954-2002 to investigate the causal relationship between money growth, inflation, currency devaluation and economic growth in Indonesia. Three testable hypotheses were investigated: (1) Does the money supply growth Granger-cause

inflation? (2) Does currency devaluation Granger cause inflation? (3) Does inflation affect economic growth? The empirical results suggest that there exist a short-run bi-directional causality between money supply growth and inflation and between currency devaluation and inflation. For the complete sample period, the causality running from inflation to narrow money supply growth was stronger than that from narrow money supply growth to inflation. The result was consistent with the view that in a high-or hyperinflationary economy, inflation does have a feedback effect on money supply growth and this generates a self-sustaining inflationary process. The short-run bi-directional causality between currency devaluation and inflation was, however, weak or not so robust for the complete or any shorter sample period. On the relationship between inflation and economic growth, the results suggest that there was no short-run causality from inflation to economic growth for the complete or any sub-sample period.

Fumitaka (2007) empirically examined the relationship between inflation rate and unemployment rate using the Vector Error Correction Model (VERM) analysis to test the existence of the Phillips curve in Malaysia for the period 1973 to 2004. The simple Phillips curve employed for estimation is as follows:

$$IFR_t = \alpha_0 + \beta_1 UER_{t-1} + \varepsilon_t \dots\dots\dots 3.11$$

Where:

α_0 = constant

β_1 = slop coefficient

IFR_t = inflation rate in Malaysia in the year t

UER_t = the unemployment rate in Malaysia in the year t

ε_t = is the error term

Incorporating the natural rate of unemployment into model, the standard Phillips curve could be expressed:

$$IFR_t = \alpha(L)IFR_{t-1} + \beta(L)(UER_t - NUER_t) + \varepsilon_t \dots\dots\dots 3.12$$

Where:

$\alpha(L)$ and $\beta(L)$ = polynomials in the lag operation

$NUER_t$ = natural rate of unemployment in Malaysia in the year t

The most interesting finding of this paper is the existence of a long-run and trade-off relationship and also a causal relationship between the unemployment rate and the inflation rate in Malaysia. In other words, this paper has provided an empirical evidence to support the existence of the Phillips curve in the case of Malaysia.

Djivre and Robon (2000) estimated a four-equation quarterly structural VAR model of the Israel economy during the years 1990-1999. The estimated system of equations includes an unemployment equation, an inflation equation and a nominal interest equation describing the evolution of the interest rate on monetary instruments controlled by the central bank and a nominal exchange rate equation. They used two identification restriction sets, which allowed them to differentiate between two structural models. In the first model, model 1, the supply does not respond on impact to changes in aggregate demand while in the second model, model 2, the supply response is such that it maximizes the impact effect of demand shocks on unemployment.

The Unemployment Equation:

$$U_t = \lambda_1 DP_t + \lambda_2 i_t + \lambda_3 \dot{e}_t + \sum_{i=1}^k a^i_{11} U_{t-i} + \sum_{i=1}^k a^i_{12} DP_{t-i} + \sum_{i=1}^k a^i_{13} i_{t-i} + \sum_{t=i}^k a^i_{14} \dot{e}_{t-i} + \varepsilon_t^s \dots\dots\dots 3.13$$

Equation (3.13) which describes the deviation of the unemployment rate from its trend may be interpreted as an inverted Phillips curve in line with the approach adopted by King and Watson (1994) and Dolado *et al.* (1996). In this case the structural error term stands for a structural shock which shifts this Phillips curve (upwards or to the right) in the inflation-unemployment plane. In

the context of an AS/AD model equation (3.13) stands for aggregate supply and the error term ε_t^s for a supply shock.

The Inflation Equation:

$$DP_t = \delta_1 U_t + \delta_2 \dot{i}_t + \delta_3 \dot{\varepsilon}_t + \sum_{i=1}^k a^i{}_{21} U_{t-i} + \sum_{i=1}^k a^i{}_{22} DP_{t-i} + \sum_{i=1}^k a^i{}_{23} \dot{i}_{t-i} + \sum_{i=1}^k a^i{}_{24} \dot{\varepsilon}_{t-i} + \varepsilon_t^d \dots\dots\dots 3.14$$

Equation (3.14) represents an inverted aggregate demand. In the context of an AS-AD model the structural shock, ε_t^d , stands for a demand shock which shifts the aggregate demand curve upwards in the inflation unemployment plane.

The Interest Rate Equation

$$\dot{i}_t = \theta_1 U_t + \theta_2 DP_t + \theta_3 \dot{\varepsilon}_t + \sum_{i=1}^k a^i{}_{31} U_{t-i} + \sum_{i=1}^k a^i{}_{32} DP_{t-i} + \sum_{i=1}^k a^i{}_{33} \dot{i}_{t-i} + \sum_{i=1}^k a^i{}_{34} \dot{\varepsilon}_{t-i} + \varepsilon_t^i \dots\dots\dots 3.15$$

Equation (3.15) is regarded as the reaction function of the interest rate as the econometrician on the basis of the observed data perceives in it. In this context the error term in expression (3.14) might stand for random shocks to the central bank preferences as a result. The inclusion of inflation and unemployment in the interest rate equation is consistent to the same extent with the existence of a unique policy target, say, inflation and of a dual policy target, inflation and unemployment. It is practically impossible to identify on the basis of equation (3.15) the preferences of the central bank.

The Exchange Rate Depreciation Equation

$$\dot{e}_t = \eta_1 U_t + \eta_2 DP_t + \eta_3 i_t + \sum_{i=1}^k a^i_{41} U_{t-i} + \sum_{i=1}^k a^i_{42} DP_{t-i} + \sum_{i=1}^k a^i_{43} i_{t-i} + \sum_{i=1}^k a^i_{44} \dot{e}_{t-i} + \varepsilon_t^i \dots \dots \dots 3.16$$

Equation (3.15) describes the endogenous determination of the nominal exchange rate depreciation in a small and open economy like Israel. The equation is introduced because the exchange rate plays a primary role in the determination of the inflation rate and the level of economic activity. The latter through its short run effect on the determination of the real exchange rate. The inclusion of the exchange rate depreciation as an endogenous variable in the model is not however costless. The exchange rate regime in Israel underwent very drastic changes during the period under consideration. It starts with a fixed exchange rate before February 1989, shifting to a horizontal exchange rate band in the beginning of 1989 (30.1.89) and heavy intra-band central bank intervention, and converging to a crawling and gradually widening exchange rate band without any central bank intra-band intervention.

The estimation results of the reduced form VAR model confirm the model's ability to reproduce the major changes which characterized the evolution of the endogenous variables during the period surveyed both in the context of a static (one period ahead) and of a dynamic simulation. Below are the four most important contributions from the results by Djivre and Robon (2000):

1. According to the findings, monetary policy shocks reflected in an interest rate increase induce a rise in unemployment. This is because of aggregate demand contraction, and a slow down in the inflation rate. However, in view of the relatively small size of the nominal interest rate coefficient in the exchange rate depreciation equation, the impact effect of a positive interest rate shock on the nominal exchange rate and through it on aggregate demand and economic activity is limited so that ex-post the response of the two models to interest rate shocks appears to be the same even though the transmission mechanism is substantially different between the two models.
2. Prices respond quite fast to changes in the monetary policy and do not lag behind changes in unemployment. This is mainly due to the quick response of the exchange rate to monetary policy shocks, on the one hand, and to the short lags with which changes in the exchange rate affect prices through their effect on aggregate demand and aggregate supply. This is a common feature of small and open economies like Israel, which is not shared by large and relatively closed economies in which the transmission process of changes in the exchange rate to prices is, according to empirical findings, relatively slow.

3. In spite of the effect of monetary policy shocks on unemployment and inflation their relative contribution in explaining the variability of these two variables is limited in both the structural models estimated. These results are in line with empirical findings on other economies. Moreover the estimation results suggest that supply shocks constitute the main sources of unemployment variability both in the short and in the long run.
4. Monetary policy shocks do not constitute an important source of inflation variability in the short run.

The conclusion that can be derived from the above studies is that the Phillips curve exists in some countries, for example in Pakistan. In some case causality have been noted and it runs from inflation to unemployment. This means that in most countries, inflations causes unemployment. Interest rate increase is found to induce unemployment and prices respond quickly to changes in monetary policy.

3.3.1. Literature from South Africa

There are very few studies that have analysed the effects of monetary policy on inflation and unemployment as well as the Phillips curve for South Africa. Due to the dynamic environment in which monetary policy operates, monetary policy approaches are responding to these changes. As a result, this has stimulated econometric investigation on the effect of monetary policy on inflation and unemployment. The few studies includes Aron and Muellbauer (2001), Ludi and Ground (2006), Burger and Marinkov (2006), Hodge (2002), Nell (2000) and Du Plessis and Burger (2006), among others.

Aron and Muellbauer (2001) gave a detailed characterization of the institutions and operations of monetary policy, including its transparency and accountability in South Africa for the period 1970-2000. They provide a quantitative assessment of the actual interest rate policy rules followed by the South African Reserve Bank (SARB) in the very “opaque” policy era of 1986-97, (prior to inflation targeting. In their analysis they employed the Taylor rule model (Taylor, 1993), to estimate the weights applied to different policy objectives in the interest rate rule with quarterly data, using their own inflation and unemployment gap forecasts to 1998. The findings were that: (1) the Reserve Bank emphasized current inflation with low weight on the unemployment gap, despite claiming to focus largely on money growth targeting; (2) no weight is attached on future inflation; and (3) excess money growth was less important after 1994.

Ludi and Ground (2006) examined the bank-lending channel of the credit channel of monetary policy in South Africa by making use of structural vector autogressions (SVAR'S) and tested the pass-through effects of a change in the repurchase (repo) rate on bank deposits and loan and output using a parsimonious vector error correction model (PVECM). They also employed the Johansen (1988) cointegration to test for a demand or supply driven bank-lending channel in a way that the validity and effectiveness of the monetary policy regime can be tested and evaluated. The results indicated that loans in South Africa are governed by consumer demand, and not by bank supply, meaning to disprove that the bank-lending channel has effectively worked as a tool of monetary policy. This might be accredited to a mismatch between firms and consumers seeking loans and banks seeking to supply loans, caused by asymmetric information and lack of appropriate technologies among other factors.

Another strand of literature introduced the Vector Error Correction Model (VECM) of the Phillips curve, Gordon triangular model and General Methods of Moments (GMM) model of the baseline New Keynesian Phillips Curve (NKPC) for South Africa. The results derived from these models, however, deviate from the time series augmented Phillips curve methodology. They detected little evidence of output gape effect and in some cases no significant direct effect, but an indirect channel via the adjustment of unit labour costs to its long-run equilibrium. These studies comprise the work of Burger and Marinkov (2006), Hodge (2002), Nell (2000) and Du Plessis and Burger (2006).

Burger and Marinkov (2006) considered whether or not Gordon's triangle model is applicable to South Africa that is to find out if there is hysteresis and inertia present in the country. In addition, in an attempt to find a better estimation of the output gap, the paper experiments with alternative ways to estimate the long-run output level, thereby extending on the standard technique that uses the HP-filter. The total period for the data used stretches from just post the 1973 oil shock, thus from 1974Q1 to 2002Q2. Burger and Marinkov estimates the general triangular model of Gordon represented below. All parameters are expected to have positive signs as shown in (3.16):

$$p_t = \beta_1 p_{t-1} + \beta_2 (y - \bar{y})_t + \beta_3 \Delta(y - \bar{y})_t + \beta_4 w + \beta_5 z_t + e_t \dots\dots\dots 3.17$$

To allow for a non-linear Phillips curve, output gap is divided into two variables: the negative unemployment gap, but containing positive values (with the years that contained negative values

set to zero), and the positive output gap, but containing negative values (with years containing the negative values set to zero. Both split gaps expected to have parameters with positive signs. The general model of Gordon with a split output gap is contained below:

$$p_t = \beta_1 p_{t-1} + \beta_2 (y - \bar{y})_t^{\text{overh}} + \beta_3 (y - \bar{y})_t^{\text{weak}} + \beta_4 \Delta(y - \bar{y})_t^{\text{overh}} + \beta_5 \Delta(y - \bar{y})_t^{\text{weak}} + \beta_6 w + \beta_7 z_t + e_t \dots\dots\dots 3.18$$

To estimate the long run output they used three methods and all of them resulted in time varying trend. The first is the standard Hodrick-Prescott (HP) filter. The function minimizes y_{HP} in the following objective function:

$$\sum_{t=1}^T (y_t - y_{HP,t})^2 + \theta \sum_{t=2}^{T-1} (\delta y_{HP,t+1} - \delta y_{HP,t})^2 \dots\dots\dots 3.19$$

Where according to convention: takes on a value of 100 for annual data, 1600 for quarterly data and 44000 for monthly data. Given the use of quarterly data in this study, is set to 1600.

Thus, the triangular model of Gordon estimated with the standard HP filter:

$$p_t = \beta_1 p_{t-1} + \beta_2 (y - \bar{y}_{HP})_t + \beta_3 \Delta(y - \bar{y})_{HP} + \beta_4 w + \beta_5 z_t + e_t \dots\dots\dots 3.20$$

The second method based on the method developed by Ball and Mankiw (2002) for Phillips curves uses the NAIRU, and is based on the idea that one should distinguish between long run changes in the relationship between inflation and output and short run fluctuations in inflation as captured by the error term.

The final presentation of this model is :

$$-\bar{y}_t + e_t / \beta_1 = -y_t + \partial p_t / \beta_1 \dots\dots\dots 3.21$$

The right-hand side of equation can be computed with the given β_j . Following the computation of the right hand side value, the HP filter is applied to that value so as to extract the value of y . This value of y then constitutes the time varying long run output used to calculate the output gap that will enter the actual Phillips curve estimation using Gordon's triangular model.

Thus, the triangular model of Gordon estimated with the Ball and Mankiw method:

$$p_t = \beta_1 p_{t-1} + \beta_2 (y - \bar{y}_{BM})_t + \beta_3 \Delta(y - \bar{y})_{BM} + \beta_4 W + \beta_5 z_t + e_t \dots\dots\dots 3.22$$

The third method applies a centered-moving average (CMA) filter to the actual long run output level. The long run output level calculated with the CMA filter is then given by:

$$\bar{y} = \frac{1}{2k+1} \left(y_t + \sum_{i=1}^k (y_{t+i} + y_{t-i}) \right) \dots\dots\dots 3.23$$

Thus, the triangular model of Gordon estimated with the CMA filter:

$$p_t = \beta_1 p_{t-1} + \beta_2 (y - \bar{y}_{CMA})_t + \beta_3 \Delta(y - \bar{y})_{CMS} + \beta_4 W + \beta_5 z_t + e_t \dots\dots\dots 3.24$$

Burger and Marinkov (2006)'s results were that there is almost no evidence of output level effects, suggesting the presence of hysteresis in output. Evidence to support the rates-of-change effect seems just as limited. Thus, the triangular model seems not to apply to South Africa. In addition to the standard components of the triangular model, unit labour costs and terms-of-trade were also included. The latter were not statistically significant in both sub-periods, while unit

labour costs were statistically significant in the second sub-period. Thus, unit labour cost can play a role in the reduction of inflation and the maintenance of low inflation in deflationary and stable inflationary periods.

On the conduct of policy, Burger and Marinkov stated that the insignificance of the output gaps in both sub-periods suggests that the anti-inflationary policy, in so far as it affected the demand side of the economy, does not really influence inflation. Thus, the conclusion is not that monetary policy does not influence the unemployment gap, but that any such policy does not seem to influence inflation via the unemployment gap. However, it seems as if monetary policy does work through inflationary expectations, given the presence of inertia and given that the strong anti-inflationary policy period (second subperiod) coincides with the decrease in inflation. Furthermore, the insignificance of the overheating gaps in the deflationary period also bodes well for the economy, as it suggests that if actual output exceeds potential output, the output gap does not put upward pressure on inflation.

Hodge (2002) estimated the relationship between inflation and unemployment with annual data for the period 1983-98 and presents his own estimate of a Phillips curve for South Africa:

$$p_t = \beta_1 + \beta_2 p_{t-n} + \beta_3 U_{t-n} + \beta_4 m_{t-n} + e_t \dots\dots\dots 3.25$$

Where:

P = inflation

U = the actual unemployment rate

m = SA import price index (to control for supply shocks)

In addition to estimating equation (3.24) with unemployment data, Hodge also estimated the equation by substituting in turn the annual percentage change in employment, the jobless rate and economic growth rate for the unemployment rate. Unlike Burger and Marinkov (2006), he did not estimate a long run trend for employment-the jobless rate or the economic growth rate. Thus, Hodge did not use a time-varying estimate of the Non Accelerating Inflation rate of Unemployment (NAIRU) or any of the other variables that he used to substitute for the

unemployment rate. He found no evidence of a relationship between inflation and either unemployment, employment or the jobless rate. However, he found evidence of a relationship between the first differences of inflation and growth.

Nell (2000) estimated potential or long-run output growth and substituted it into the Phillips curve relationship. To allow for a non-linear and convex Phillips curve, Nell estimated a model where he separates the output gap variable into positive and negative values. The model is similar to the one adopted by Burger and Marinkov (2006). In addition, Nell estimated the Phillips curve relationship for South Africa for two distinct periods: the accelerating inflation period (1971Q1-1985Q4) and the deflationary period (1986Q1-1997Q2). The findings were that the negative output gap is statistically significant in the accelerating inflation period, while the positive output gap is statistically insignificant. The overall output gap for this period, however, is statistically insignificant. When using the split output gap procedure, instead of a convex Phillips curve, the results indicated concavity when the economy overheats for the accelerating inflation period and non-concavity (and non-concavity) when the economy is weak for the decelerating inflation period.

Du Plessis and Burger (2006) estimated the New Keynesian Phillips curve using quarterly frequency from the South African Reserve Bank's *Quarterly Bulletin* for the period 1975 Q1 until 2003 Q4. Their equation was estimated using Generalized Methods of Moments (GMM) with the inverse of the Newey-West covariance matrix (with 4 truncation lags) as the weighting matrix. This procedure yields consistent estimates under heteroscedasticity and autocorrelation of unknown form. The kernel used to weight the autocovariances is based on the quadratic spectral kernel. Below is the estimated model:

$$\pi_t = \beta\pi_{t+1} + \lambda\hat{\phi}_t + \varepsilon_t \dots\dots\dots 3.26$$

Where $\varepsilon_t = \beta\{E_t[\pi_{t+1}] - \pi_{t+1}\}$ is an inflation shock which, under the assumption of rational expectations, will be orthogonal to the information set in period t.

The results showed that the structural parameters that were derived from the NKPC suggest an inflation dynamic that is not fundamentally unusual with that found in the USA and Europe. However, it was also found that the estimated models were sensitive across different sub-samples and while the most encouraging results were obtained for the more recent subsamples, (though

they show evidence of the weak instrument problem) the fragility of structural parameters across sub-samples and with respect to different non-linear normalisations remains a concern.

Fair (2003) examines various interest rate rules, as well as policies derived by solving optimal control problems, for their ability to dampen economic fluctuations caused by random shocks. A tax rate rule is also considered. A multicountry econometric model was used for the experiments using different estimation periods: 1954:1-2002:3 and 1994:1-1998:4. The results differ sharply from those obtained using recent models in which the coefficient on inflation in the nominal interest rate rule must be greater than one in order for the economy to be stable.

In South Africa there is a large gap from literature on the effect of monetary policy on inflation and unemployment and the Phillips curve. However, the reviewed studies have shown that the Reserve Bank put more weight on inflation than unemployment. The Phillips curve was found out not to exist in South Africa. Thus, there is no evidence of the relationship between inflation and unemployment in the country.

3.4. Limitations of the reviewed studies

Some of the reviewed studies have been criticized both on the theoretical and empirical grounds. Some doubts have been on the fitness of the employed theories for econometric modeling. For example, Mankiw (2001), Eller and Gordon (2003), Rudd and Whelan (2005), and Karanassou and Snower (2007) argued that existing rational expectations sticky-price models fail to provide a useful empirical description of the inflation process, especially relative to traditional econometric Phillips curves of the sort commonly employed for policy analysis and forecasting. Also, they found it hard to argue that empirical Phillips curve equations are easily estimated and completely reliable for forecasting and policy analysis. Rudd and Whelan (2005) went on to point that the labor's share version of the new-Keynesian model actually provides a very poor description of observed inflation behavior. Furthermore, the new Keynesian Phillips curve is incapable of generating empirically plausible impulse response functions to monetary policy shocks (Mankiw, 2001). This failure of the model extends along two dimensions: first, labor's share fails to provide a good measure of inflationary pressures; and second, this version of the model cannot account for the important role played by lagged inflation in empirical inflation regressions.

The VAR methodology has received criticism from many researchers. The ordering imposed by Choleski decomposition is not in fact theoretical (Cooley and LeRoy, 1985). This implies a

particular type of recursive contemporaneous structure for the economy which is not consistent with economic theory. Also the estimated shocks are not pure shocks but rather linear combinations of the structural disturbances. Therefore it is difficult to assess the dynamic effects on variables because they will depend on all of the structural disturbances. The innovation (disturbance) accounting techniques of impulse response functions and variance decompositions associated with traditional VAR analysis have no obvious economic interpretation as a consequence of the non theoretical approach taken (McCoy, 1997).

Empirically, Rudd and Whelan (2005) and Mankiw (2001) challenged the role played by rational forward looking behavior of the Hybrid New-Keynesian models, citing that the data actually prove little evidence of their important role. Moreover, a combination of supply shocks that are hard to measure, and structural changes in the labour market alter the natural rate. This makes it unlikely that any empirical Phillips curve will ever offer a tight fit. The NK model is also largely criticized because it lacks microfoundations. Abbritti *et al.* (2007) noted three main shortcomings of the NK model: (1) there is no involuntary unemployment, because of the hypothesis of a Walrasian labour market; (2) there is no trade-off between inflation and output gap stabilization.

These authors show, among other things, that the stance of monetary policy is important not only to the policy maker's response to the exogenous economic shocks (e.g., the Taylor rule), but also to the contemporaneous effects of the monetary policy innovations (i.e., the monetary shock itself). What they do not address are the long-run objectives and impacts of monetary policy. The study therefore investigates those long-run impacts. The long-run identification is achieved through the long-run impact matrix of a vector error-correction model (VECM). Short-run identification is achieved by making standard assumptions of how monetary policy impacts other economic variables of interest and by similar assumptions about the information set of the South Africa Reserve Bank.

Table 3. 1 Summary of key findings

Group	Author(s)	Methodology	Findings
1	Aron and Muellbauer(2001), and Djivire and Robon (2000)	Taylor Rule Model	<ul style="list-style-type: none">- Low weight is put on unemployment gap and future inflation- Monetary policy shocks do not constitute to inflation variability in the short run.- Monetary policy induces a rise in unemployment.
2	Burger and Marinkov (2006) and Hodge (2002)	Phillips Curve	<ul style="list-style-type: none">- No evidence of the Phillips Curve
3	Mihov and scott (2001), Abrams et al, (1980) and Hitchet (2003)	NKPC	<ul style="list-style-type: none">- Monetary policy is not universal and as such different countries react differently to economic shocks
4	Kakes and Pattanaik (2000), Svensson (2002), Alexius and Holmland (2008)	VAR	<ul style="list-style-type: none">- Monetary contraction has negative impact on real activity on real activity
5	Fair (2003), Huchet (2002), Du Plessis and Burger and Marinkov	Various	<ul style="list-style-type: none">- countries react differently to positive and negative shocks to monetary policy

3.5. Conclusion

In macroeconomics, various theoretical models have been developed on the conduct of monetary policy over the years. These theoretical developments emanate from propositions by diverse competing schools of thought: the Classicals, the Keynesians and the Monetarists. There are common grounds in which they agree and also areas of disagreements. The debate was sparked by the development of the Classical Fishers quantity theory of money. It postulates the neutrality of money in the economy and consequently shuns intervention by governments in the markets. The Keynesians did not agree with the Classicals' proposition. They embraced the Phillips (1958) idea of the trade-off relation between inflation and unemployment which they see as a justification of their policies. They treated it as a menu from which the monetary authorities could choose. On the contrary, the Monetarists (Friedman, 1966, 1968; Phelps, 1967) placed some doubts of the existence of the trade-off hypothesis. Instead they introduced the idea of rational expectations where the Phillips curve become vertical rather than the Keynesian's downward idea-thus the augmented-Phillips curve.

Models were developed based on these theoretical developments (the Quantity theory of money, the NKPC, the NAIRU). These models range from the traditional VAR models, the GMM models, Multi-country econometric models and the VEC models. A lot of studies have employed these models and apply them empirically. The results are however inconclusive. Some studies witnessed the significance of monetary policy for both nominal and real variables in the economy whilst others even doubt its importance. The existence of Phillips curve in many countries is not clear. In other countries, the relationship between inflation and unemployment has been negative (for example Malaysia). But in the case of South Africa, no evidence was found to support the existence of the Phillips curve. Many of the reviewed studies have analyzed the effects of monetary policy to the economy through many channels of the transmission channels. This study, instead, examine the effects in aggregate terms.

CHAPTER FOUR

METHODOLOGY

4.1. Introduction

Chapter three reviewed the literature on the impact of monetary policy on nominal and real variables, and Phillips curve in South Africa. This, coupled with the background on the conduct of monetary policy shed some light on the relationship between, monetary policy, inflation and unemployment in South Africa. This chapter builds on that background to set the analytical framework used in this study.

4.2. Data sources and definition of variables

The study employs annual data over the period 1980-2008. The data is obtained from the electronic database of the South African statistics and the department of trade and industry. However, some publications of the South African Reserve Bank, International Financial Statistics Supplement Series, will complement the data. As is usual, the series are initially transformed to induce stationarity. We apply the maximum likelihood estimation to a vector error correction model to simultaneously determine the long run and short run effects of the dependent variable in a model. This approach also provides the speed of adjustment coefficient, which measures the speed at which the unemployment rate will revert to its natural rate following a short term shock to the system.

RIR: the short term interest rate is used for monetary policy indicator, following most of the recent literature. According to the “inflation and the Fisher effect”, nominal interest rate must be equal to growth rate of money in nominal terms and real interest rate must be equated to the growth rate of purchasing power. Inflation erodes purchasing power of money and real interest as nominal interest adjusted for inflation. Based on Fisher’s (1930) argument, nominal interest rate ought to increase one for one with the increase in the expected rate of inflation. Therefore it implies that high nominal interest rate should be followed by high inflation and thus we expect a positive relationship between the monetary policy and interest rate. Interest rate is the average yearly ruling money market rate in this study.

IFR: inflation as a measure of prices is an index charting changes in the prices paid by consumers. It is determined by comparing the price, in two different periods, of a fixed basket of goods and services. Thus, the inflation rate is calculated as follows:

$$\text{Inflation rate} = \frac{P_0 - P_{t-1}}{P_{t-1}} \times 100\%$$

Where:

P_0 = current average price level

P_{t-1} = the average price level a year ago

UER: a narrow definition is used as a measure of unemployment. Under the narrow definition, a person is regarded as unemployed if that person did not work in the previous week, wants to work, is available to begin work within a week and has taken active steps to look for employment or self-employment in the previous four weeks. The unemployment rate is the number of people looking for work divided by the total number of people in the labor force. Thus unemployment rate is calculated as:

$$\text{Unemployment} = (\text{Number of unemployed} / \text{labor force}) \times 100\%$$

M0: is the simplified measure of monetary policy rule which is responsive. The rule is responsive in the sense that it calls for changes in the money supply, the monetary base, or short-term interest rate following changes in the price level or unemployment. The monetarists view that inflation is a monetary phenomenon, which can be tested by including money supply growth in the model. Monetarist contends that the increase in money supply stimulates demand which fuels inflation if the growth in real output is lower than the growth rate in money supply. When there is excess demand, producers respond by raising prices. Despite disagreeing with monetarist on the transmission mechanism, Keynesians also content that an increase in money supply is inflationary through the interest rate effect. For instance, if money supply increases, interest fall

raising the demand for investment goods and this results in a rise in aggregate demand, exerting upward pressure on prices at a given level of output. The failure to respond to the increase in aggregate demand because of supply constraints, for example, causes inflation. Thus, we expect a positive relationship between money supply and inflation.

4.3. Research techniques

The study follows Johansen (1988) and Johansen and Juselius (1990) cointegration technique. The technique establishes the long run relationship between variables. The first task is to make sure that the data is integrated of the same order. This is done by using unit root tests to examine the stationarity of data sets. Thus, the variables are subjected to the Dickey Fuller (DF) and the Augmented Dickey-Fuller (ADF) unit root tests¹⁶.

4.3.1. Testing for stationarity

The assumptions of the Classical regression model necessitate that both the dependent and independent variables be stationary and the errors have a zero mean and finite variance. Non stationary variables results in spurious regression and as Granger and Newbold (1974) argued, they are characterized by a high R^2 and a low Durbin-Watson (dw) statistic, t-and F-statistics that appear to be significant, but the results derive no any economic sense (Verbeek,2000:281). The results “looks good” because the least-squares estimates are not consistent and the customary test of statistical inference do not hold (Enders, 1995:215).

In addition, a series is said to be integrated and is denoted as $I(d)$, where d is the order of integration. The order of integration refers to the number of unit roots in the series, or the number of differencing operations it takes to make a variable stationary (Takaendesa, 2004). In particular, as shown in Phillips (1986), the ordinary least squares estimator does not converge in probability as the sample size increases, the t-and F- statistics do no have well-defined

¹⁶ Assuming that the data generating process is described by $\Delta Y_t = a_1 + a_2t + \alpha Y_{t-1} + \sum_{i=1}^M d_i \Delta Y_{t-i} + \mu_t$. The DF and the ADF test the null hypothesis that there exists a unit root in the time series (nonstationary time series), which is $H_0: \alpha=0$ against the alternative hypothesis, $H_1: \alpha < 0$, that the time series is stationary (no unit root). A rejection of the null hypothesis under these tests means the series does not have a unit root

asymmetric distributions, and the dw statistic converges to zero. The reason is that with variables being $I(1)$, the error term μ_t will also be a nonstationary $I(1)$ variable (Verbeek,2000:281).

Enders (1995: 215) noted four cases of spurious regression: Case I: when both variables are stationary, the classical regression is appropriate. Case II: regression equations using variables which are integrated of different sequences are meaningless. Case III: if the variables in nonstationary sequence are integrated of the same order and the sequence contains a stochastic trend, the regression is spurious. The results from such spurious regressions are meaningless in that all errors are permanent. In this case, it is often recommended that the regression equation be estimated in first differences. Case IV: if variables in nonstationary sequence are integrated of the same order and the residual sequence is stationary and the variables are cointegrated.

4.3.2. Dickey-Fuller and the Augmented Dickey-Fuller Tests

Dickey and Fuller (1979) consider three different regression equations that can be used to test the presence of a unit root. Basically the three regressions differ due to the presence of the deterministic elements a_1 and a_2t and they are given as follows:

$$\Delta Y_t = \alpha Y_{t-1} + \mu_t \dots\dots\dots 4.1$$

$$\Delta Y_t = a_1 + \alpha Y_{t-1} + \mu_t \dots\dots\dots 4.2$$

$$\Delta Y_t = a_1 + a_2t + \alpha Y_{t-1} + \mu_t \dots\dots\dots 4.3$$

Where Y_t is the required time series, Δ is the difference operator, t is the time trend and μ_t is the pure white noise error term which should satisfy the following assumptions: normality, constant variance and independent error terms. Equation (4.1) is a pure random walk, equation (4.2) adds an intercept or drift term and equation (4.3) includes both a drift and linear time trend. The test involves estimating the equations using the OLS in order to obtain the estimated value of α , and the associated standard error and compare the resulting t-statistic with appropriate value reported in the Dickey-Fuller (DF) tables. The weakness of the DF test is that it does not take account of possible autocorrelation in the error process or term (μ_t). To cater for the above mentioned problem associated with DF test, the Augmented Dickey-Fuller (ADF) can be used. The ADF

include extra lagged terms of the right-hand side of the DF equation (4) in order to eliminate autocorrelation. The ADF test consists of estimating the following regression:

$$\Delta Y_t = a_1 + a_2 t + \alpha Y_{t-1} + \sum_{i=1}^M d_i \Delta Y_{t-i} + \mu_t \dots \dots \dots 4.4$$

Where μ_t is the pure white noise error term, $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in (4.4) is serially correlated (Gujarati, 2003:819). The null hypothesis is that there exists a unit root in the time series (nonstationary time series), which is $H_0: \alpha = 0$ against the alternative hypothesis, $H_1: \alpha < 0$, that the time series is stationary (no unit root).

The assumptions that the error terms are independent and have a constant variance raises problems related to the fact that (1) the true data generating process may contain both autoregressive and moving average (MA) components. In this case, we do not know how to conduct the test if the order of the MA terms is unknown, (2) we can not properly estimate α and its standard error unless all the autoregressive terms are included in the estimating equation, (4.3) the DF test considers only a single unit root and (4) it is difficult to ascertain where the intercept and/or time trend belongs (Enders, 1995:225). In addition, the DF test tends to accept the null hypothesis of unit root more often than is wanted. That is, according to Brooks (2002: 381) and Gujarati (2003:819), it exhibits low power.

4.3.3. Cointegration and vector error correction modeling

Regression of one non-stationary variable on another is very likely to yield impressive-seemingly results which are wholly spurious (Mukherjee *at al.*, 1998:135). In general, if two time series variables are both non-stationary in levels but stationary in first-differences, they are integrated of order 1, I(1), then there could be a linear relationship between them which is stationary, I(1) and as such all the series of interest should be integrated of the same order, preferably I(1). The two time series variables that satisfy this requirement are considered to be cointegrated. Variables are cointegrated with one another if the residuals from the levels regression are stationary. These cointegrated variables must have an error correction representation in which an error correction term (ECT) must be incorporated into the model. Accordingly, a vector error correction model (VECM) is formulated to reintroduce the information lost in the differencing

process, thereby allowing for long-run equilibrium as well as short-run dynamics (Ang and McKibbin, 2006).

The next stage involves estimating the Vector Error Correction Model (VECM). It contains information on both the long run and short run relationship between variables. The Engle and Granger (1987) (EG) approach can be used which combine both the short run and long run properties, and which at the same time maintain stationarity in all variables. One of the best features of the EG approach is that it is both very easy to understand and implement. However, it is associated with some shortcomings: it is silent about the arrangement of variables (i.e., which variable can be used as a regressor and why?); it fails to treat a possibility of there being more than two variables and; finally, it is subjected to the tendency of carrying forward errors as it rely on a two step estimator where residual series generated in the first step can be used to estimate a regression in the second step. In addition, one of the models has more than two variables, and hence a possibility of having more than one cointegrating vector. This happens when variables in the model form several equilibrium relationships governing the joint evaluation of all the variables. Actually, a problem arises when for example; only one cointegrating relationship exists, where there are actually more than one. This problem, however, can not be resolved by the EG single-equation approach. In that case we apply the Johanesen (1988) techniques based on VAR.

In order to present this approach, according to Asteriou and Hall (2007), it is useful to extent the single equation error correction model to a multivariate one as follows:

Assuming a vector $Z_t = [M0_t, RIR_t, UER_t, IFR_t]$ which are endogenous;

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \dots + A_k Z_{t-k} + \mu_t \dots \dots \dots 4.5$$

In order to use the Johansen test, the model above (4.5) is reformulated in a vector error correction model (VECM) as follows:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \dots + \Gamma_{k-1} \Delta Z_{t-k-1} + \Pi Z_{t-1} + \mu_t \dots \dots \dots 4.6$$

Where $\Gamma = (1 - A_1 - A_2 - \dots - A_k)$ ($i = 1, 2, \dots, k - 1$) and $\Pi = -(1 - A_1 - A_2 - \dots - A_k)$. Π is a ($n \times n$) matrix whose rank determines the number of cointegrating relationships. In our case, the Π matrix is a 4×4 and 2×2 due to the fact that we have assumed four variables and two variables respectively. The Π matrix contains information regarding the long run relationships. We can decompose $\Pi = \alpha\beta'$ where α will include the speed of adjustment to equilibrium coefficients while β' will be the long run equilibrium matrix coefficients. Therefore, $\beta'Z_{t-1}$ is the error correction term which contains up to $(n-1)$ vectors of a multivariate framework. The Johansen test centers on an examination of the Π matrix (Brooks, 2002: 405).

However, there are procedures that have to be followed before one proceeds to test for the rank of Π . The first step in the Johansen approach is to test for the order of integration of the variables under examination. The aim is to have no-stationary variables in order to detect among them a stationary cointegrating relationship(s) and avoid the problem of spurious regressions. It is clear that the most desirable case is when all the variables are integrated of the same order and then to proceed with cointegration test. However, it is important to stress that it is not always the case, and that even in cases where the mix of $I(0)$, $I(1)$ and $I(2)$ variables are present in the model, cointegrating relationships might exist. The inclusion of such variables, though, will massively affect our results and more consideration should be applied in such cases (Asteriou and Hall, 2007:322).

The second step, as Asteriou and Hall (2007:322) stressed involves determining the appropriate order (k) of the VAR where they agree that the Johansen test can be affected by the lag length employed in the VECM, thus it is crucial to attempt to select the lag length optimally. Finding the optimal (appropriate) lag length is very important because we want to have Gaussian error terms (i.e. standard normal error terms that do not suffer from non-stationarity, autocorrelation and heteroskedasticity). Before we estimate, we take a careful inspection of the data and the functional relationship in order to decide whether to include additional variables. It is at this stage that we decide whether to include dummy variables that take into account short run effects on such as political events and financial crises that had important effects on macroeconomic conditions.

In the third step, we decide whether an intercept/ or a trend should be included either in the short run or in the long run, or both models. In choosing the dynamic model we employ the Puntula principle which involves the estimation of models and the presentation that the results from the

most restrictive hypothesis (i.e. r =number of cointegrating relations=0 and model 1) and through the least restrictive hypothesis (i.e. r =number of variables entering the VAR-1= $n-1$ and model 4). The model selection procedure then comprises moving from the most restrictive model, at each stage comparing the trace test statistic to its critical value, stopping only when we conclude for the first time that the null hypothesis of no cointegration is not rejected (Asteriou and Hall, 2007:324).

The fourth step involves determining the rank of Π or the number of cointegrating vectors. There are two methods and corresponding statistics for determining the number of cointegrating relations and both involve estimation of the matrix Π :

The maximum eigenvalue (λ_{\max}) and the trace (λ_{trace}), are specified as follows:

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \dots \dots \dots 4.7$$

and,

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \dots \dots \dots 4.8$$

Where r is the number of cointegrating vectors under the null hypothesis and $\hat{\lambda}_i$ is the estimated value for the i th ordered eigenvalue from the Π matrix. The maximum eigenvalue method test the null hypothesis that $\text{rank}(\Pi) = r$ against the hypothesis that the rank is $r+1$. The test considers the largest eigenvalues in descending order and considers whether they are significantly different from zero. On the other hand, the trace statistic considers whether the trace is increased by adding more eigenvalues beyond the r th eigenvalue. The null hypothesis is that the number of cointegrating vectors is less than or equal to r

Finally, once we have determined the number of cointegrating vectors, we should proceed with testing which variables are weakly exogenous. If a variable is found to be weakly exogenous we drop it as an endogenous part of the system. A VECM (equation 4.6) can be estimated by

specifying the number of cointegrating vectors, trend assumption and normalising the model on the true cointegrating relation(s). The Johansen procedure is particularly attractive over the standard VAR because it permits temporary causality to emerge from firstly, the sum of the lagged differences of the explanatory differenced variable and secondly, the coefficient of the error-correction term (Monoj and Manasvi, 2007).

4.3.4 Diagnostic Checks

Diagnostic checks test the stochastic properties of the model, such as residual autocorrelation, heteroskedasticity and normality, among others (Takaendesa, 2004).

4.3.5. Autocorrelation LM test

Autocorrelation can be defined as relation between members of a series of observations ordered in time. It arises in cases where the data have a time dimension and where two or more consecutive error terms are related. In this case, the error term is subject to autocorrelation or serial correlation. It arises as a result of either excluded variables or the use of incorrect functional form. The consequences of autocorrelation are that the OLS remains unbiased, but becomes inefficient and its standardized errors are estimated in the wrong way (Gujarati (2003: 454) and Verbeek, (2000:90)). The Lagrange Multiplier (LM) test the null hypothesis, $H_0: \rho_1 = \rho_2 = \dots = \rho_p = 0$ (no autocorrelation) against the alternative hypothesis, H_1 : at least one of the ρ s is not zero, thus serial correlation.

4.3.6. White heteroskedasticity test

Heteroskedasticity arises if different error terms do not have identical variances, so that the diagonal elements of the covariance matrix are not identical. The error terms are mutually uncorrelated while the variance of μ_i may vary over the observations. The consequences of using the usual testing procedures despite the heteroskedasticity is that the conclusions we draw or the inferences we make may be very misleading (Gujarati, 2003:399). In this study we employ the White test. The general white test of heteroskedasticity does not rely on the normality assumption and is easy to implement (Gujarati, 2003:413). The basis of this test is to check whether there is any systematic relation between the squared residuals and the explanatory variables (Mukherjee *at al.*1998:261). It tests the null hypothesis that there is no

heteroskedasticity in which the test statistic should not be significant in the absence of heteroskedasticity and misspecification.

4.3.7. Residual normality test

The assumptions of the Classical Linear Regression Model (CLRM) require that the residuals are normally distributed with zero mean and a constant variance and violation of this restriction will result in t- and F-statistics being not valid. One way of detecting misspecification problems is through observing the regression residuals. Usually the normality test checks for skewness (third moment) and excess kurtosis (fourth moment) (for details on the test see Verbeek, 2000:173). Jarque-Bera normality test compares the third and fourth moments of the residuals to those from the normal distribution under the null hypothesis that residuals are normally distributed and a significant Jarque-Bera statistic, therefore, points to non-normality in the residuals.

4.4. Conclusion

The chapter presented the procedures involved in the Johansen (1988), Johansen and Juselius (1990) approach. The cointegration technique has been chosen as the preferred parameter estimation technique for monetary policy model. This is because of its several advantages over alternative techniques. Based on the cointegration approach, the error correction model, which contains information on both the long run and short run relationship between variables is estimated. The estimated model has to pass all the diagnostic checks which involve autocorrelation LM test, white heteroskedasticity test and residual normality test. Having familiarise ourselves with the estimation techniques, we now apply these techniques to South African data in order to achieve the objectives of this study as set out in Chapter one.

CHAPTER FIVE

ESTIMATING THE EFFECT OF MONETARY POLICY IN SOUTH AFRICA

5.1. Introduction

The main aim of this section is to examine the relationship between monetary policy and the two economic fundamentals (inflation and unemployment) using the VEC modeling technique. The model regresses the monetary policy variable (M0) against inflation and unemployment growth over the period 1980-2008. Real interest rate is added as a proxy for short term interest rate to avoid the linearity problem.

5.2. Model specification

A reaction function model by Taylor (1993) is employed. The model provides a useful framework for the analysis of historical policy. It is also important for the econometric evaluation of specific alternative strategies that the Reserve Bank can use as the basis for its monetary policy decisions. Thus the purpose of using the Taylor-type reaction function is to establish whether or not the SARB remains focused on its objectives of low inflation and low unemployment.

The hypothetical model which acts as representative model is given as follows:

$$i_t = r^* + \pi_t + \alpha_1 y_t + \alpha_2 (\pi_t - \pi^*) \dots \dots \dots 5.1$$

Where

r^* – Long run equilibrium real interest rate

i_t – Short interest rate taken as monetary policy instrument

π_t – Previous four quarters (including the current one) average inflation

y_t – Output gap calculated as percentage deviation of actual output from the normal level.

π^* – Long run inflation target of the central bank

The above rule (expression 5.1) can be modified by employing variables used by Kakes and Pattanaik (2000) and easily be converted into an estimable form as

$$MO_t = \beta_0 + \beta_1 IFR_t + \beta_2 UER_t + \beta_3 RIR_t + U_t \dots\dots\dots 5.2$$

Where

MO = measure of monetary policy

IFR = consumer price index

UER = unemployment rate

RIR = real interest rate

In this section, we follow the estimation techniques developed in the analytical framework given in Chapter 4. Thus, the following step involves subjecting the variable to stationarity.

5.4. Stationarity test

The results in Table 5.1 show that the null hypothesis of non-stationarity cannot be rejected when variables are at levels. When the test is applied to first differences of the series, they all become stationary. We therefore can conclude that the variables in our cointegration regression are first difference stationary, that is, each series is characterized as integrated of order one I(1). The results are shown in table 5.1 below:

Table 5. 1: Unit root tests 1980-2008

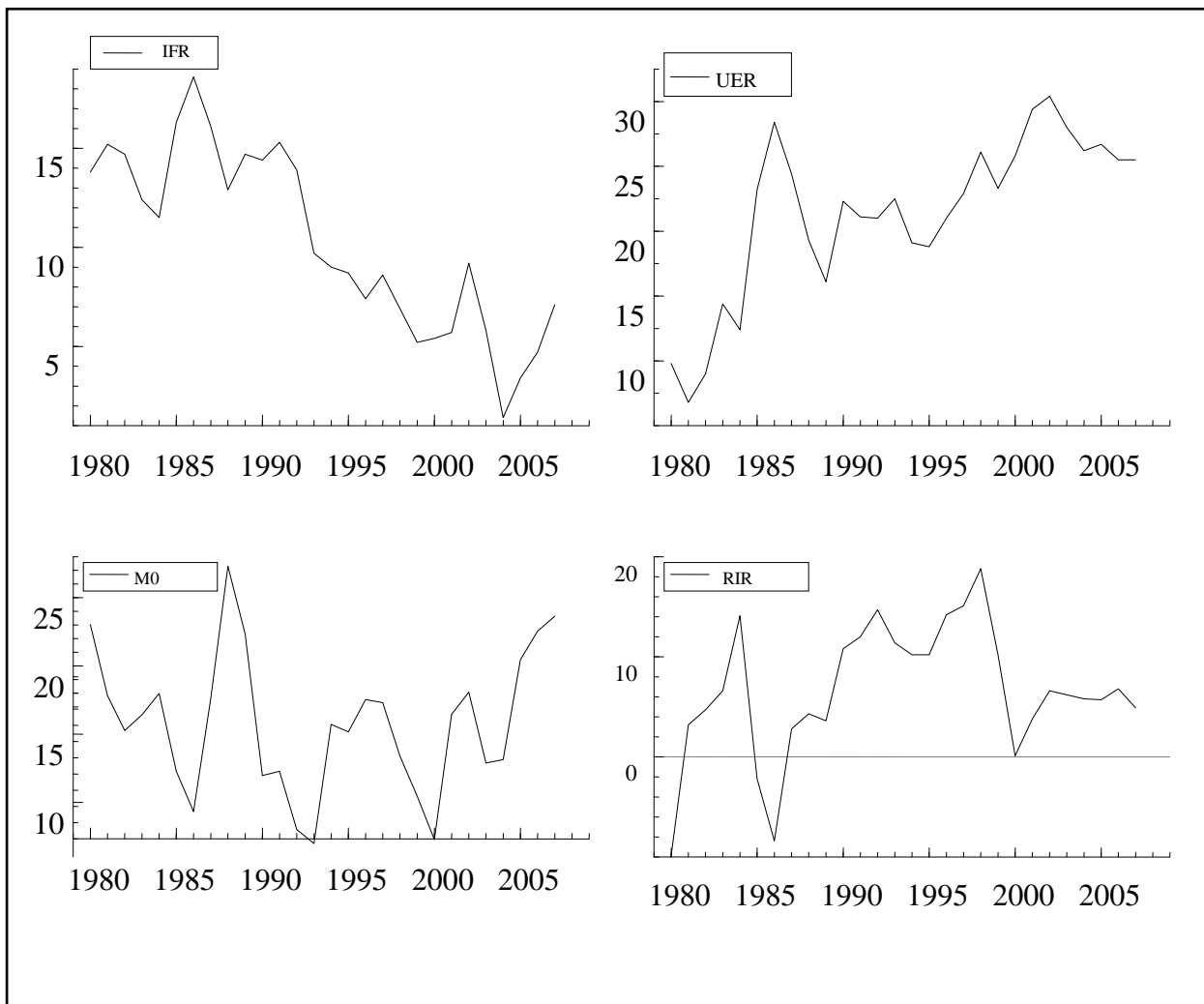
		<i>Dickey-Fuller</i>			<i>Augmented Dickey-Fuller</i>			
Variable		Intercept	Trend & intercept	None	Intercept	Trend & intercept	None	I
<i>M0</i>		-2.8991	-2.7702	-0.76288	-3.936**	-3.785*	-0.5936	I(1)
		-4.4401**	-4.4109**	-4.5278**	-5.66**	-5.556**	-5.577**	I(0)
<i>IFR</i>		-1.312	-2.767	-1.044	-1.185	-3.33	-1.185	I(1)
		-4.456**	-4.339**	-4.474**	-5.335**	-5.186**	-5.222**	I(0)
<i>UER</i>		-2.115	-2.439	0.2358	-2.115	-2.439	0.2442	I(1)
		-4.966**	-4.984**	-4.783**	-4.23**	-4.401**	-4.1**	I(0)
<i>RIR</i>		-3.5953**	-3.3017	-1.8593	-2.865	-2.806	-1.558	I(1)
		-5.3899**	-5.2749**	-5.5248**	-5.054**	-5.049**	-5.165**	I(0)
Critical values	1%	-3.696	-4.338	-2.652	-3.708	-4.355	-2.656	
	5%	-2.975	-3.587	-1.954	-2.98	-3.594	-1.955	
Values marked with * represent a stationary variable at 5% significance level and ** represent a stationary variable at 1% significance level.								

The graphical analysis serves as a benchmark for the formal measure of unit root. The graphs on Figure 5.1 part (A) show that it is apparent the series are non-stationary at levels except for (RIR) which exhibits some fluctuations around a zero mean. The conclusion of non-stationarity is arrived at after observing that none of the graphs fluctuate around a zero mean, an indication of stationarity. The other characteristic of the series is that the variables (IFR) and (UER) show a sign of a trend whilst variable (M0) show some fluctuations. However, part (B) of Figure 5.1 shows that all variables become stationary with the first difference. This is shown by the

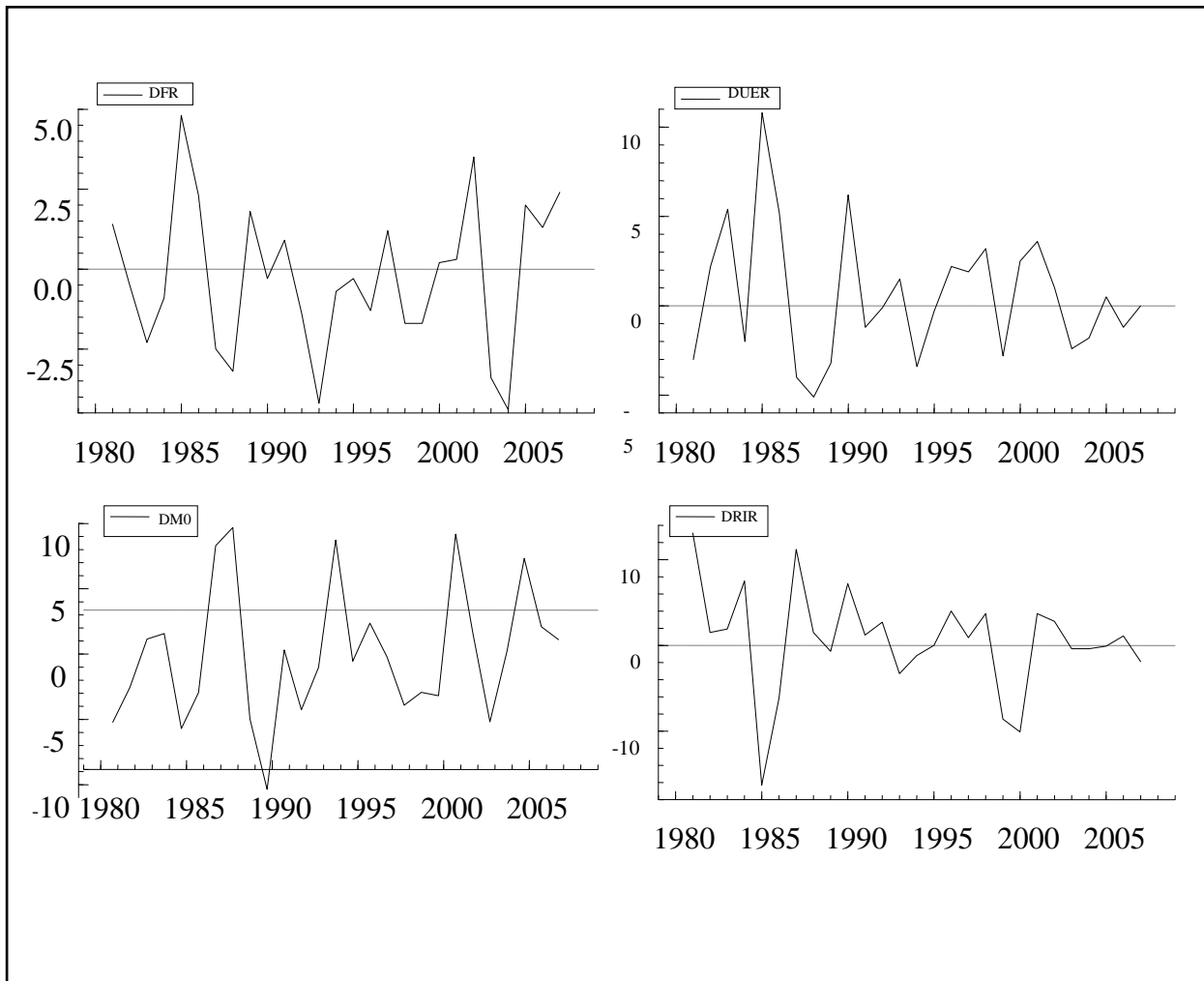
fluctuations around a zero mean, which is an indication of stationarity. The problem with the visual inspection technique is that the approach is very subjective.

Figure 5. 1: Graphical unit root tests 1980-2008

(A). Stationarity test: levels



(B). Stationarity test: first difference



5.4. Cointegration

To implement Johansen, it is required to determine the order of integration among the variables (r) and an optimal lag length (k) must be chosen for the VAR system. The explored cointegration showed that there is one cointegration among variables and the results are also significant and in line with economic theory. We can not reject the null hypothesis that there is no cointegration among the variables, thus in conclusion we can say that the test confirms that $r=1$. Based on the given explanation we then move on to the next stage of generating an error correction model.

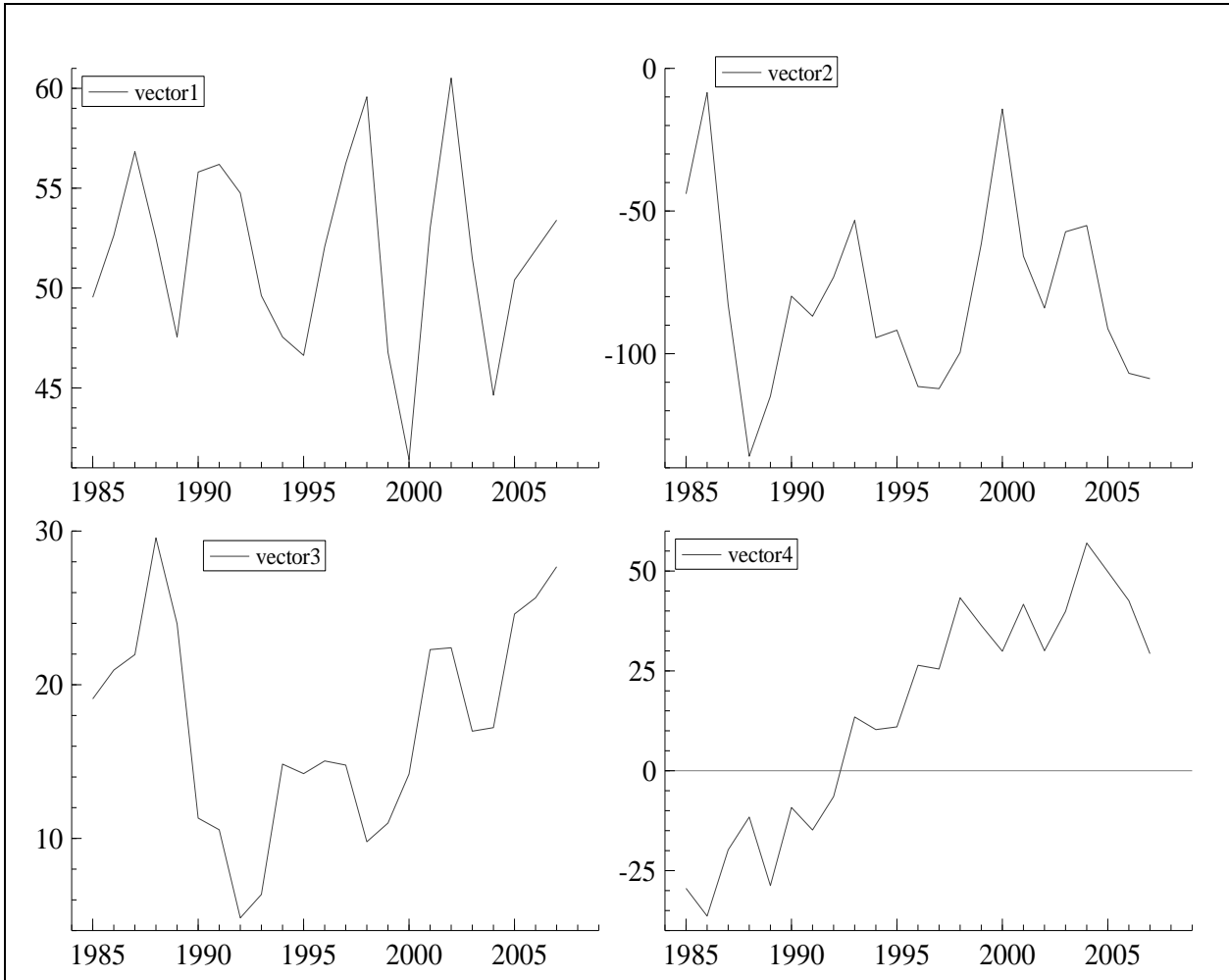
Table 5. 2: Cointegration analysis 1980-2008

H0:Rank=p	λ_i	Maximum statistics	Eigenvalue	Trace Statistics	
		-Tlog (1- λ_i)	(λ_{max}) 95%	-T \sum log (1- λ_i)	(λ_{trace}) 95%
$\rho=0$	0.695934	27.38*	27.1	55.53**	47.2
$\rho\leq 1$	0.517777	16.78	21.0	28.14	29.7
$\rho\leq 2$	0.386557	11.24	14.1	11.37	15.4
$\rho\leq 3$	0.0056619	1.1306	3.8	0.1306	3.8

Values marked with * represent a stationary variable at 5% significance level and ** represent a stationary variable at 1% significance level.

The cointegration analysis is based on a single cointegrating vector. The explanation given above is confirmed in figure 5.2. The figure shows the plot of cointegrating vectors. The diagrams shed more light on the rank of π . The first vector in the figure shows stationarity, confirming a rank of one. Thus the tests and graphs strongly confirm that $r=1$. The cointegrated variables must have an error correction representation in which an error correction term (ECT) must be incorporated into the model. Accordingly, a vector error correction model (VECM) is formulated to reintroduce the information lost in the differencing process, thereby allowing for long-run equilibrium as well as short-run dynamics (Ang and McKibbin, 2006).

Figure 5. 2: Cointegration vectors



5.5. Vector error correction modeling

In this section the Vector Error Correction Model (VECM) is estimated. The model contains information on both the long run and short run relationship between variables. The Johansen (1988) and Juselius (1990) approach can be used which combine both the short run and long run properties, and which at the same time maintain stationarity in all variables.

To check for the long term relationship amongst the dependent and independent variables, the variables are subjected to estimation using the specifications stated in equations 4.7 and 4.8 in chapter 4. The number of cointegrating relationships obtained in the previous step, the number of lags and the deterministic trend assumption used in the cointegration test are all used to specify a VECM. The general-to-specific modelling strategy is used. Insignificant variables are sequentially eliminated, leading eventually to parsimonious specifications. The results in table 3

shows that the VAR characterizes the data generating process fairly well, as the model passes the tests of autocorrelation, normality, functional specification and heteroscedasticity.

The model does not suffer from omitted variables and lags as reported by the F-test value. Thus, the model is free from autocorrelation, heteroscedasticity and non-normal distributed disturbances. Figure 5.1 plots the fitted values versus actual values. The fitted values fairly match the actual values confirming the better fit of the model in explaining the sample data. The model thus can be useful for forecasting purposes. The scaled residuals show that they are white noise. In other words, the test generally confirms the adequacy of the restricted error correction specification.

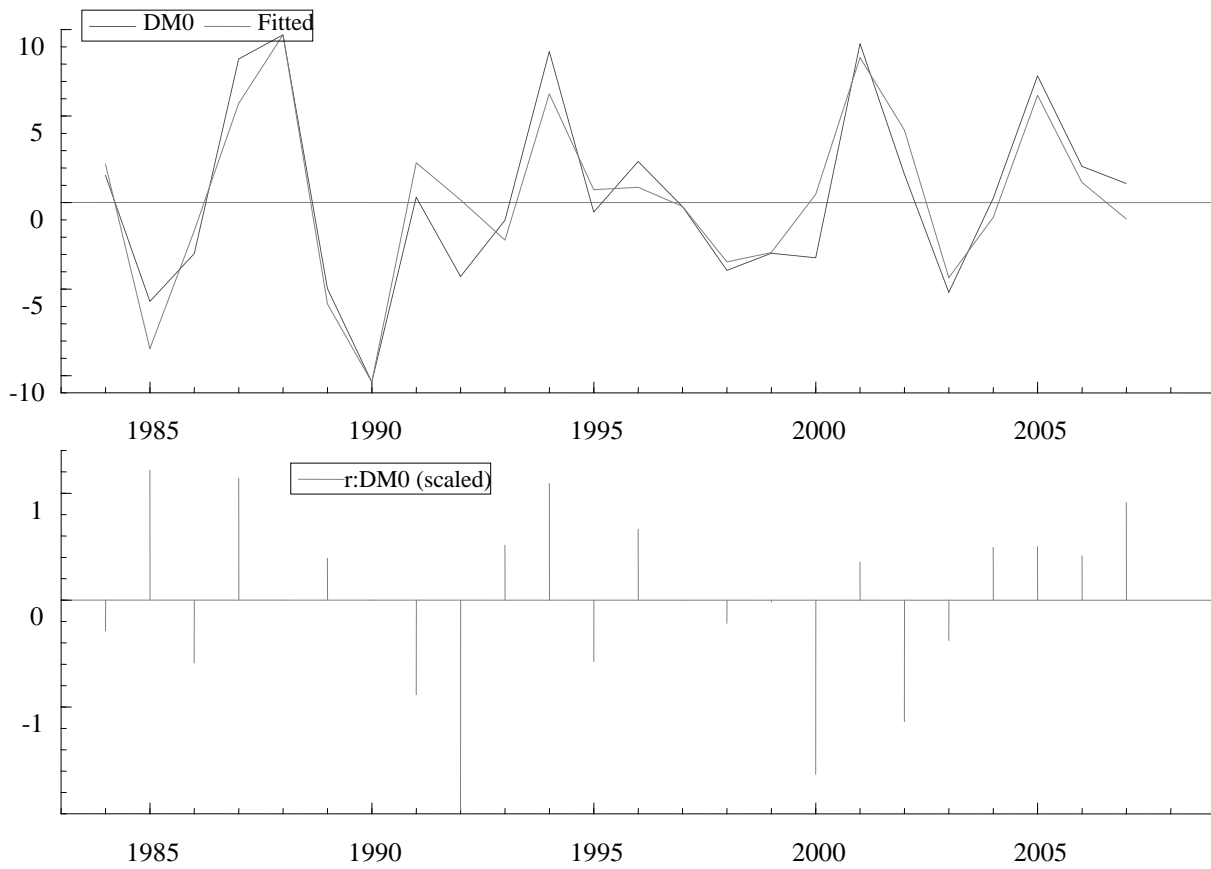
In Table 5.3, all variables have correct signs and in line with economic theory and some previous empirical work. The unemployment rate-a proxy for real economic activity is slowly adjust to monetary policy changes, 38.3% of a change in monetary policy stance is explained by variability in unemployment. A 10% increase in money supply will bring about 3.83% decreases in unemployment in the short run. In other words the coefficient confirms that an increase in money supply is followed faster by a reaction in the labour market of the South African economy. The variable is also significant at 5% significant level. The impact of money growth on inflation is highly significant as explained by a high coefficient of 0.83, reflecting its importance for the control of inflation. Thus, in South Africa there is a positive association between inflation and growth of money. The results, however, contradict with those of Aron and Muellbauer (2001) that excess money growth was less important after 1994.

The Error Correction Term (ECT) carries a negative sign and is statistically at 1% level. The model converges quickly to equilibrium, with over 73% of the discrepancy corrected in each period. This means any deviation from monetary policy long run equilibrium is fully adjusted in a year's time. Thus, in this sense monetary policy ends up with little effect on real economic activity in South Africa. Monetary policy have less direct effect on unemployment in the long run and confirms the findings from the work of Burger and Marinkov (2006), Hodge (2002), Nell (2000) and Du Plessis and Burger (2006); they found no significant direct effect, but an indirect channel via the adjustment of unit labour costs to its long-run equilibrium.

Table 5. 3: The preferred model

Modeling M0 by OLS 1980-2008		
Independent variable	Coefficient	t-Value
Constant	-2.23537	-1.73
<i>DIFR_{t-1}</i>	0.828377	3.43**
<i>DUER_{t-1}</i>	-0.382880	-2.05*
<i>DRIR_{t-1}</i>	0.410024	4.12**
<i>ECT_{t-1}</i>	-0.727187	-6.33**
<i>i1988</i>	13.7954	5.12**
<i>i1990</i>	-6.47962	-2.19*
<i>Trend</i>	0.150587	2.16*
$R^2 = 0.861717$	$F(7,17) = 15.13 [0.000]**$	
AR 1-2 test:	$F(2,15) = 0.26184 [0.7731]$	
ARCH 1-1 test:	$F(1,15) = 0.47120 [0.5029]$	
Normality test:	$\text{Chi}^2(2) = 2.3879 [0.3030]$	
Hetero test:	$F(12,4) = 0.059133 [0.9999]$	
RESET test:	$F(1,16) = 3.8760 [0.0666]$	
<p><i>Note:</i> * and ** denotes significance at 5% and 1% respectively. DW is the Durbin Watson statistic; AR is the Lagrange Multiplier test of autocorrelation; ARCH is Engle ARCH test for autocorrelated squared residual. Normality is the Jarque-Berra test for normality of the residuals; RESET is a general test for model mis-specification.</p>		

Figure 5. 3: Actual versus fitted values and scaled residuals for the model



The results also reflect that monetary authorities in South Africa put more weight on inflation than on unemployment. This is explained by a large coefficient of 0.85 on an inflation variable (*IFR*) compared to only 0.38 on the unemployment variable (*UER*) (see Table 5.3). Thus, monetary authorities quickly respond to variability in inflation than variability in unemployment. This is an indication that the South African monetary authorities somehow follow the Taylor principle. To this end, the principle emphasizes that Reserve Banks' interest rate policy needs to respond to fluctuations of inflation by more than one for one. This is in order to guarantee price stability in the long-run. The results conform with the results in Aron and Muellbauer (2001) who noted that in practice, the Reserve Bank emphasized current inflation (with a low weight on the unemployment), despite claiming to focus largely on money growth targeting.

Real interest rate (*RIR*), a proxy for inflation expectations has a positive sign and is statistically significant at 5% level. It is quite common to find a positive short-term interest rate elasticity of broad money demand (see for example Kakes and Pattanaik, 2000). The coefficient of 0.41 suggests that policy makers in South Africa, in a way, take into account the effect of expectations on inflation if monetary policy is formulated on the basis of money growth. This shows that as the rate of inflation increases above the target rate, the larger is the increase in the short-term interest rate and thus in line with the classical dichotomy. These results are however in contrast with some theoretical propositions predicted in the Mundell-Tobin effect. It suggests that nominal interest rates would rise less than one-for-one with inflation. This is because the public would hold less in money balances and more in other assets in response to inflation, which would drive interest rates down. In other words, an increase in the exogenous growth rate of money increases the nominal interest rate and velocity of money, but decreases the real interest rate.

The model is enhanced by the inclusion of two dummy variables: the 1988 (*i1988*) and 1990 (*i1990*) dummy variables. The dummy variable for 1988 is positively related to monetary policy. The variable is statistically significant at 5% level. This was the period pre-announced monetary targets were used for the first time. The main policy emphasis was on the Reserve Bank's discount rate in influencing the cost of overnight collateralized lending and hence market interest rates.

The dummy variable for 1990 is negatively related to monetary policy and statistically significant at 5% level. The coefficient suggests a negative shock to the system. In 1990, the South African economy was opened to the international world for the first time. Globalization effects were a source of instability within South Africa. One example of the negative impact of globalization has been on the prices of commodities. This has reduced the ability of the Reserve Bank to accomplish its vital tasks: controlling inflation and unemployment domestically. Once a country is exposed to the global world it is very difficult for it to be immune to international shocks. These shocks pose challenges to monetary policy authorities in their conduct of monetary policy. Good examples of external shocks that might affect the effectiveness of monetary policy in South Africa are financial crises and oil price increases. Globalization renders ineffective old models for monetary policy and as a result new models should be developed to embrace the positive effects that might come with globalization. For example foreign direct investment and improved financial intermediation among others.

The trend variable, a proxy for technological change, is positively related to monetary policy in South Africa. This implies that technological innovations in the financial system improve the effectiveness of monetary policy. Financial innovation refers to technological advances which facilitate access to information, trading and means of payment. It also includes the emergence of new financial instruments and services, new forms of organization and more developed and complete financial markets. Thus, bank regulation and financial innovations is well coordinated with monetary policy. The coordination has improved the effectiveness of monetary policy in the country. For this reason, financial innovation has reduced costs and risks. Also, it provides an improved service that meets the particular needs of financial participants in the economy.

5.6. Conclusion

The main aim of this section was to examine the relationship between monetary policy, inflation and unemployment. The data was subjected to stationarity and cointegration tests. The Vector Error Correction (VEC) modeling technique was employed to determine the relationship between monetary policy, inflation and unemployment both in the short and the long run. The findings showed that there is a cointegrating relationship between the designated variables. The simulations by the model support the notion that monetary policy affects the target variables with a lag. Sometimes the effect will be felt after a year or two. These effects are largely felt on nominal variables (inflation) compared to real variables (unemployment) in the economy. It points to the significance of the expectational consequences of monetary policy choices. The monetary policy approach followed by the South Africa Reserve Bank is able to stabilize expectations. That is why it is able to maintain low and stable inflation with minimal effects on unemployment. The credible maintenance of price stability will in turn allow real economic performance to achieve its potential over the long run.

CHAPTER SIX

ESTIMATING THE PHILLIPS CURVE IN SOUTH AFRICA

6.1. Introduction

According to conventional macroeconomic theory, the inflation-unemployment tradeoff is central to understanding not only the effects of monetary policy but also other policies and events that influence the aggregate demand for goods and services (Ball and Mankiw, 2002). Most central banks rely in one way or another on forecasts of future inflation to set the interest rate-the policy instrument using the Phillips curve as the maintained theory for inflation (Razzak, 2002). In general, the Phillips curve represents the relationship between the unemployment gap and inflation¹⁷. It suggests that policymakers should choose that point on this relation which minimizes the sum of the costs of unemployment and inflation. This conception is rather unclear. Policy makers had been driven in a policy dilemma in which they find it difficult to establish an acceptable level of unemployment and inflation to maintain a stable economic environment. The aim of this chapter therefore is to empirically test the existence of the Phillips curve as well as the causal relation between inflation and unemployment in South Africa.

6.2. The Phillips curve model

This section employs Fumitaka (2007)'s model to empirically examine the relationship between inflation rate and unemployment rate using the Vector Error Correction Model (VECM) analysis to test the existence of the Phillips curve in South Africa. The simple Phillips curve employed for estimation is as follows:

$$IFR_t = \alpha_0 + \beta_1 UER_{t-1} + \varepsilon_t \dots\dots\dots 6.1$$

¹⁷ Output gap is the deviation of output from its equilibrium level in the absence of nominal rigidities

Where:

α_0 = constant

β_1 = slop coefficient

IFR_t = inflation rate in South Africa in the year t

UER_t = the unemployment rate in South Africa in the year t

ε_t = the error term

Incorporating the natural rate of unemployment into model, the standard Phillips curve can be expressed as follows:

$$IFR_t = \alpha(L)IFR_{t-1} + \beta(L)(UER_t - NUER_t + \varepsilon_t) \dots \dots \dots 6.2$$

Where:

$\alpha(L)$ and $\beta(L)$ = polynomials in the lag operation

$NUER_t$ = natural rate of unemployment in South Africa in the year t

For estimation, we follow the similar procedures to the previous section. Thus, the next step involves testing for stationarity.

6.3. Unit root test: The Phillips curve model

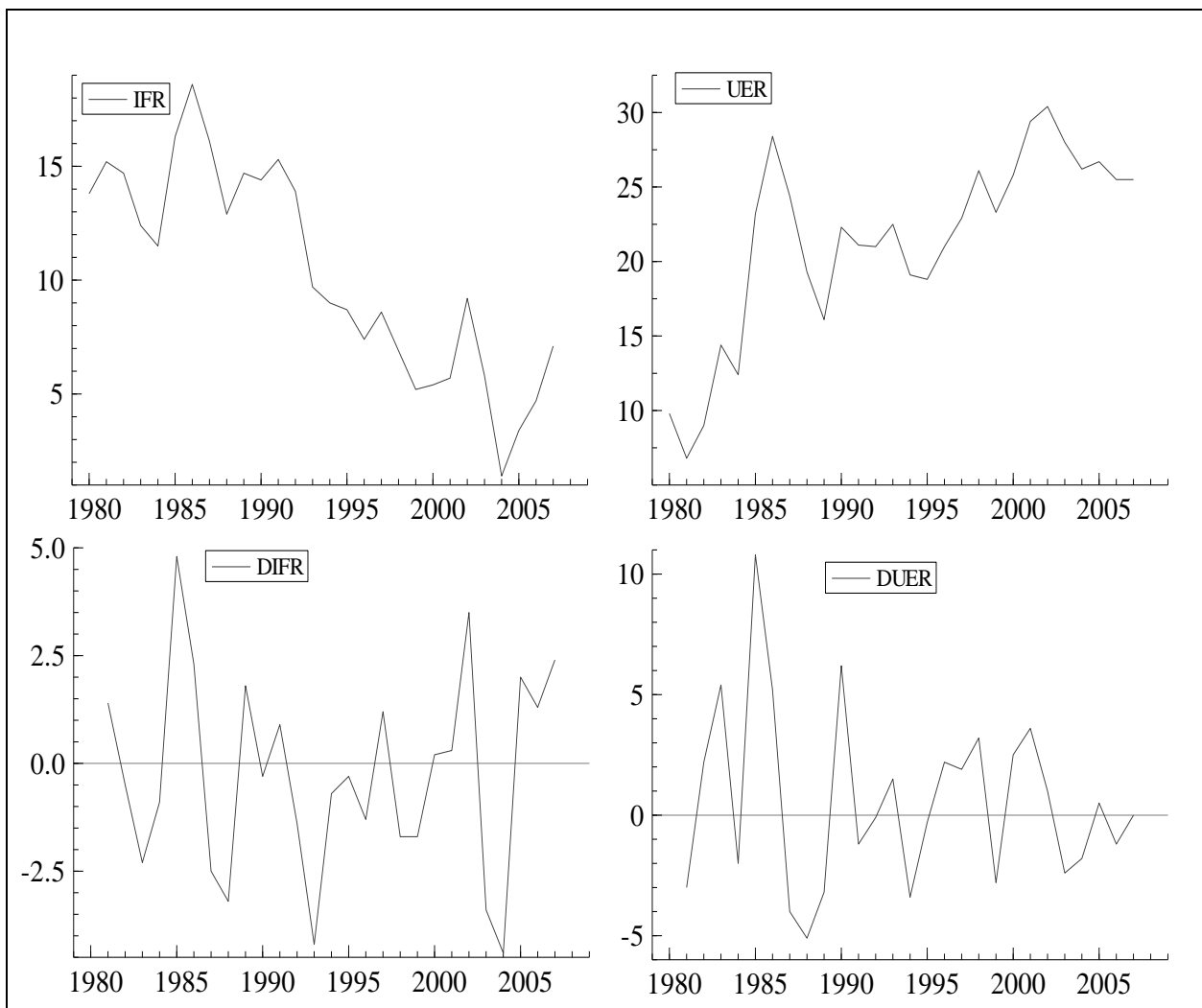
Table 6.1 reports the unit root test results using both the DF and ADF tests. The test reveals that the null hypothesis of unit root is accepted for both IFR and UER variables in their levels but rejected in their first differences. These variables are thus found to be non-stationary in their levels (or integrated of order one, $I(1)$) based on both tests). We can thus conclude that the standard regression model is not appropriate in examining the relationship between inflation and unemployment. Instead, we have to use the cointegration techniques to uncover the relationships.

Table 6. 1: Unit root test: The Phillips curve model 1980-2008

		<i>Dickey-Fuller</i>			<i>Augmented Dickey-Fuller</i>			
Variable		Intercept	Trend & intercept	None	Intercept	Trend & intercept	None	I
<i>IFR</i>		-1.312	-2.767	-1.044	-1.185	-3.33	-1.185	I(1)
		-4.456**	-4.339**	-4.474**	-5.335**	-5.186**	-5.222**	I(0)
<i>UER</i>		-2.115	-2.439	0.2358	-2.115	-2.439	0.2442	I(1)
		-4.966**	-4.984**	-4.783**	-4.23**	-4.401**	-4.1**	I(0)
Critical values	1%	-3.696	-4.338	-2.652	-3.708	-4.355	-2.656	
	5%	-2.975	-3.587	-1.954	-2.98	-3.594	-1.955	
Values marked with * represent a stationary variable at 5% significance level and ** represent a stationary variable at 1% significance level.								

The results in figure 6.1 confirms the DF and ADF tests and the conclusion is that both series are first difference stationary I(1). Thus, the variables are integrated of the same order. As mentioned above, I(1) and I(1) variables could be cointegrated, so both variables are carried forward to the next step to identify whether or not there is a cointegrating relationship among the variables.

Figure 6. 1: Graphical unit root tests: The Phillips curve model 1980-2008



6.4. Cointegration test: The Phillips curve model

To implement Johansen, as stated in chapter 5, it is required to determine the order of integration among the variables (r) and an optimal lag length (k) must be chosen for the VAR system. The choice of the lag length is based on the Johansen cointegration test which is identified at lag length 2 as shown in table 6.2. Cointegration using lag length 2 showed that there is one cointegration among variables and the results were significant and in line with economic theory. Thus, in conclusion the test confirms that $r=1$.

Table 6. 2: Cointegration analysis: The Phillips curve model 1980-2008

H0:Rank=p	λ_i	Maximum statistics	Eigenvalue	Trace Statistics	
		-Tlog (1- λ_i)	(λ_{max}) 95%	-T \sum log (1- λ_i)	(λ_{trace}) 95%
$\rho=0$	0.566623	18.4*	14.1	21.79*	15.4
$\rho \leq 1$	0.143124	3.398	3.8	3.398	3.8

Figure 6. 2: Cointegration analysis: The Phillips curve model 1980-2008

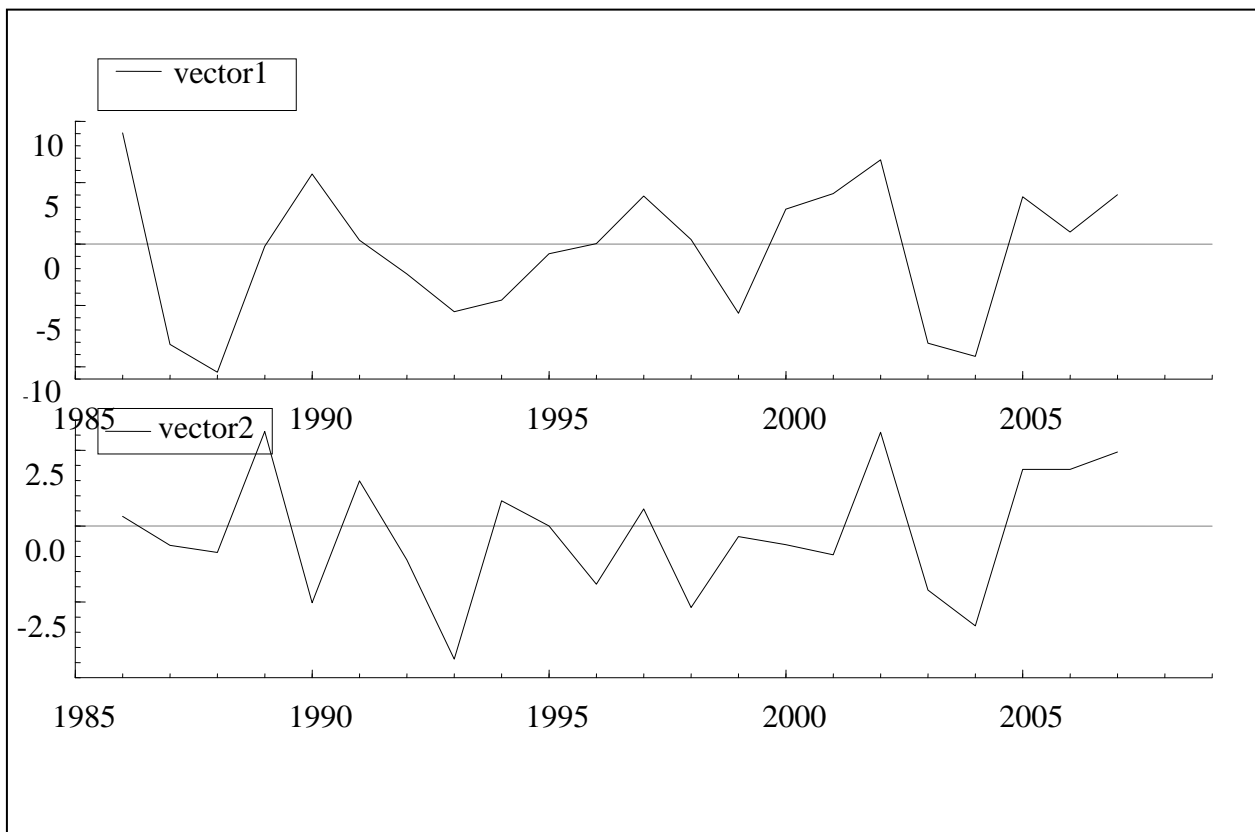


Figure 6.3 shows the plot of cointegrating vectors. The diagrams shed more light on the rank of π . The first vector in the figure shows stationarity, confirming a rank of one. Thus the tests and graphs strongly confirm that $r=1$.

6.4. Vector Error Correction Model (VECM) estimates: The Phillips curve model

Given that the variables are co-integrated, one can proceed to estimate the VECM model. This stage involves estimating the Vector Error Correction Model (VECM). It contains information on both the long run and short run relationship between variables. The procedure involves regressing the first difference of the dependent variable on the contemporaneous and lagged values of the first differences of all these variables including the dependent variable and the lagged residuals from the long-run equilibrium regression.

The results in Table 6.3 shows that the VAR characterizes the data generating process fairly well, as the model passes the tests of autocorrelation, normality, functional specification and heteroscedasticity. The model does not suffer from omitted variables and lags as reported by the F-test value. Thus, the model is free from autocorrelation, heteroscedasticity and non-normal distributed disturbances.

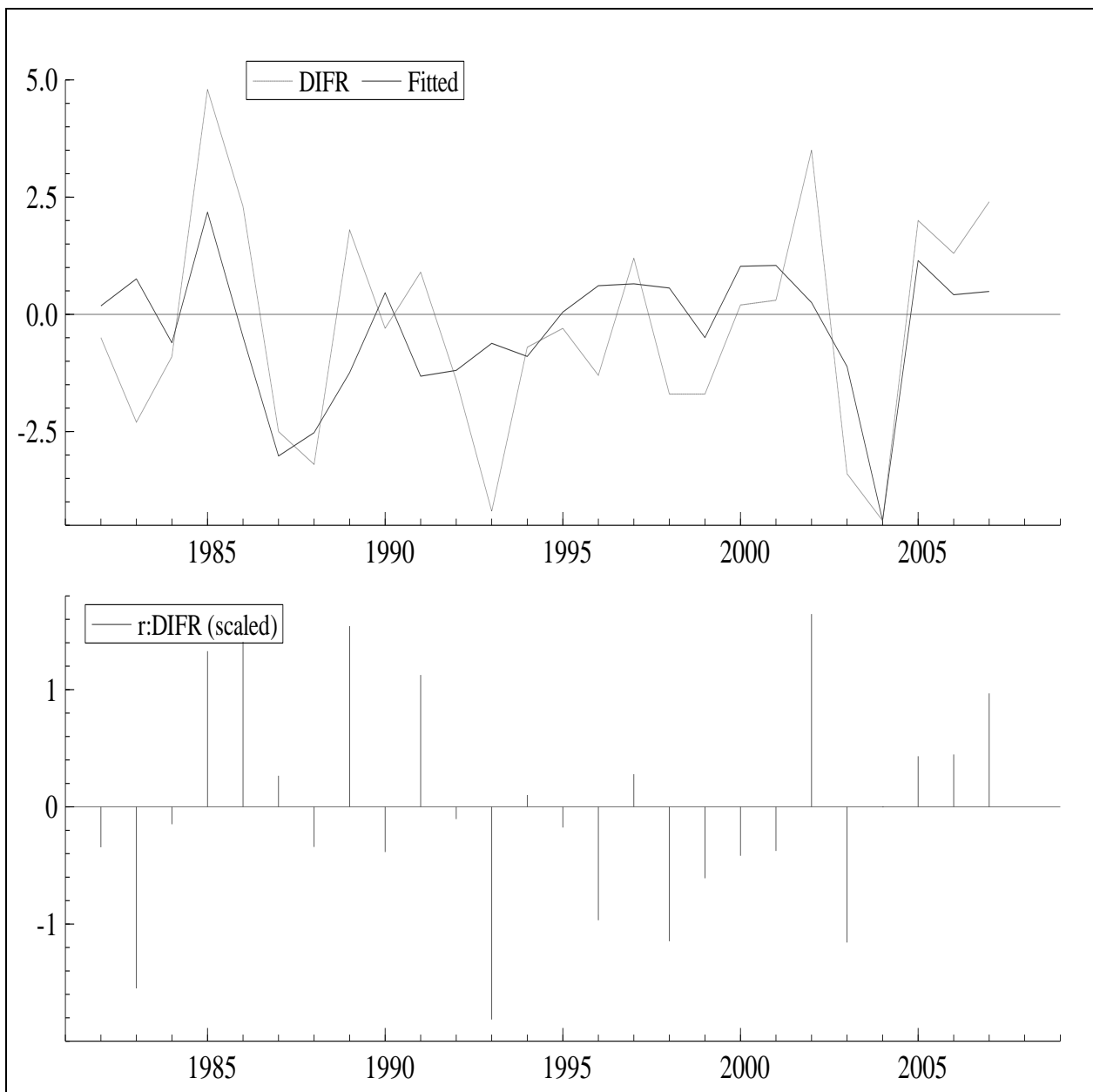
The coefficient of unemployment is positive; indicating a positive relationship between change in inflation and changes in unemployment. In addition, as the results show, 0.18 of the discrepancy in the two rates in the previous year is eliminated in one years' time. Also, short run changes in inflation reflected on the unemployment after a year, as the coefficient is 0.198. In a nut shell, the test generally confirms the adequacy of the restricted error correction specification. The Phillips curve generally suggests that inflation and unemployment have an inverse relationship where an improvement in one area worsens the other. However, the results suggest that inflation and unemployment in South Africa have a positive relationship. Thus, there is no Phillips curve-kind of relationship between inflation and unemployment in South Africa. This positive relationship is compatible with a vertical long run Phillips curve at the natural rate of unemployment. The results are conventional to the work of Krogh (1967), Strydom and Steenkamp (1976), Hodge (2002) and Diamond *et al.* (2003).

Table 6. 3: VEC results of the preferred Phillips curve model

Modeling Inflation by OLS method		
Independent variable	Coefficient	t-Value
Constant	-0.248784	-0.590
$DUER_{t-1}$	0.197771	1.71*
ECT_{t-1}	-0.183251	-1.83*
$D2004$	-4.19813	-2.00**
$R^2 = 0.376274$	$F(3, 21) = 4.223 [0.017]^*$	
AR 1-2 test:	$F(2, 19) = 0.044452 [0.9566]$	
ARCH 1-1 test:	$F(1, 19) = 2.1558 [0.1584]$	
Normality test:	$\text{Chi}^2(2) = 0.060982 [0.9700]$	
RESET test:	$F(1, 20) = 0.60158 [0.4470]$	
<p><i>Note:</i> * and ** denotes significance at 10% and 5% respectively. DW is the Durbin Watson statistic; AR is the Lagrange Multiplier test of autocorrelation; ARCH is Engle ARCH test for autocorrelated squared residual. Normality is the Jarque-Berra test for normality of the residuals; RESET is a general test for model mis-specification.</p>		

Figure 6.3 shows the fitted values versus actual values. The fitted values fairly match the actual values confirming the better fit of the model in explaining the sample data. The scaled residuals show that they are white noise. In other words, the test generally confirms the adequacy of the restricted error correction specification.

Figure 6. 3: Actual versus fitted values and scaled residuals for the Phillips curve model



6.6. Conclusion

An understanding of the relationship between inflation and unemployment is important for policy formulation and analysis in South Africa. The study employed the Vector Error Correction method to examine the linkage and causal relation between these two fundamentals. The test was carried for both the short run and the long run. The results showed that there is no long-run trade-off between unemployment and inflation. This confirms a demonstration by Nobel Prize winners Milton Friedman and Edmund Phelps. In other words, the Reserve Bank is not able to lower unemployment permanently by running up inflation. The causal relation runs in one direction that is from inflation to unemployment. This only happens in the long run. In the short run there is no causation. Thus, the empirical findings of the present study show that there is a long-run relationship between inflation and unemployment.

CHAPTER SEVEN

CONCLUSIONS AND POLICY RECOMMENDATIONS

7.1. Summary of the study and conclusions

The aim of study was divided into two parts: the first part examined the relationship between monetary, inflation and unemployment; and the second part empirically tests the existence of the Phillips curve in South Africa. The study begins by giving an overview of the evolution of South Africa's monetary policy and the underlying economic framework. This was followed by a discussion on the importance of monetary policy and the transmission mechanism process. Thereafter, the various channels of the transmission mechanism through which monetary policy affects the targeted variables (inflation and unemployment) were considered.

The first part of the study employed an empirical model of monetary policy for South Africa and regress M0-a proxy for monetary policy as the depended variable. The variables included in the model, as potential targets of monetary policy include a measure of inflation, unemployment, real effective exchange rate and the short-term interest rate. The time series data spans from 1980 to 2008. The second part tests the Phillips curve and a bi-variate model was employed using the same data series.

In order to determine both the long and short run properties of the models, the Johansen cointegration and error correction methods were preferred to the other techniques. These techniques were chosen because of the advantages they have over those alternative techniques. In the applying these methods, the time series was subjected to both informal and formal tests for stationarity. The variables in the cointegration regression were found to be first difference stationary, that is, each series is characterized as integrated of order one $I(1)$. Johansen cointegration tests provided evidence that there is cointegration between monetary policy and its targets, which were included in these models. Evidence of cointegration allowed the estimation of VECMs, which simultaneously provided the parameter estimates for both the long and short run. In both cases, the estimated models were robust and passed all the relevant diagnostic tests. The results conform to theoretical literature reviewed for the study. The VEC estimates have an error correction parameter which is very important. The parameter measures the speed of adjustment in monetary policy following a shock to the system. The model converges quickly to equilibrium, with over 73% of the discrepancy corrected in each period. This means any

deviation from monetary policy long run equilibrium is fully adjusted in a one or two year's time.

The findings of this study show that monetary authorities in South Africa put more weight on inflation than on unemployment. Thus, monetary authorities quickly respond to variability in inflation than variability in unemployment. The results also suggest that the monetary authorities take the public expectations when formulating monetary policy strategies.

Monetary policy is also affected by qualitative factors such as globalization and technological trends. Two dummy variables (for 1988 (*i1988*) and 1990 (*i1990*)) were introduced to cater for such factors. The 1988 dummy represents the first introduction of pre-announced monetary targets. The negative effect of globalization on monetary policy was represented by the 1990 dummy variable. Once a country is exposed to the global world, it is very difficult for it to be immune to international shocks. These shocks pose challenges to monetary authorities in the conduct of monetary policy. Technological advancement also has a bearing on the effectiveness of monetary policy. This has been shown by the technological trend variable which is positive and highly significant. This means that financial engineering is very crucial as far as the speed at which monetary policy actions can be felt on inflation and unemployment in South Africa is concerned.

The preferred model of the Phillips curve suggests that there is a long run positive relationship between inflation and unemployment in South Africa. Thus, the results showed that the Phillips curve does not exist in South Africa. Thus, the empirical findings of the present study show that there is a positive long-run relationship between inflation and unemployment.

7.2. Policy implications and recommendations

The results of the research have revealed that monetary policy effect both inflation and unemployment. A positive relationship between inflation and unemployment means that both are rising together in the country. Thus, combined, the results of the study have a number of policy implications.

Firstly, the problem of inflation and unemployment needs optimal monetary policy strategies. The options available for the Reserve Bank that can work with the current inflation targeting framework, is the use of either rule or discretion in the conduct of monetary policy. The adoption of a monetary rule would remove the greatest source of instability in the economy but only if not

disturbed by erratic monetary growth. If the monetary authorities determine money supply according to some known rule, then the authorities will be unable to influence inflation and unemployment in the economy. This is because a systematic monetary policy can be anticipated by economic agents. Economic agents incorporate the systematic component in their decision making. However, the monetary policy rule will eventually not have effect on unemployment.

Secondly, in practice, only unanticipated monetary policy changes influence unemployment and inflation. The monetary authorities can use some discretion to deal with the factors that pose a threat to monetary aggregates. This is to improve the problems of the business cycle and of liquidity crisis. However, a discretionary policy could turn out to be disturbing and making matters worse. This leads to the long and variable lags associated with monetary policy. Finally, the study provides evidence that the unemployment problem in South Africa is not fundamentally a monetary phenomenon but a supply side problem. Therefore the solution to the unemployment problem in the country requires supply side policies.

Thirdly, the policy implication behind a positive relationship between inflation and unemployment for South Africa is that any attempt by the Reserve Bank to maintain unemployment below the natural rate would result in accelerating inflation. The monetary authorities would intervene by increasing the rate of monetary expansion. Eventually, monetary expansion will determine the rate of inflation.

According to the monetarist approach, the inflation-unemployment cost associated with monetary changes depends upon two main factors: (1) whether the monetary authorities pursue a rapid or gradual reduction in the rate of monetary expansion; (2) the extent of institutional adaptations. For example whether or not wages are indexed; and the speed with which economic agents adjust their inflationary expectations downwards. If the increase in the quantity of money is higher than the rate at which the economy is growing, then inflation rises. Thus, inflation is essentially a monetary phenomenon caused by excessive monetary growth. According to the monetarist convention, reducing the rate of monetary growth expansion, results in an increase in the level of unemployment. However, in South Africa this does not happen according to the result of this study. Instead, by reducing the level of inflation rate, a good enough environment for investment have to be created which will lower the level of unemployment in the country.

The Reserve Bank lack knowledge about the natural rate and as a result could not target unemployment rate for the fear of the consequences of accelerating inflation. However, the study

has shown that unemployment does not cause inflation. This means that the monetary authorities can target unemployment without causing inflation in the country.

It is therefore recommended that (1) discretion must be strictly limited, in order that it is not used to create or permit inflation. The adoption of a monetary rule can remove the instability in the South African economy. Thus, the monetary authorities can expand the money supply at a steady rate over time so that the economy settles down at the natural rate of unemployment with a steady rate of inflation, (2) the transition from the state of the monetary policy stance should be gradual, this means that if the growth rate of the money stock be reduced, it have to be very gradually, at about one-half to one percent a year, for several years until the inflation rate comes to the required range of between 3 to 6% and (3) since the natural rate of unemployment is difficult to ascertain in South Africa, the government should not target unemployment. Instead, the government should pursue supply-side policies to improve the structure and functioning of the labour market rather than demand management policies. The policies that can reduce unemployment in South Africa are: to increase the incentive to work through reductions in marginal tax rates, improve flexibility of wages and working practice, and improve the market efficiency of the goods through privatization.

Finally, indexation can be used as a supplementary policy measure to accompany the gradual adjustment process to lower the rate of inflation. This allows money wages increases to automatically decline as inflation decreased. This removes the dangers of employers being committed to paying wage increases under the existing contracts when inflation falls. Thus, with indexation, wage increases would be less rapid and unemployment would rise by smaller amount.

In conclusion, the study has shown that monetary policy actions have pronounced affects on inflation than on unemployment. In the long run, the rate of money supply determines the rate of inflation. Thus, sustained inflation in South Africa can be regarded a monetary phenomenon. In this case, the main aim of monetary policy should be the pursuit of a low and stable rate of inflation. Once this is achieved, a conducive economic environment is created and finally economic expansion leads to reduced unemployment rate in South Africa.

7.3. Limitations of the study

The limitation of this study was the unavailability of data on the actual variables suggested by the theoretical models on the impact of monetary policy. This means that some of the variables

either were excluded in the empirical model, or proxies have been found for those variables. The risk involved in finding proxies is that they may not correctly represent the impact of the actual variables, resulting in inconsistent results. However, these problems seem not to significantly affect the findings to be presented in this study, since they support both the theoretical and empirical knowledge on the relationship between monetary policy, inflation and unemployment. Another limitation arises from the use of aggregate unemployment whilst in actual fact monetary policy might affect sectoral unemployment differently.

7.4. Areas of further research

The question of what monetary policy can and can not do is increasingly becoming complicated because of financial markets development in South Africa. Further research can look into the relationship between financial innovation and the effectiveness of monetary policy in South Africa.

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