Rethinking the current inflation target range in South Africa

Bonga-Bonga, Lumengo and Lebese, Ntsakeseni Letitia

University of Johannnesburg

22 August 2016

RETHINKING THE CURRENT INFLATION TARGET RANGE IN SOUTH AFRICA

Abstract

With critics suggesting that inflation targeting is not an appropriate monetary policy framework for developing and emerging countries, this paper assesses whether or not the 3%-6% inflation target is the optimal inflation target band in South Africa. The optimal inflation target band is determined based on the time-varying non-accelerating inflation rate of unemployment (the NAIRU). The estimation results provide an estimated inflation range that is wider than the current range pursued by the South African Reserve Bank. This may suggest that the current range of inflation hinders real activities, especially employment in South Africa.

Keywords: inflation target, NAIRU, unemployment, South Africa
JEL codes: E52, C13

1.Introduction

South Africa had double digit inflation rates from the 1970s to the early 1990s (Casteleijn, 1999:64; Rossouw & Padayachee, 2008:19). In 1994, following its re-integration into the international economy, South Africa was subjected to increased political pressure to reduce its inflation rate to levels which were commensurate with its trading partners (Banerjee, Galioni, Levinsohn, McLaren & Woolard, 2008:717; van der Merwe, 2004:12; Padayachee, 2001:744; and Ricci, 2005:191). Subsequently, the government introduced inflation targeting as a monetary policy framework in 2000 (Mboweni, 1999:404). Inflation targeting policy aimed at stabilising prices in South Africa.

A number of studies support the view that the pursuit of price stability has been successful in reducing the high inflation rate in South Africa (National Labour and Economic Development Institute, 2004:3 and Ricci, 2005:191). South Africa managed to achieve single digit inflation rates in the mid-1990s for the first time since the 1960s, (Casteleijn, 1999:64). However, while the South African Reserve Bank (SARB) succeeded in reducing inflation, the government failed to realise the development objectives as set out in GEAR (National Labour and Economic Development Institute, 2004:3). South Africa experienced a continued increase in the unemployment rate from 1980 to 2010, reaching 27% in 2003 (Department of Economic Development, 2010:11). In 2010, South Africa was ranked amongst the top 10 countries in the world that have high unemployment rates (Department of Economic Development, 2010:14). According to McCord and Bhorat (2003:125), South Africa has the highest unemployment rates compared to other emerging countries in Africa, Asia and Latin America. The rising unemployment may be attributed to the change in monetary policy as international empirical evidence (Akerlof, Dickens, Perry, Gordon & Mankiw 1996; Fortin, 2001; and Lundborg & Sacklěn, 2006) indicates that a change in the inflation rate from a high level to a low level is associated with perpetual increases in the unemployment rate. Some experts reinforce this observation by noting that at low inflation rates, the Phillips curve is negatively sloped, implying a trade-off between inflation and unemployment (Akerlof et al., 1996; Holden, 2002; Lundborg and Sacklěn, 2006:399; Padayachee, 2001:762). The existence of trade-off means that reductions in the inflation rate are directly correlated with increases in the unemployment rate (Erceg, 2002:85). Hence, it is essential for a central bank to establish the correct shape of the Phillips curve for that particular economy and the consequent dynamics of the inflation/unemployment trade-off before deciding, on the one hand, on the suitable monetary policy regime to pursue or, on the other, if inflation targeting is the choice, on the targeted band.

Critics argue that inflation targeting is not an appropriate monetary policy framework for developing countries (Kahn, 2008:124). They maintain that developing countries are more susceptible to the negative effects of external shocks due to the uncertainty perceived by investors with respect to their political and economic stability (Ricci, 2005:207). Investor uncertainty and the requirement of a flexible foreign exchange market expose small developing economies to negative external shocks more than it does big and developed economies (Kahn, 2008:124; Ricci, 2005:207). In addition, some scholars argue that if the central bank makes the pursuit of price stabilisation its sole objective, economic growth and development are inhibited (Kahn, 2008:126). However, recent studies (Arkerlof, Dickens, Perry, Bewley and Blinder, 2000; Ball and Mankiw, 2002; Fortin, 2001; Lundborg and Sacklěn, 2006; Hsing, 2009; Fortin, 2001:9), on the relationship between inflation and unemployment indicate that there is a particular point on a non-linear Phillips curve where the trade-off is optimised and central banks should set the target for inflation at this specific point.

Since a number of authors suggest that inflation targeting derives its justification from the theory of natural rate (Bernanke, et al., 1999; Bernanke, 2003), it is clear that the optimal target for inflation rate should be set by taking into account the level of natural rate of unemployment, which determines the shape of the Phillips curve. However, the widespread implementation of low-inflation targets assumes, without proper verification, the principle of a vertical long-run Phillips curve, whereby inflation has no long-run effect on unemployment. This paper shows that setting inflation targets simply by relying on the idea of vertical Phillips curve may be misleading if the actual shape of the Phillips curve is not vertical.

Given the fact that unemployment has maintained a growing trend in South Africa even after the adoption of the inflation targeting policy, the policy has become very controversial (Department of Economic Development, 2010:14; Banerjee, Galioni, Levinsohn, McLaren & Woolard, 2007:7; Klasen & Woolard, 2008:2), this paper aims to evaluate whether the 3%-6% inflation target band is at a level that optimised the trade-off between inflation and unemployment. An optimal inflation ban should refrain from generating excess unemployment.

The remainder of this paper is organised as follows: In Section 2, the literature is reviewed. This is followed by the discussion of methodology in Section 3. The estimation of results is detailed in section 4 while in section 5 we provide the conclusion and policy implications of the research.

2. Literature Review

2.1. Theoretical Discussion

The debate on the relationship between inflation and unemployment dates back to 1958 when Phillips (1958:238) found a nonlinear relationship between unemployment and changes in wages by conducting empirical tests on data from the United Kingdom for the period 1861 to 1951. Based on the results of his study, Phillips concluded that by accepting some degree of inflation, central banks could maintain lower rates of unemployment (Van der Merwe, 2004:11). Phillips' conclusion led to major disagreements among economists on the existence of a relationship between inflation and unemployment and, consequently, the actions that should be taken to address the trade-off between these economic indicators (Friedman, 1968; Burger and Marinkov, 2006; Fischer, 1996; Mankiw, 2001).

Monetary economists argue that the Phillips curve is vertical in the long run (Friedman, 1968; Fischer, 1996; Michie, 2003). According this group of economists, the trade-off between inflation and unemployment is temporary and mainly results from the behaviour of workers as they adjust their wage expectations following an increase in the unemployment rate (Hodge, 2002:420; Friedman, 1968:1). In the long run, following the full incorporation of inflation expectations in wage negotiations; there is an increase in the inflation rate and the unemployment rate remains unchanged as nominal wages adjust towards their real rate (Hodge, 2002:420). The unemployment rate thus returns to its natural rate and hence, remains stable in the long run (Friedman, 1968:8 and Michie, 2003:10). A vertical Phillips curve, as hypothesised by the monetarists, implies that there is no permanent relationship between inflation and unemployment.

Post-Keynesian economists contest this tenet of monetary economists. . They are of the view that workers base their wages on adaptive expectations; and that a trade-off between inflation and unemployment depends on how quickly workers adopt their future inflation expectations following disturbances in the economy and on the bargaining power of employers during wage negotiations (Holden, 2002:2; Michie, 2003:14; Hodge, 2002:420 and Michie, 2003:14). The post-Keynesian economists maintain that at any unemployment rate, besides the natural rate of unemployment, there will be a trade-off between inflation and unemployment (Michie, 2003:14).

The debate between the Keynesian, monetary and post-Keynesian economists can only be resolved by evaluating empirical evidence to conclude whether or not there is a relationship between inflation and unemployment or whether the Phillips curve is vertical or not. The empirical evidence is presented below.

2.2. International Empirical Evidence

2.2.1. Existence of a trade-off

Empirical evidence supports the existence of a trade-off between inflation and unemployment. Research-conducted for European countries (Holden, 2002); certain member countries of the Organisation for Economic Corporation and Development (Ball, Mankiw & Nordhaus, 1999) as well as for the United States of America (Karanassou, Sala & Snower, 2010; Banarjee *et al.*, 2008; Akerlof *et al.*, 2000)-demonstrates that there is a trade-off between inflation and unemployment. The trade-off results from, inter alia, expectations about future inflation coupled with rigidities in nominal wages (Akerlof *et al.*, 1996; Akerlof *et al*., 2000); regulated and highly unionised labour markets (Holden, 2002) and shocks to economies (Svenssons, 1999).

In their study, Akerlof *et al.* (2000:3) find that employees' expectations deviate from rational behaviour at low inflation levels and that workers and employers tend to ignore the impact of low inflation when they negotiate wages and prices. Akerlof *et al.* (2000:4) use survey data based on inflation expectations of workers and employers to determine the inflation rate and the unemployment level, which optimises the trade-off between inflation and unemployment. In contrast to models based on rational expectations; Akerlof *et al.* (2000:41) find that the Phillips curve is not vertical at low inflation levels, and that there is a trade-off between inflation and unemployment.

In his study on European countries, Holden (2002:4) find that countries with regulated labour markets, and where the majority of workers are unionised, face a trade-off between inflation and unemployment when they target low inflation rates. This situation arises because, in unionised labour markets, wages can only be changed through mutual consent between employers and workers (Holden, 2002:2). Hence, workers and their labour unions possess bargaining power, which they can use to prevent employers from effecting cuts in nominal wages when inflation is low (Holden, 2002:4). The inability of employers to reduce nominal wages unilaterally means that, in the long run, increases in nominal wages lead to increases in inflation rate (Holden, 2002:3).

2.2.2. Determination of an optimal inflation rate

The existence of a trade-off means that there is an optimal inflation target. An appropriate inflation target would ideally be close to the optimal inflation rate on a nonlinear Phillips curve. Given the presence of a trade-off, studies have been conducted in certain developed countries (Akerlof *et al.*, 2000; Fortin, 2001; Lundborg & Sacklen, 2006; Maugeri, 2010; Wyplosz, 2000) to evaluate whether the inflation target is set at a level that optimises the trade-off between inflation and unemployment. For example, Fortin (2001:7) in his analysis of inflation in Canada over the period 1992 to 2002 find that the inflation target, which is set by the Bank of Canada exhibits a trade-off between inflation and unemployment. While the Bank of Canada has set an inflation rate band of 1%-3%, Fortin (2001:5) find that an optimal inflation target band for Canada would be 2%-3%.

In a study of inflation targeting policy in Sweden, Lundborg & Sacklen (2006:2) find that the inflation target of 2 percent, which is pursued by the European Central Bank, is not at a level that optimises the trade-off between inflation and unemployment. Lundborg & Sacklen (2006:24) analyse data from 1963 to 2000 and find that the trade-off would be optimised if the European Central Bank targeted an inflation rate of 4 percent.

A similar study was conducted by Maugeri (2010) for Italy for the period 1960 to 2003. Maugeri (2010:17) finds that the inflation target of 2 percent, which is pursued by the European Central Bank, is not optimal for Italy. Maugeri notes that the inflation rate that would minimise the trade-off between inflation and unemployment in Italy is between 15% and 20% (Maugeri, 2010:17).

.

Making use of survey data on inflation expectations of economic agents in regulated and unionised labour markets of France, Germany, the Netherlands and Switzerland from 1960 to 1999, Wyplosz (2000:15) investigates the inflation rate that optimises the trade-off of the two variables in these countries. Wyplosz finds that the 2 percent inflation target, which is pursued by the European Central Bank, results in trade-off between inflation and unemployment, that is, the low inflation target leads to the increase in unemployment in these countries. The results from Wyplosz's study (2000:30) suggest that an optimal inflation rate for France, Germany, the Netherlands and Switzerland should be 5 percent.

While an optimal inflation target range should refrain from generating excess unemployment, Mishkin and Westelius (2008) suggest that the higher the uncertainty about the inflation process, the wider should

the target range be. This is true for emerging market countries, which are more vulnerable to external shocks and likely to have more uncertainty about inflation outcomes.

2.3. Empirical Evidence in South Africa

Most of the literature on inflation targeting in South Africa (e.g. du Plessis and Burger, 2006; Fedderke and Schaling, 2005; Nell, 2002 and Pretorius and Smal, 1994) indicates the existence of trade-off, in the short run, between inflation and unemployment or between inflation and proxies for demand effects such as marginal costs and output gaps.

Early studies, which were conducted in the 1960s and 1970s, find trade-off between inflation and unemployment (e.g. Gallaway, Koshal and Chapin (1970); Hume (1971); Hodge (2002:426); du Plessis and Burger (2006:67)) - and between inflation and output gaps (e.g. Krogh (1967); Truu (1975); Strydom and Steenkamp (1967);du Plessis and Burger (2006:67)). Recent studies based on output gaps (Pretorius & Smal, 1994; Fedderke & Schaling, 2005; Nell; 2002) mainly find evidence of trade-off between inflation and output gaps. Studies, based on expectations-augmented Phillips curve of South Africa (Pretorius and Smal, 1994:67 and Fedderke and Schaling, 2005:88), find that the trade-off occurs indirectly through labour costs rather than through prices.

More recent studies (Leshoro, 2012; Phiri, 2010; Gupta and Uwilingiye, 2008) demonstrate that the 3%-6% inflation target range limits the level of economic growth in South Africa. Leshoro (2012:9) asserts that an inflation rate greater than 4 percent has a negative effect on GDP growth rates. Gupta and Uwilingiye (2008:7) assert that a 3% to 6% inflation target range results in a welfare loss, which ranges from 0.34 percent to 0.67 percent of GDP. Phiri (2010:354) find an inflation threshold of 8 percent and concludes that any inflation rate below and above the threshold will have an adverse effect on growth.

3. Methodology

To determine the optimal level of inflation target in South Africa, this paper follows the methodology developed by Ball and Mankiw (2002), which rests on the premise that there is a short run trade-off between inflation and unemployment. Given the existence of the short run trade-off, Ball and Mankiw (2002) show that there exists a level of unemployment that is consistent with stable inflation. The unemployment level that corresponds with a stable inflation is known as the non-accelerating inflation rate of unemployment (NAIRU) (Gordon, 1997 and Ball & Mankiw, 2002). Thus, this paper uses an

expectations-augmented Phillips curve to estimate a time-varying NAIRU for South Africa from 1980 to 2015. The NAIRU is not directly observable but is estimated based on variables which are used to determine an expectations-augmented Phillips curve (see Staiger, Stock, and Watson, 1997:197; Boone, Giorno, Meacci, Rae, Richardson and Turner, 2003:172). To determine if the SARB target is set at a level that optimises the trade-off between inflation and unemployment, the estimated NAIRU is used to determine a stable inflation rate for South Africa. The inflation rate, based on the estimated NAIRU, is then compared to the inflation target range that is adopted by the South African Reserve Bank. .

The short-run trade-off between inflation and unemployment can be expressed as:

$$\pi = \alpha - \beta U \qquad\qquad (1)$$

Where:

- π represents the inflation rate;
- U represents the unemployment rate;
- α is a parameter which represents a constant term in the equation; and
- $\beta > 0$ is a parameter which measures how the inflation rate responds to changes in the unemployment rate.

Nonetheless, the amended version of the inflation-unemployment dynamics is represented as:

$$\pi = \pi^e - \beta\left(U - U^*\right) + \varepsilon \qquad\qquad (2)$$

Where π^e is expected inflation, U^* is the NAIRU and ε is the supply shock. Equation 2 shows that the actual inflation depends on the expected inflation and how U deviates from U^*. Supply shocks, such as oil crisis and changes in the exchange rate, may affect also the level of inflation.

Ball and Mankiw (2002:118) acknowledge that economic agents base their decisions on adaptive expectations[1]. Thus, the expectations-augmented Phillips curve, which is based on adaptive expectations, is thus presented as follows:

$$\pi = \pi_{-1} - \beta\left(U^* - U\right) + \varepsilon \qquad\qquad (3)$$

Where:

- π_{-1} represents the inflation rate observed during the previous period.

---

[1] Ehlers and Steinbach (2007) show that economic agents in South Africa make use of adaptive expectations to a certain extent in forming their expectations of future inflation.

The expectations-augmented Phillips curve, as represented by equation 3 above, is used as a base to derive an estimate of a time-varying NAIRU that is used to determine a stable inflation rate. Ball and Mankiw (2002) show that to estimate the NAIRU, Equation 3 should be rewritten as:

$$\Delta\pi = \beta U^* - \beta U + \varepsilon \qquad\qquad (4)$$

Suppose that the value of parameter β is estimated, Equation 4 becomes:

$$\frac{\Delta\pi}{\beta} + U = U^* + \frac{\varepsilon}{\beta} \qquad\qquad (5)$$

Given that π and U are observed from the data, the left-hand side of Equation 5 can be computed to provide the estimate of $U^* + \frac{\varepsilon}{\beta}$. Ball and Mankiw (2002) suggest the use of Hodrick-Prescot (HP) filter to obtain U^*, which represents the longer-term trend and $\frac{\varepsilon}{\beta}$, the shorter-term supply shock or cyclical movement. The inflation rate, which corresponds to the natural rate of unemployment, is estimated by imputing values for parameters derived above into Equation 4.

4. Data and Empirical Results

In this study, we use the headline inflation rate $(\pi)^2$ and the official unemployment rate based on the narrow definition (U) to evaluate the appropriateness of the current inflation target range. Quarterly data from 1980 to 2015 is used and data for π and U are sourced from Quantec.

In order to estimate the NAIRU (U^*) we estimate the coefficient β from Equation 1. However, given that both π and U have a unit root, we have to test if there is a cointegrating relationship between these variables by making use of the Engel-Granger cointegration test.

The results of the Engle-Granger cointegration test are reflected on Table 1. The results show that the null hypothesis of no cointegration between π and U is rejected when inflation is an endogenous variable.

---

[2] It is important to note that the South African Reserve Bank (SARB) was targeting CPIX-inflation from 2000 t0 2008 instead of the headline CPI. In 2008 the SARB reverted back to targeting headline CPI inflation

[Insert Table 1 near here]

The study adopts the results of the Engle-Granger cointegration test and estimated the cointegrating parameter in the relationship between unemployment and inflation. The estimation, as per Equation 1, yields a value of 0.66 for parameter β.

Knowing the value of β, we proceed to estimate the natural rate of unemployment as per the procedure described above by using the HP filter. Figure 1 below provides a diagrammatic representation of South Africa's NAIRU, together with the headline inflation and actual unemployment rate, from 1980 to 2015.

[Insert Figure 1 near here]

Figure 1 shows that the estimated time-varying NAIRU increases substantially from single digit figures in the 1980s to double digit figures from the late 1980s to 2000. From the year 2000 to 2015, the NAIRU stabilises around 23 to 25 percent. In Kabundi et al. (2015) and Viegi (2015) we find support for these findings as both studies show that the NAIRU stabilises around these rates in South Africa. Figure 1 further shows that the unemployment rate is below the NAIRU during the period 1994 to 1997. This period corresponds to increasing economic activities in South Africa. However, the unemployment rate in South Africa trended above the NAIRU during the period 1998-2000 marking the period of contagion from the Russian and Latin American financial crises and during the period post 2008, signifying the effects of global financial crisis on the South African labour market. The trend of unemployment compared to the NAIRU is an evidence of the contribution of external shocks to the labour market and economic activities in South Africa.

It is clear from Figure 1 that the relationship between inflation (π), unemployment and NAIRU is far from supporting the evidence of a vertical Phillips curve in South Africa, especially after 2004. Figure 1 shows that deviation of unemployment rate from NAIRU translates to changes in inflation rate. For example, in the period 2004-2008 the unemployment rate in South Africa is below the NAIRU. This deviation of unemployment rate from the NAIRU coincides with the increase in inflation rate in South Africa. However, during the period of global financial crisis and the afterward of the crisis, unemployment soars above the NAIRU as inflation rate decreases. This finding indicates that the difference between the NAIRU and unemployment coincide with the change in inflation in South Africa as per the theory of the augmented Phillips curve. This occurrence indicates that actual inflation is not

11

only influenced by inflation expectations but also by the deviation of the unemployment rate from the NAIRU. This further shows that the Phillips curve is not vertical in South Africa, as actual inflation does not depend solely on inflation expectations.

The final step of the analysis is to obtain estimates of the stable inflation rate that would minimise the trade-off between inflation and unemployment. The estimates from Equation 3 yield a rate of inflation which ranges from 1.4 percent to 11.5 percent from 2000 to 2015. Figure 2 compares the actual inflation rate (π) and the inflation rate derived from the South African NAIRU (*InflaN*).

[Insert Figure 2 near here]

The results show that *InflaN* and Actual inflation (π) have similar trends, but, in spite of this, they have different ranges. Moreover, these results indicate that, if South Africa were to put in place an inflation target range based on the NAIRU, it would have to target an inflation rate that ranges from 1.4 to 11.5 percent. This range is different to the official inflation target of 3% to 6% adopted by the South African Reserve Bank (SARB). It is a reality that when South Africa implemented inflation targeting, it chose an inflation range that coincided with its trading partners rather than a range that could optimise the trade-off between unemployment and inflation.

It is clear that monetary policy makers in South Africa are adopting the inflation targeting policy on the premise of a vertical Phillips Curve without sound evaluation of the domestic context and reality. It is not surprising that stakeholders such as the trade unions continue to believe that the South African Reserve Bank has been too restrictive in the conduct of monetary policy. Although South Africa's trading partners have set inflation targets at similarly lower rates, these countries have lower unemployment rate and NAIRU than South Africa's which gives them the leverage to target inflation rates over narrow bands. Table 2 indicates that a vast majority of these countries have low and stable inflation rate interval, and with the exception of Brazil, all the countries, Thailand, Peru and Israel target inflation at rates which are slightly below South Africa's inflation target range. It is then difficult to understand why South Africa has a lower upper bound inflation rate and a tighter inflation target interval than one of his important trade partner, Brazil. A wider inflation target, like the one of Brazil is ideal for emerging market economies that are vulnerable to external shocks. A wider inflation target range could prevent monetary authorities from frequently reacting to external shocks. Stringent anti-inflationary policies might have caused persistent and high unemployment in South Africa. Literature shows that a number of emerging market economies have harmed their economies from unnecessarily reacting to external shocks. For example, Mackowiak

12

(2007) shows that United States (US) monetary policy shocks affect a larger fraction of the variance in the aggregate price level and aggregate output in emerging economies than of the variances in the same variables in the US itself. Moreover, Kaminsky et al. (2005) indicate that emerging market economies are overwhelmingly procyclical in their conduct of monetary policy and often deepen downturns when reacting to external shocks. South African monetary authority may have caused reduced economic activities as it responds to the effects of external shocks on the domestic economy with restrictive measures. Indeed a number of studies have found that restrictive monetary policy reactions often fail to reduce inflation in South Africa (Bonga-Bonga and Kabundi, 2011).

[Insert Table 2 near here]

Moreover, in a historical perspective, the 3% to 6% inflation range adopted by the SARB is strikingly low, as Figure 1 shows that in the 1980s when South Africa had one digit unemployment rate, inflation rate was between 12% and 14%.

5. Conclusion

This paper aims to assess whether or not the SARB 3% to 6% inflation target range is at a rate that optimises the trade-off between inflation and unemployment. Empirical work shows that countries with low levels of inflation and/or whose Phillips Curve is vertical (many of which are developed economies) may adopt low inflation rate/ ranges targets. Studies also show that despite South Africa having non-vertical Phillips Curve, significant high levels of unemployment, and high income inequality, its inflation targeting policy is modelled around a narrow inflation rate band with a lower upper bound, unlike countries at similar level of development such as Brazil. Furthermore, while South Africa's inflation target range compares well with that of other emerging market countries, the level of unemployment in South Africa is higher than that of these emerging market countries. In this research work, we estimate the stable inflation rate based on the expectations-augmented Phillips curve for South Africa. Given the magnitude of the computed NAIRU, the estimation results provides an inflation range that is wider than the current inflation target range set by the South African Reserve Bank. The paper concludes that the current tighter inflation target policy in South Africa is based on unsound fundamentals and may have led to some unnecessary responses by the monetary authority to apply restrictive measures which in turn have been detrimental to output growth and reduced employment, among other things.

6. References

Arkerlof, G.A., Dickens, W.T., Perry, G.L., Gordon, R.J., and Mankiw, N.G. (1996). The macroeconomics of low inflation. *Brookings Papers on Economic Activity,* Vol.1999, No.1, pp. 1 – 76.

Arkerlof, G.A., Dickens, W.T., Perry, G.L., Bewley, T.F., and Blinder, A.S. (2000). Near-Rational Wage and Price Setting and the Long-Run Phillips Curve. *Brookings Papers on Economic Activity,* Vol. 2000, No.1, pp. 1 – 60.

Ball, L. Mankiw, N.G. and Nordhaus, W.D. (1999). Aggregate Demand and Long-run Unemployment. *Brookings Papers on Economic Activity,* Vol. 1999, No. 2, pp. 189 – 251.

Ball, L. and Mankiw, N.G. (Fall, 2002). The NAIRU in theory and practice. *Journal of Economic Perspectives,* Vol. 16, No. 4, pp. 115 – 136.

Banerjee, A., Galioni, S., Levinsohn, J. McLaren, Z. and Woolard, I. (June, 2007). Why has unemployment risen in the new South Africa? *National Bureau of Economic Research,* NBER Working Paper Series, Working Paper No. 13167.

Banerjee, A., Galioni, S., Levinsohn, J. McLaren, Z. and Woolard, I. (2008). Why has unemployment risen in the new South Africa? *Economics of Transition,* Vol. 16, No. 4, pp. 715 - 740.
Bernanke, B.S, Laubach, T.S. and Mishkin, F.S. (1999). Inflation targeting. Princeton, Princeton university Press.

Bernanke, B.S. (2003). Panel discussion, October 17. www.federalreserve.gov/boarddocs/speeches/2003. Accessed 12 Decembre 2015.

Bonga-Bonga, L. and Kabundi, A. (2011). Monetary policy action and inflation in Siuth aFrica: an empirical analysis, African Finance Analysis, 13(2): 25-37.

Boone, L., Giorno, C., Meacci, M., Rae, D., Richardson, P. and Turner, D. (2003). Estimating the structural rate of unemployment for the OECD countries. *OECD Economic Studies,* Vol. 2002/2, No. 33, pp. 172 - 211.

Burger, P. and Marinkov, M. (2006). The South African Phillips curve: How applicable is the Gordon model? *South African Journal of Economics.* Vol. 74, No. 2, pp. 172 – 189.

Casteleijn, A.J.H. (June, 1999). *The Viability of Implementing an Inflation Targeting Monetary Policy Framework in South Africa*. Pretoria: South African Reserve Bank.

Department of Economic Development (2010). *New Growth Path Framework*. Pretoria: Department of Economic Development.

Department of Finance (1996). *Growth, Employment and Redistribution: A Macroeconomic Strategy*. Pretoria: Department of Finance.

Du Plessis, S. and Burger, R. (2006). *A New Keynesian Phillips Curve for South Africa*. Paper presented at the South African Reserve Bank Conference, Pretoria.

Ehler, N. and Steinbach, R (2007). The formation of inflation expectations in South Africa. Working paper no. 3243, South African Reserve Bank.

Erceg, C.J. (May, 2002). The Choice of an Inflation Target Range in a Small Open Economy. *AEA Papers and Proceedings,* Vol. 92, No. 2, pp. 85 – 89.

Fedderke, J.W. and Schaling, E. (March, 2005). Modelling Inflation in South Africa: A multivariate cointegration analysis. *South African Journal of Economics.* Vol. 73, No. 1, pp. 79 - 92.

Fischer, S. (1996). *Why are central banks pursuing long-run price stability?* Kansas City: Federal Reserve Bank of Kansas City.

Fortin, P. (Feb., 2001). Inflation targeting: the three percent solution. *Policy Matters,* Vol. 2, No. 1, pp. 1 – 16.

Fraga, A., Goldfajn, I., and Minella, A. (October, 2003). Inflation targeting in emerging market economies. *National Bureau of Economic Research,* NBER Working Paper Series, Working Paper No. 10019.

Friedman, M. (March, 1968). The Role of Monetary Policy. *The American Economic Review,* Vol. 58, No. 1, pp. 1 - 17.

Gordon, R.J. (Winter, 1997). The time-varying NAIRU and its implications for economic policy. *Journal of Economic Perspectives,* Vol. 11, No. 1, pp. 11 – 32.

Gupta, R. and Uwilingiye, J. (February, 2008). Measuring the Welfare Cost of Inflation in South Africa. *Economic Research Southern Africa,* Working Paper No. 68.

Hodge, D. (2002). Inflation versus unemployment in South Africa: Is there a trade-off? *South African Journal of Economics*, Vol.70, No.3, pp. 418 – 443.

Holden, S. (April, 2002). The costs of price stability – downward nominal wage rigidity in Europe. *The National Bureau of Economic Research*, Working Paper No. 8865, pp. 1 - 41.

Hsing, Y. (2009). Estimating the time-varying NAIRU for Germany and policy implications. *Applied Economic Letters,* Vol. 16, No. 5, pp. 469 – 473.

Kabundi, A.; Schaling, E. and Some, M. (2015). Estimating a Phillips Curve for South Africa: A Bounded Random Walk Approach. ERSA working paper no. 568.

Kahn, B. (2008). *Challenges of Inflation Targeting for Emerging-market Economies: The South African Case.* Paper presented for the South African Reserve Bank Conference Series on *Challenges for monetary policy-makers in emerging markets*, Pretoria.

Kaminsky, G.L. ; Reinhart, C.M. and Vegh, C.A. (2005). Whe it rains, it pours: procyclical capital flow and macroeconomic policies, in NBER macroeconomic Annual 2004, Vol.19, ed. By Gertler, M. and Rogoff, K., Cambridge: NBER.

Karanassou, M., Sala, H. & Snower, D.J. (2010). Phillips curves and unemployment dynamics: A critique and holistic perspective. *Journal of Economic Perspectives,* Vol. 24, No. 1, pp. 1 - 51.

Klasen, S. and Woolard, I. (2008). Surviving Unemployment without State Support: Unemployment and Household Formation in South Africa. *Journal of African Economies,* Vol. 18, No. 1, pp. 1 – 51.

Leshoro, T.L.A. (May, 2012). Estimating the inflation threshold for South Africa. *Economic Research Southern Africa.* ERSA, Working Paper 285.

Levin, A.T., Natalucci, F.M. and Piger, J.M. (2004). The macroeconomics effects of inflation targeting. Conference proceeding of the 28th annual economic policy conference on "Inflation Targeting: Prospects and Problems" held in St Loius. Conducted by the Federal Reserve Bank of St Louis. St Louis: Federal Reserve Bank of St Louis.

Lundborg, P. and Sacklěn, H. (2006). Low-inflation targeting and long-run unemployment. *The Scandinavian Journal of Economics*, Vol. 108, No. 3, pp. 397 – 418.

Mackowiak, B. (2007). External shocks, US monetary policy shocks and macroeconomic fluctuations in emerging market. Journal of monetary economics, 54(8): 2512-2520.

Mankiw, N.G. (May, 2001). The Inexorable and Mysterious Trade-off between Inflation and Unemployment. *The Economic Journal*, Vol.111, No. 471, pp. C45 – C61.

Maugeri, N. (2010). *Macroeconomic Implications of Near Rational Behaviour: An Application to the Italian Phillips Curve*. Unpublished doctoral thesis. Siena: Università di Siena.

Mboweni, T.T. (December, 1999). Inflation targeting in South Africa. *The South African Journal of Economics*, Vol. 67, No.4, pp 401 - 409.

McCord, A. and Bhorat, H. (2003). Employment and Labour Market Trends. In *Human Resources Development Review*. Edited by Kraak, A. and Perold, H. Cape Town: HSRC Press.

Michie, J. (Oct., 2003). *The Institutional Underpinnings of the Unemployment-Inflation Relationship: A Review Paper*. Pretoria: Human Sciences Research Council.

Mishkin, F.S. and Westelius, N.J. (2008). Inflation Band Targeting and Optimal Inflation Contracts. Journal of Money, Credit and Banking, 40(4): 557-582

National Labour and Economic Development Institute. (2004). *Highlights of the current labour market conditions in South Africa.* Johannesburg: National Labour and Economic Development Institute.

Nell, K.S. (2002). Is low inflation a precondition for faster growth? The case of South Africa. *University of Kent,* Department of Economics, Working Paper No. 0011.

Padayachee, V. (2001). Central bank transformation in a globalized world: The Reserve Bank in post-apartheid South Africa. *Journal of International Development,* Vol. 13, pp. 741 – 765.

Phillips, A.W. (November 1958). The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861 – 1957. *Economica*, Vol.25, No.100, pp. 283-299.

Phiri, A. (2010). At what level is inflation least detrimental towards finance-growth activity in South Africa? *Journal of Sustainable Development in Africa,* Vol.12, No. 6, pp. 354 – 364.

Pretorius, C.J. and Smal, M.M. (March1994). A macro-economic examination of the price-formation process in the South African economy. *The South African Reserve Bank Quarterly Bulletin No. 191,* pp. 25 – 36.

Ricci, L.A. (2005). Bringing inflation under control. In *Post-Apartheid South Africa: The First Ten Years.* Edited by Nowak, M. and Ricci, L.A. Washington: International Monetary Fund.

Rossouw, J. and Padayachee, V. (April, 2008). *An Analysis of inflation from a central banking perspective: The South African experience since 1921.* University of Kwazulu Natal: School of Development Studies. Working Paper No. 50.

Staiger, D., Stock, J.H. and Watson, M.W. (Winter 1997). How Precise are Estimates of the Natural Rate of Unemployment? *The Journal of Economic Perspectives,* Vol. 11, No. 1, pp. 34 – 49.

Svenssons, L.E.O. (Aug., 1999). Price-level targeting versus inflation targeting: A free lunch? *Journal of Money, Credit and Banking,* Vol. 31, No. 3, pp. 277 – 295.

Van der Merve, E.J. (July, 2004). Inflation targeting in South Africa. *The South African Reserve Bank Occasional Paper No. 19.*

Viegi, N. (2015), LabourMarket andMonetary Policy in South Africa. SARB Working Paper 15/01.

World Bank (2015). World Development Indicators. http://beta.worldbank.org. accessed 27 january 2016.

Wyplosz, C. (2000). Do we know how low should inflation be? Conference proceeding of the first Central Banking Conference on "Why Price Stability" held in Geneva. Conducted by the European Central Bank. Geneva: Graduate Institute of International Studies.

Table 1. Results of the Engle-Granger cointegration test

| Variable	z-statistic	Probability
π	-29.6342	0.0214
U	-18.20813	0.2031

Note: the null hypothesis of no cointegration is rejected when π is endogenous

**Table 2. Emerging markets' South Africa's competitors who adopted inflation targeting**

Coutry	Inflation Target range	Unemployment rate
Chile	2 - 4%	5.90%
Israel	1 -3 %	6.20%
Brazil	1.5 - 8.5%	6.50%
Czech Republic	2 - 4%	7%
Thailand	0.90%	0.80%

Source: Levin, Natal & Piger (2004) and Fraga, Goldfajn & Minella (2003), World Bank (2015)

Note; unemployment rate is for the period 2006-2010.
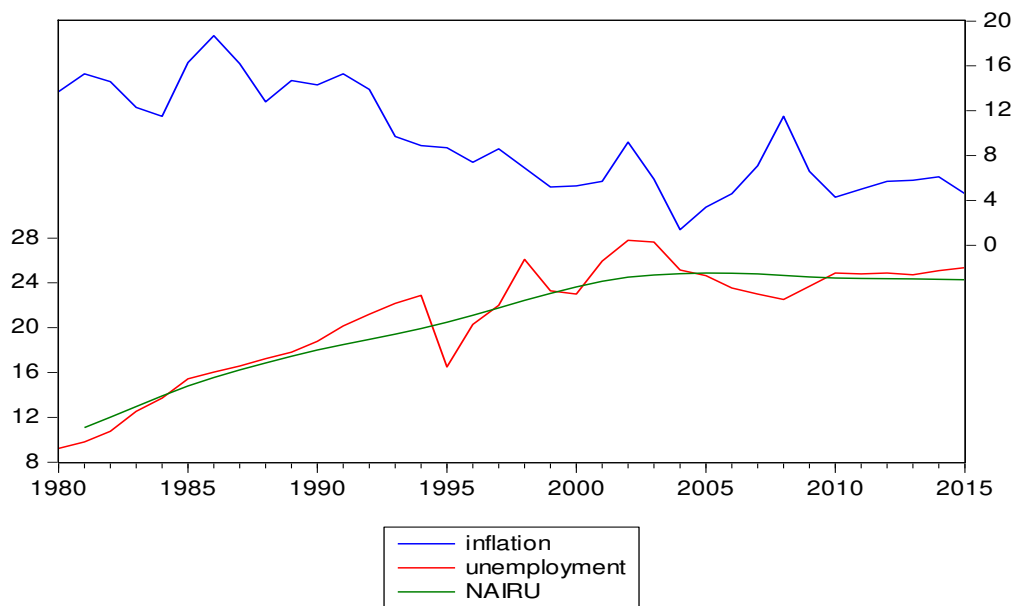
Figure 1. Graphical representation of South Africa's estimated NAIRU, inflation and unemployment from 1980 to 2015
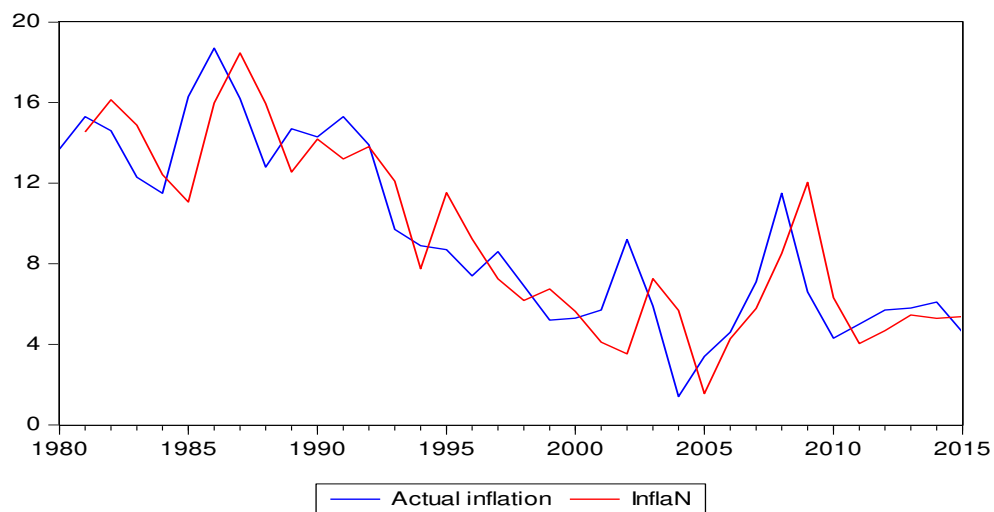
Figure 2. South Africa's inflation range based on estimates of natural rate of unemployment (InflaN) and the actual inflation rate

19