Inflation, growth and employment in South Africa: Trends and trade-offs

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Abstract

It is often publicly contended that overly strict application of inflation targeting stifles employment growth in South Africa, with the Phillips curve often cited as seemingly authoritative reference. This paper revisits this debate and argues that the Phillips curve has often been misinterpreted and subsequently applied incorrectly. Furthermore, this paper investigates the effect of inflation on employment in South Africa via the effects of inflation on output. It aims to determine whether higher inflation could contribute to employment creation. Using the Engle-Granger Error-Correction approach, long run trends as well as short run dynamics of this relationship in the South African economy are explored. Evidence is found of a positive cointegrating long run relationship between employment and output, leading to the assertion that anything that negatively effects output (such as high inflation) will by extension harm employment creation. No significant relationship in the short run between the level of inflation or shocks to inflation and employment creation could be found. The conclusion is that the current relatively low and constant inflationary environment, attributed to the inflation targeting regime, is actually conducive to employment creation in South Africa.

JEL codes: E24, E52, E63

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1 Introduction

In recent years, the South African Reserve Bank (SARB) has come under fire in the media for their supposed overly conservative approach to monetary policy, specifically inflation targeting, and the damaging effects that this might have on employment creation in South Africa. It is argued that there exists a trade-off between inflation and unemployment, which could be exploited in favour of lowering the unemployment rate. This idea of a trade-off between the inflation rate and unemployment rate was born out of findings by A.W.

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Phillips (1958). Phillips detected a negative relationship between the rate of money wage changes (wage inflation) and the unemployment rate in the British economy over the period 1861–1957. His graph of inflation plotted against unemployment famously became known as the "Phillips Curve". Academics and government officials alike started to believe in a permanent and stable trade-off between inflation and unemployment, and that this relationship could be manipulated or exploited in favour of employment creation. Critics of the SARB's inflation targeting framework often cite the Phillips Curve as a basis for their arguments.

Some economists and unions have argued that, to keep inflation within the targeted range of 3-6%, the SARB maintains a too high repo (interest) rate, preventing the South African economy from growing at its full potential and subsequently undermining job creation. Furthermore, inflation shocks are often met by a contractionary monetary policy stance through an increase in the repo rate. The SARB is accused of "applying the brake of inflation targeting" (Financial Mail, 2011) and there have been calls for the inflation targeting framework to be reviewed – even scrapped – and for government to rather adopt "employment targeting" – instead of inflation targeting – monetary policy (IOL, 2011). Trade union UASA claims that "the current prime interest rate of banks would be...lower...had South Africa been targeting both unemployment and inflation as opposed to inflation only" (Business Day, 2011b). It is also argued that "an inflation-based macroeconomic framework constrains fiscal policy from being aggressive enough to address challenges and backlogs related to social and economic infrastructure and the creation of jobs" (COSATU, 2011:7). It is further argued that the SARB should "print more money", lower the interest rate and weaken the exchange rate to protect jobs (Financial Mail, 2009), implicitly implying that higher inflation will not harm job creation. In a critique on inflation targeting in general, Epstein (2003:1) asserts that the focus on inflation targets "has led to slower economic growth and lower employment growth". In short, the contention is that the current inflation targeting monetary policy regime constrains economic growth and consequently stifles employment creation and contributes to high levels of unemployment.

On the other hand, there are those who believe that the current South African monetary policy regime is appropriate, as low and stable inflation is seen as a precondition for sustainable long-term economic growth and thus employment creation, and that inflation targeting has had important benefits for the countries that have adopted it (Bernanke, Laubach, Mishkin & Posen, 1999; SARB, n.d.). Central banks around the world have adopted price stability (defined as low and stable inflation) as the main mandate of monetary policy. Furthermore, the SARB itself officially pursues flexible inflation targeting (SARB, n.d.), by their own admission not focussing exclusively on inflation but also taking into account other macroeconomic variables such as economic growth and unemployment. They admit that "monetary policy cannot contribute directly to economic growth and employment creation in the long run", but that "by creating a stable financial environment, monetary policy fulfils an important precondition for the attainment of economic development" (SARB, n.d.). On

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the pro-inflation targeting side of the debate it is also argued that cheap money is not a quick fix for employment (Business Day, 2010). A labour analyst points the finger back to the trade unions, arguing that "[t]rade unions by elevating wages and keeping older people in jobs were preventing youngsters from joining the workforce, so youth unemployment is largely a creation of the trade unions in South Africa" (Business Day, 2011a). There are also fears that overly expansionary monetary policy – while it could perhaps boost economic growth and subsequently employment creation in the short run – would cause higher inflation, which would have adverse effects in the long run, essentially destroying the progress made in the first place. Furthermore, the Phillips curve relationship has broken down for most countries since the stagflation of the 1970s, which saw high levels of both inflation and unemployment (Zhu, 2005), so it could be argued that the trade-off does not even exist anymore. Since the 1970s, however, tremendous theoretical work has been done on the Phillips curve hypothesis which steers away from the traditional view. This includes the expectations-augmented and New-Keynesian Phillips curves etc. Newer models essentially posit a vertical long run Phillips curve and argue that – consistent with the SARB's admission above – money is neutral in the long run (i.e. there is no impact of money or inflation on real variables such as output and unemployment); there could, however, be short run distortions. Nonetheless, anti-inflation targeters in South Africa tend to propagate the traditional view, i.e. that higher inflation is associated with lower unemployment, and do not fully acknowledge the more modern considerations. It appears that the focus is very much on short term gains in employment.

It is clear that there are two contrasting points of view regarding the application of monetary policy in South Africa and its effect on employment creation. Both of these positions have merit. Unemployment in South Africa is widespread, with the official unemployment rate (the number of unemployed expressed as a fraction of the labour force) hovering around 20-25% for most of the past 25 years. Over the same time, annual inflation has fallen from a high of 15.3% in 1991 to consistent single-digit figures since 1993 (with the exception of an 11.5% inflation rate in 2008) (Statistics South Africa). Price stability of this kind is believed to foster a stable macroeconomic environment, leading to improved productive investment opportunities, capital inflows and stable and sustainable long-term economic growth. Recent healthy economic growth has unfortunately done little to improve the bleak unemployment outlook. In fact, while the South African economy has grown at an annual average of 2.5% per year since 1990, the unemployment rate has in fact significantly deteriorated. Over the same period, the actual number of people employed has grown by 1.6% per year, just over half the growth of real GDP. These numbers give the impression that low and stable inflation does play a part in helping the economy grow. At the same time, however, it does not appear that this economic growth is translated into sufficient employment growth.

While this was an interesting and sometimes heated debate in the popular press, it was still merely a debate. However, the fact that so many observers have such a strong shared opinion provides motivation enough to undertake this

study in order to objectively determine whether such comments have merit. Do the commentators have a sound economic argument, or is it merely populist propaganda, a symptom of the political business cycle? Conversely, if the argument is sound why has nothing changed in terms of monetary policy over the past decade? What is really the impact of inflation on employment creation?

This paper challenges the assertion that higher inflation will lead to employment growth in South Africa. It in fact argues for the opposite position: that higher inflation is associated with slower economic growth, which would directly result in weaker employment creation. The paper is organised as follows: Section 2 provides a brief outline of the Phillips curve hypothesis and discusses the theoretical considerations behind these arguments. Section 3 presents an overview of the South African literature on comparable studies and investigates the data and some graphical evidence. Section 4 proposes a simple econometric model, and presents and discusses the results. Conclusions, practical implications and recommendations for future research on the topic are provided in Section 5.

2   Theoretical overview

Proponents of the Phillips curve argument in the context of the South African inflation targeting vs. unemployment debate are – more often than not – telling only half the story. It is argued that there is always a trade-off between inflation and the unemployment rate, and so a higher inflation rate will most certainly be associated with a lower unemployment rate. Therefore, the SARB should relax interest rates and allow inflation to increase, which would subsequently lead to a drop in the unemployment rate. If only it was that simple. This argument fails to acknowledge that Phillips' original hypothesis was based on the relationship between *wage* inflation and the unemployment rate. Furthermore, it almost naively seems to assume direct causality from the inflation rate to the unemployment rate without properly interrogating the channels in between. Finally, even though the Phillips relationship was generalized to the relationship between overall inflation and unemployment rates and found to be quite accurate globally up until the 1960s, the relationship has broken down from 1970 onward (Zhu, 2005). The traditional Phillips curve therefore, as often cited in the South African unemployment debate, is unfortunately nothing more than a formerly-elegant theory which is conveniently – yet often entirely inaccurately – applied to the South African context.

2.1   Phillips' original hypothesis

In his seminal paper, Phillips (1958) analysed the relationship between wage inflation and unemployment in the United Kingdom during the period 1861-1957 and found a stable non-linear negative relationship between the two variables. He originally hypothesised that it is changes in the demand for labour which lead to changes in the money wage rate. Phillips states that "[w]hen the demand for labour is high and there are very few unemployed we should expect

employers to bid wage rates up quite rapidly, each firm and each industry being continually tempted to offer a little above the prevailing rates to attract the most suitable labour from other firms and industries" (1958:283). He continues by arguing that "a second factor influencing the rate of change of money wage rates might be the rate of change of the demand for labour, and so of unemployment" (1958:283). Phillips equates a high demand for labour to low numbers of unemployed, and argues that a high demand for labour will lead firms to bid up wages in order to attract the desired labour. While it is certainly true that a higher wage rate could encourage more people to join the labour force, never does Phillips assert that a higher wage rate will reduce the unemployment rate. He clearly states that "[t]he purpose of the present study is to see whether statistical evidence supports the hypothesis that the rate of change of money wage rates in the United Kingdom can be explained by the level of unemployment and the rate of change of unemployment" (1958:284). Zhu (2005:1) confirms that "[e]arly versions of the Phillips curve postulated that in the long run, the rate of wage inflation depended on the unemployment rate and on lagged rates of price inflation", and not that the unemployment rate is dependent on the wage inflation rate. This is the complete opposite of the argument that (wage) inflation could influence the unemployment rate.

As was alluded to earlier, it could conceivably be argued that more people would join the labour force if higher nominal wages are offered, which could explain how higher nominal wages might influence employment. This could have an impact on the unemployment rate and might be an unintentional by-product of Phillips' original hypothesis. A simple numerical example illustrates this possibility. Let the unemployment rate be calculated as (labour force – number of people employed) / (labour force). Assume an initial hypothetical labour force of 100 people, with 70 of them employed. The unemployment rate is therefore (100-70)/100 = 30%. If a nominal wage increase encourages 10 more people to join the labour force, and assuming optimistically that they are all immediately employed, the unemployment rate drops to (110-80)/110 = 27,3%. If, however, only 7 out of the 10 new entrants to the labour force find employment the unemployment rate remains at (110-77)/110 = 30%, and if 6 people or less are employed the unemployment rate will actually increase. The critical consideration is therefore how many of the new labour market entrants will be hired by existing employers. This simple illustration suggests that the unemployment rate is therefore not only a function of the wage rate (which reflects the demand for labour), but also of conditions on the production side (supply of labour). Phillips' original argument was that firms essentially attempted to poach desirable employees from other firms and industries by offering a higher wage rate, effectively assuming an almost sterile (i.e. no in- or outflows) labour force (changes in his labour force were exogenously determined). This could be interpreted as a merry-go-round of employees, where the "good" labour moves to firms offering higher wages, with a small trickle of new entrants to fill some of the positions that "good" labour has recently vacated. However, even if a higher nominal wage rate encourages new prospective employees into the labour market, how many of these new entrants will actually end up being employed by

meeting the requirements of those very firms offering higher wages in the hope of attracting suitable employees? Could it be that the higher wages on offer encourages for example five new entrants who will all be competing for only one or two positions? What about the three or four who fail to gain employment? They are now (at least for a while) part of the labour force and their unemployed status will skew the unemployment rate upwards. While demand side policies might reasonably be expected to succeed in increasing employment (i.e. creating jobs), the unemployment *rate* is a different and more complex metric altogether. Clearly, based on the above example, the quality of labour supplied is crucial in determining the unemployment rate. This is a very important question in the South African context of skills shortages in the labour market and will be addressed in section 3 below.

2.2 Causality

The negative relationship between the inflation rate and the unemployment rate, illustrated in Figure 1, paved the way for the idea of a permanent and stable trade-off between inflation and unemployment. Given this trade-off, it was asserted that "policymakers could 'buy' [at least in the short run] a lower rate of unemployment at the cost of a higher rate of inflation" (Cashell, 2004:2).

Even though Phillips originally hypothesised that the unemployment rate explains the rate of money wage changes, it can be argued that causality might also run the other way by generalising the rate of money wage changes to the overall inflation rate. One way to interpret this supposed trade-off, which is the foundation of this study, is that by tolerating a higher rate of inflation a lower level of unemployment could be had. The economic argument domestically goes as follows: By lowering the repo rate (expansionary monetary policy) the SARB allows the South African economy to grow at a faster pace. Cheaper money, by virtue of lower interest rates, boosts consumption and investment spending, increasing aggregate demand and subsequently economic growth. Higher growth leads to the expansion of output and productive capacity, increasing the demand for labour and thus increasing employment and lowering the unemployment rate. However, a by-product of a faster-growing economy is a higher level of inflation. Because of the increased demand for labour workers now have more bargaining power and wage rates will increase at a faster pace. As a result aggregate demand will increase further (primarily through the consumption channel), exerting more upward pressure on prices. At the same time firms might increase the prices of their goods in order to protect their profit margins in the face of higher nominal wage demands, further contributing to higher price levels. The converse is also true. In order to realise lower levels of inflation, the SARB could employ contractionary monetary policy by way of a higher repo rate. Through the same channels as mentioned above, aggregate demand should slow down to reduce inflationary pressures, but this would be to the detriment of economic growth and subsequently employment creation. In this case, however, inflation does not drive changes in employment and it could therefore not strictly be described as a "causal" relationship. It is merely a by-product of strong eco-

nomic growth; higher inflation could therefore perhaps be "tolerated" in order to achieve higher employment targets.

Another possible theory explaining a more direct causal link from inflation to unemployment is derived from the Keynesian sticky-wage theory of monetary non-neutrality. Nominal wages are sticky and therefore slow to adjust. If the central bank would pursue an expansionary monetary policy, prices would rise (inflation) and real wages would fall. Subsequently the demand for labour would increase, leading to a fall in the unemployment rate. There are only two problems with this theory. Firstly, "real wages do not exhibit the countercyclical behaviour that this theory predicts" and therefore "this story is patently false" (Mankiw, 2001:C49). Secondly, even if the theory did hold, there is no guarantee that a higher demand for labour would translate into a fall in the unemployment rate, as was illustrated by the hypothetical examples above. It is therefore doubtful whether changes in the inflation rate could directly cause changes in the unemployment rate – there is simply no reliable theoretical link. The only reasonable relationship therefore is through inflation being a by-product of a specific set of circumstances, this set of circumstances being the actual drivers of processes which could contribute to lowering the unemployment rate.

2.3   The Phillips curve fails

Based on favourable statistics, a reliable correlation and a neat graph of the inflation rate plotted against the unemployment rate (Figure 1) it was assumed that there is a stable trade-off between the inflation rate and the unemployment rate for many countries around the world. While the direction of causality and deeper mechanical processes were obscured in opacity, the Phillips curve became an essential part of macroeconomic modelling and policy analysis of the 1960s (Zhu, 2005). However, the Phillips curve broke down during the 1970s, and the assumed relationship between inflation and unemployment was called into serious question. This breakdown "cast serious doubt on the theoretical and empirical validity of the Phillips curve" (Zhu, 2005:1). Lucas & Sargent (1979:6) called the Phillips curve an "econometric failure on a grand scale", while Reichel (2004:341) is of the opinion that the Phillips curve "as a policy guideline is totally useless".

Newer forms of the Phillips curve were created, however, among other Friedman's (1968) natural rate hypothesis, and the New-Keynesian and expectations-augmented Phillips curves, which have somewhat repaired the reputation of the Phillips curve. Blinder (1997:241) claimed that the reliability of the (new) Phillips curve was the "clean little secret" of modern macroeconomics. Mankiw (2001) argues in favour of the "inexorable and mysterious" trade-off between inflation and unemployment, but qualifies this statement as referring to the short run only. Subsequently the idea of a trade-off between inflation and unemployment has also been revived. These specifications are, however, generally complex models and do not simply elegantly predict that higher inflation will lead to a lower unemployment rate (see Mankiw, 2001 and Zhu, 2005 for a detailed discussion on newer Phillips curve formulations). In fact, these models are mostly

concerned with short-term macroeconomic forecasting, and should therefore be interpreted very carefully when it relates to long-term policy analysis. In the long run they generally establish a vertical Phillips curve, i.e. fixed at some (natural) level of unemployment. Finally, modern studies generally use some formulation of the Phillips curve to express the price level (or inflation rate) in an economy as a function of certain other variables, often including some form of aggregate demand such as the output gap or an unemployment gap as an explanatory variable. The dependent variable in these formulations is the price level or rate of inflation, and not the unemployment rate. The modern Phillips curve formulations therefore confirm Phillips' original theory that the demand for labour (approximated by e.g. the output gap or the unemployment rate) determines the price level or (wage) inflation, and not the other way around. Unfortunately the Phillips curve is still often misunderstood and misinterpreted, quoted and cited out of context, or simply abused.

This section substantiates the point made in earlier sections, which is that causality in the Phillips curve literature runs primarily from aggregate demand to the price level or inflation rate, and not the other way around. Citing the Phillips curve (either the old version which has broken down, or newer versions which are essentially modelling the price level) as an argument for employment creation is akin to arguing that an increase in ice cream sales brings on summer and therefore seems spurious at best.

3 Empirical overview and South African context

3.1 Earlier research on inflation, growth and employment in South Africa

Numerous excellent studies have been done on the relationship between inflation and economic growth in South Africa. These papers include among others Krogh (1967), Gallaway, Koshal & Chapin (1970), Hume (1971), Truu (1975), Strebel (1976), Strydom (1976), Strydom & Steenkamp (1976), Levin & Horn (1987), Pretorius & Smal (1994), Schaling (1999), Nell (2000), Hodge (2002), Fedderke & Schaling (2005), Burger & Du Plessis (2006), Burger & Marinkov (2005), Hodge (2006), Nell (2006) and Hodge (2009). Models were estimated ranging from Phillips' traditional view to expectations-augmented and New-Keynesian specifications. The majority of these papers, however, have not strictly analysed the relationship between inflation and unemployment, but have concentrated on the relationship between inflation and economic growth or output. While several of the authors were interested in testing whether a Phillips curve exists for South Africa (that is, is there evidence of a trade-off between inflation and unemployment), this could ultimately not be determined. Due to South Africa's political history, there is hardly any official data available on black employment prior to the 1990s, while the data that is available is generally regarded as inaccurate. Hodge (2006:175) finds South African unemployment data "patchy and unreliable", while "the lack of a reliable and sufficiently long unemployment

time series" is lamented by Burger & Marinkov (2005:1).

While the unemployment rate is not available, a series on South African formal sector employment was constructed and updated by various authors, the latest version of which could be found in Hodge (2009). The data in Hodge (2009) spans the period 1946-2007 and was constructed from the Standardised Employment Series, originally estimated by Roukens de Lange & Van Eeghen (1984, updated and revised in 1993), and extended with data from various editions of the South African Labour Statistics (1990-1995), the October Household Survey (1995-1999) and the Labour Force Survey (2000-2007). This series was further updated for this paper with employment data from Statistics South Africa's Quarterly Labour Survey up to 2014. Other data used in this analysis are the inflation rate, calculated from the World Bank's published Consumer Price Index (CPI) figures, and real GDP figures (at constant 2010 prices), extracted from the SARB's online database.

3.2 Preliminary data analysis

Necessitated by the unavailability of reliable unemployment data, specifically during the period 1950-1985, previous authors generally used economic growth as a proxy for unemployment to test the Phillips curve hypothesis in South Africa. This is based on the theoretical premise that higher economic growth should lead to a comparable reduction in unemployment through a higher demand for labour. The majority of these authors therefore tested the relationship between inflation and some measure of output, and found a consistently negative long-term relationship, indicating that higher inflation adversely affects economic growth. This is consistent with international evidence, summarised by Sarel's (1996:199) assertion that "it is now widely accepted that inflation has a negative effect on economic growth". The conclusion was that, because output plays such an important role in employment creation, higher inflation would by extension harm employment creation.

However, as was discussed earlier, it is conceivable that an increase in output might not necessarily lead to a comparable increase in employment (or decrease in the unemployment rate), and as such economic growth is perhaps an inaccurate or only partial approximation of employment creation in this context. Figures 2 and 3 indicate that, while employment and economic growth generally trend together over time (figure 2), there is a quite inconsistent relationship between the two series (figure 3).

In 1997, for example, the economy grew by 2.6% whereas employment contracted by 2.2%. In 1999 employment growth (4.8%) was double economic growth (2.4%), while in 1973 and 2000 both the economy and employment grew by around 4.0%. This inconsistency is further substantiated by the disparate rates of average annual economic growth (2.5%) and employment growth (1.6%) from 1990-2014 alluded to earlier. Hodge (2009) calculates an employment coefficient (the average rate of employment growth expressed as a fraction of the average rate of economic growth) of 0.5 for the period 1990-2007, which also indicates that there is a substantially smaller than one-to-one relationship be-

tween employment creation and economic growth. Part of this paper is then also devoted to formalising the link between economic growth and employment creation, something which was previously assumed but not formally tested in this context.

The South African literature found strong evidence of a trade-off between inflation and economic growth. This is also consistent with the international experience. However, due to the unpredictable pass-through from economic growth to employment this does not really provide a great deal of insight into the relationship between inflation and employment. While it is assumed that employment growth will move in the same direction as economic growth in response to inflation (as is the general trend in Figure 3), the magnitude of the response is unclear. This assumption is also being challenged by the critics of the SARB's inflation targeting framework. The contribution of this paper therefore lies in the analysis of the long term relationship between output (economic growth) and the demand for labour (employment creation), thereby avoiding the inconsistencies in South African unemployment data, and in determining whether inflation plays a role in either or both the long run equilibrium relationship or in short run disturbances.

Hodge's (2009) relatively low employment coefficient could also provide insight into a potential issue highlighted earlier: Even though the demand for labour might increase due to economic expansion, and the supply of labour might also increase due to either higher profits enabling higher nominal wages or the prospect of employment in growing industries, this is no guarantee that new entrants into the labour market will be employed. The South African labour market is often said to be lacking proper skills (see Daniels, 2007 for a thorough overview of the topic of skills shortages in the South African labour market), therefore the supply of labour might not meet the requirements demanded by employers; subsequently many of these new entrants could be left structurally unemployed. An interesting paradox therefore emerges: In a labour market with a prevalent state of "skills-shortage", an increase in either nominal wages or the demand for labour would not necessarily lead to a fall in the unemployment rate. Consider the example from section 2 above. If, out of the 10 new entrants to the labour force, say 3 possess the specific skills required by the employers in the industry which is currently growing, the unemployment rate will actually increase from 30% to (110-73)/110 = 33,6%. Immediately this appears to be a labour market failure of some kind, even though 3 people who previously had no (wage) income are now employed and earning a wage. This point is also made by Hodge (2009:490) who argues that the unemployment rate "can rise if the labour force is growing faster than growth in employment". Finally, the employment coefficient is biased downward due to capital-intensive technological change over the past 20 years, which is as much a response to the relative skills shortages in the South African labour market as it is a result of competitive and international pressures of the democratic era (Daniels, 2007).

Further data analysis suggests a conflicting relationship in the long run between inflation and employment. Figure 4 plots inflation against employment with a fitted logarithmic regression line.

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The correlation coefficient of 0.12 indicates that there is a very small positive relationship (in the long run) between inflation and the number of people employed. Higher levels of employment weakly coincide with higher levels of inflation. This is not consistent with the argument of economic growth leading to employment growth, and the negative relationship between inflation and growth in South Africa established by the authors mentioned above. This is, however, a very weak positive correlation. Removing the first 10 observations of the 1960s when employment was relatively low in fact changes the correlation coefficient to -0.40. Clearly this relationship is not as straightforward as it would seem.

To further explore this observation, the relationship between inflation and employment growth is illustrated in Figure 5. The correlation coefficient of -0.33 is stronger evidence of a moderate negative relationship. Removing the observations between 1961 and 1969 in this case, however, does not change the sign of the correlation and it remains weakly negative at -0.29, reinforcing the suggestion of a negative relationship between the two variables.

These findings could therefore already suggest that the trade-off between inflation and unemployment might not be as clear-cut as is propagated. This preliminary analysis indicates that the arguments posed on both sides of the Business Day debate might have some weaknesses. Employment creation is said to be stifled by overly strict inflation targeting, and, while it appears that higher inflation is weakly associated with higher employment, adjusting the sample calls this observation into question. Nonetheless, higher inflation is unequivocally associated with slower growth in employment. Could this then mean that allowing higher inflation by way of expansionary monetary policy might not necessarily boost long run employment growth, but actually slow it down?

4   Methodology

The crux of the Business Day Debate is that higher inflation should be tolerated as it will lower the unemployment rate in South Africa. Ideally one would therefore have been able to estimate a direct long run relationship between inflation and the unemployment rate to test this hypothesis. However, due to the unavailability of a reliable long-term time series on the South African unemployment rate and the absence of any direct theoretical link between the two variables, this is not possible. Fortunately, the series compiled by Hodge (2009) and others allows for the level of employment to be juxtaposed against the unemployment rate in South Africa. While the employment level is not a direct proxy for the unemployment rate[1], the essence of the research question stays the same: Does higher inflation contribute to a lower unemployment rate,

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[1]The unemployment rate (u) is a function of the level of employed (E) according to the definition used to calculate the South African unemployment rate. As alluded to in section 2, $u = (LF - E)/LF$, where LF represents the labour force. The number of people unemployed (U) is that part of the labour force not employed ($LF - E$). While the number of people employed is therefore not the direct inverse of the unemployment rate it is reasonable to assume that a higher level of E corresponds to a lower u, and *vice versa*.

i.e. does higher inflation contribute to higher levels of employment in the South African economy?

Section 2 proposed a channel through which inflation could influence employment. However, this theory suggests that inflation is only a by-product of monetary policy decisions which could contribute to higher employment and ignores the impact of inflation on output. The data also fails to establish a clear long run relationship between inflation and employment, substantiating the lack of a theoretical link between the two variables. Therefore, since inflation was already in earlier studies shown to have a significant (negative) impact on output, the long run model is limited to estimating the relationship between output and employment. The hypothesis put forth in this paper is thus twofold: Inflation was in earlier studies shown to negatively impact output. Output is assumed to drive employment creation and as such higher inflation is likely to indirectly slow down employment creation in the long run. Secondly, it is widely believed that higher inflation might have a short run expansionary effect on output and employment (Kydland & Prescott, 1977; Taylor, 1998; Mankiw, 2001). Therefore we might observe a positive effect of inflation on employment creation in the short run. Relating this to the Business Day Debate, the expectation – in short – is that economic growth or output would be the major long run driver of employment creation but that inflation might play a part in the short run as a shock to the equilibrium relationship.

4.1 Econometric model estimation

Given that the majority of economic time series are non-stationary (that is, they contain at least one unit root) ordinary least squares (OLS) modelling is not appropriate. The major concern with applying OLS to non-stationary data is the possibility of obtaining a spurious relationship, where seemingly strong empirical and statistical evidence (e.g. high t- and adjusted R^2-values) can be detected for a relationship between two completely unrelated variables. Therefore, it is "not possible to validly undertake hypothesis tests about the regression parameters if the data are non-stationary" (Brooks, 2008:320). One solution to the problem could be to attempt to induce stationarity in the data series, which is usually achieved by taking first differences or growth rates of the data. Since the majority of economic time series are I(1) or, equivalently, contain one unit root, (Brooks, 2008), the first differenced series will be I(0) and stationary. The drawback of this approach, however, is that information about the long run is lost.

The preferred approach to modelling non-stationary data is to use cointegration and a subsequent equilibrium or error correction model (Brooks, 2008). Cointegration is formally defined in Engle and Granger (1987), but is not repeated here for simplicity's sake. Practically, since the majority of economic time series are I(1), a set of economic variables can be seen as cointegrated "if a linear combination of them is stationary" (Brooks 2008:336). Of course not all combinations of I(1) series are automatically cointegrated, but this can be formally tested through a number of techniques. The two most popular

cointegration tests are the Engle-Granger (EG) and Johansen tests.

The EG cointegration test involves estimating a long run OLS regression between two variables which are theorised to be cointegrated. Should the residuals of this regression be stationary, i.e. I(0), the two variables are confirmed as cointegrated (Brooks, 2008). The main drawbacks of the EG approach are that only bivariate relationships can be estimated, and that the results might be sensitive to the researcher's decision of which variable to appoint the dependent variable. (However, in the analysis of economic data, a postulated cointegrating relationship should ideally be supported by some *a priori* economic theory, making the choice of dependent variable less contentious and largely removing the latter problem.)

The second popular cointegration test is the Johansen (1991) test. It is significantly more mathematically complex than the EG test, and its technical rigour is again not discussed here for simplicity's sake. At its core it involves estimating a vector autoregression (VAR) model and evaluating the long run coefficient matrix π. If the rank of π is significantly different from zero, the variables are cointegrated. The Johansen test is often seen as superior to the EG test (Alexander, 1999), mostly due to its ability to estimate multivariate tests and, subsequently, the ability to detect more than one cointegrating relationship. The Johansen approach is therefore imperative when the number of variables modelled is greater than two. A shortcoming of the Johansen approach can be, however, that "unless *a priori* information is introduced, the cointegrating vectors estimated by the maximum likelihood method of Johansen... cannot be given an economic interpretation" (Wickens, 1996:256). This problem is easy to solve in the case of only one cointegrating equation, but less so when many cointegrating equations are present in a multivariate system.

Alexander (1999:2043) argues that, in the context of financial modelling, easily extended to economic modelling, for many applications of cointegration "there are good reasons for choosing Engle-Granger [over the Johansen approach] as the preferred methodology". Whereas the Johansen test seeks the "linear combination which is most stationary" (Ibid.), the EG test seeks the "linear combination having minimum variance" (Ibid.), the latter often being paramount in financial and economic modelling. Furthermore, there is often "a natural choice of dependent variable in the cointegrating regression" (Ibid.), therefore the second shortcoming of the EG approach alluded to above does not apply. In addition to these arguments, this analysis is only aimed at determining whether a cointegrating relationship exists between two variables (employment and output), and consequently the EG approach is deemed the appropriate methodology in this context.

The econometric model is therefore estimated following the Engle-Granger Two-Step Error Correction Mechanism (ECM) procedure (Engle and Granger, 1987). A long-run equation is estimated to capture general trends in the data and to specifically test whether there exists a significant and cointegrating relationship between output and employment. However, because the data series used in the long-run equation are non-stationary (see Table A1 below), a second short-run equation is required to correct this error (Brooks, 2008). All data se-

ries used were tested for stationarity using the Augmented Dickey-Fuller (ADF) test. The null hypothesis of non-stationarity is evaluated against the ADF test statistic, with the results of the stationarity tests reported in Table A1.

The simple long run relationship is

$$E_t = \alpha + \beta_1 Y_t + \varepsilon_t \tag{1}$$

where E_t = the number of people employed, Y_t = real GDP and ε_t is a normally distributed error term.

The advantage of the Engle-Granger approach is that various dynamic disturbances can be introduced into the short run estimation in addition to the variables estimated in the long run equation. The standard short run ECM for a long run equation of the format in (1) is given by

$$\triangle E_t = \beta_0 (E_{t-1} - \alpha - \beta_1 Y_{t-1}) + \beta_1 \triangle Y_t + \beta_2 \mathbf{Z}_t + u_t \tag{2}$$

OR

$$\triangle E_t = \beta_0 \varepsilon_{t-1} + \beta_1 \triangle Y_t + \beta_2 \mathbf{Z}_t + u_t \tag{3}$$

where $\mathbf{Z}_t$ = a vector of possible short run disturbances and u_t is a normally distributed error term. ε_{t-1} is the lagged residual from the long run equation (1).

To incorporate the expected short run effect of inflation it is included in the estimation. Given that the inflation rate is non-stationary over the total period under consideration it had to be included as a first-differenced term. The final short run estimation is therefore given by

$$\triangle E_t = \beta_0 \varepsilon_{t-1} + \beta_1 \triangle Y_t + \beta_2 \triangle \pi_t + u_t \tag{4}$$

where π_t = the inflation rate and $\triangle \pi_t$ represents an inflation shock.

The short run equation suggests that changes in the level of employment (i.e. employment growth) can be caused by output fluctuations or economic growth, as well as shocks to the rate of inflation. We can therefore *a priori* expect a positive coefficient on the inflation term, which would indicate that higher inflation can boost employment creation in the short run.

A summary of the regression output obtained for both the long-run and short-run estimates is provided in Table 1. In addition to employment and real GDP, the natural logarithm of inflation was also used. Sarel (1996) argues that a logarithmic transformation of inflation will reduce the weight of the few extreme observations and give the series a more balanced distribution overall. There were also no negative inflation observations which would have made this transformation impossible. The estimation spans the period 1961 – 2014.

The long-run estimation establishes a strong positive relationship between employment and output. The residual term is stationary, which is sufficient evidence that there exists a cointegrating relationship between employment and output (Brooks, 2008) and that this regression is not spurious. The adjusted R^2 (coefficient of determination) is very high at 0.98.

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The error-correction model involves regressing the first difference of the non-stationary dependent variable of the long run equation on the lagged residual (ε_{t-1}) from the long run estimation, as well as other economic variables which might play a part in the short run. All variables included in this short run equation are required to be stationary. The statistical significance and negative sign on the equilibrium error (lagged residual from the long-run equation) further supports the cointegration hypothesis (Reichel, 2004). The fact that the coefficient $\mid \varepsilon_{t-1} \mid < 1$ indicates a stable adjustment to the long run equilibrium path The coefficient on the inflation shock is positive and statistically significant. The relatively low adjusted R^2 of 0.31 indicates that there are very likely to be other variables besides output and inflation which play an important role in the short run movements in employment.

4.2   Interpreting the results

In the long run output is shown to positively impact the level of employment. This formalises and supports the approach taken by authors on the South African literature, who used output or aggregate demand as a proxy for employment. Furthermore, the elasticity coefficient of 0.5236 on output is consistent to Hodge's (2009) estimated "employment coefficient" of 0.5, albeit over a slightly larger sample, while the coefficient of determination indicates that 98% of the long term variation in employment is explained by variation in output. Additionally, Granger causality tests (Table A2) indicate clear causality running from output to employment, lending further empirical support to the hypothesis that output drives employment. There is also evidence, although less statistically significant, that employment could in turn affect output. This is intuitively easy to understand, since higher employment would translate to higher consumption and investment activity by households which would imply higher total income and spending in the economy.

The short run estimation shows that changes in the level of employment (employment creation) are substantially driven by changes in output. This is also supported by further Granger causality tests (Table A3). An inflation shock or surprise is shown to have a positive effect on employment growth in the short run, although this is not statistically significant.

Introducing inflation as a differenced term in equation (4) above provides valuable insight into the relationship between employment growth and inflation *shocks*, yet nothing about the relationship between employment growth and the *level* of the inflation rate. It could potentially be argued that a permanently higher inflation target and subsequent rate (say 7 or 8% instead of around 6%) might translate into higher employment creation, regardless of the impact of inflation shocks on employment. Given that the inflation time series is not stationary over the total sample, even at the 10% level, the inflation rate was not included in the short run estimation in levels. However, the international literature appears uncertain of whether to treat inflation as stationary or non-stationary, with contradicting results reported. The question whether or not inflation series should be treated as stationary or non-stationary "has not yet

been conclusively resolved" (Charemza, Hristova & Burridge, 2004:2). Basher and Westerlund (2008) use the same panel data set of 13 OECD countries used by Culver and Papell (1997), who found inflation to be non-stationary, but using newer panel data unit root tests find that inflation is in fact stationary. They also admit, however, that "time series unit root evidence suggests that inflation is non-stationary" (Basher and Westerlund 2008:1), indicating that the results of stationarity tests in the inflation context are highly dependent on the approach used. Halunga, Osborn & Sensier (2009), analysing US and UK inflation, finds evidence that inflation actually changes from I(0) to I(1) during the 1970s, and subsequently reverts to I(0) during the early 1980s. Indeed, inflation rates can go through stable periods where they might be stationary, or volatile or trending periods where they might not be stationary. Accurately measuring the stationarity of an inflation series over a long period of time has proven to be especially troublesome. More recent work by Arize (2011), using quarterly inflation data from 34 African countries, finds overwhelming evidence in support of non-stationarity, whereas Zhou (2013) finds inflation to be non-linear stationary for a sample of 12 Eurozone countries. Clearly, the question of the stationarity treatment of inflation has *still* not yet been conclusively resolved. What is clear though, given the sensitivity of the above results to factors such as time periods, datasets and stationarity tests employed, is that, as long as the data used support the tests employed, the researcher enjoys some discretion in modelling inflation as either a stationary or non-stationary process.

In the South African context over the period under consideration the inflation rate was relatively low from 1961-1969, increasing from 1970-1975, relatively stable from 1975-1992, decreasing from 1992-1999 and again relatively stable, albeit somewhat volatile, around the upper end of the inflation targeting band from 1999-2014. In order to measure the impact of the level of inflation on employment growth, if the 1% level of significance requirement can be relaxed when evaluating the ADF test statistic and the sample is limited to the period 1970-2014, inflation can be shown to be stationary at the 10% significance level (see Table A1). Assuming a stationary inflation time series, the short run estimation then becomes

$$\triangle E_t = \beta_0 \varepsilon_{t-1} + \beta_1 \triangle Y_t + \beta_2 \pi_t + u_t \qquad (5)$$

However, as the statistical output in Table 2 below shows, there is still no significant role for the inflation rate in determining changes in employment growth.

While the coefficient on inflation is positive, it is not statistically significant, casting doubt over whether a higher *level* of inflation would contribute to higher employment growth whatsoever. Furthermore, the lagged error term from the long run equation is now marginally insignificant (t-statistic = 1.65, p-value = 0.107), and therefore the cointegration hypothesis probably does not hold over this particular time horizon.

On the balance of evidence, these results appear to contradict the contention that inflation targeting should be relaxed to boost employment in South Africa.

The existence of a cointegrating relationship between employment and output, as well as evidence from Granger Causality tests, proves that employment is primarily driven by output. Therefore it is clear that a higher inflation rate will indirectly harm employment and employment growth in the long run as a consequence of the confirmed negative impact that inflation has on output as was established by earlier authors in the South African and international context. This is further supported by graphical analysis which shows that higher inflation is associated with lower levels of employment and employment growth.

There is, however, no evidence of a positive short run relationship between inflation shocks and employment growth, while there is also no evidence of a relationship between the level of inflation and employment growth. This indicates that Cashell's (2004) assertion that employment can be "bought" with higher inflation in the short run does not hold in the South African context. These short run findings are not consistent with international experience (Taylor, 1998), but as the model did not include extensive control variables it could be investigated further through alternative short-run model specifications or with the introduction of alternative control variables. But whatever the case may be in the short run, inflation will have an undeniable negative effect on employment in the long run through its well-established harmful effect on output. Therefore the arguments put forth in the Business Day Debate calling for policies promoting higher inflation in order to advance employment creation are not sustainable in the long run.

5   Conclusion

This study investigated the linkages between inflation, economic growth and employment. The specific aim was to establish whether there is evidence of a significant or causal relationship between inflation and employment in response to accusations levelled against the SARB's inflation targeting monetary policy framework. It is publicly contended that the SARB is acting overly strict on fears of inflation falling outside the target range of 3-6%. They are said to be maintaining excessively tight monetary policy and that this policy prevents the economy from growing at a quick enough pace to bring about a sufficient reduction in unemployment. There are others who are of the opinion that low and stable inflation should be the central bank's top priority, achievement of which would lead to sustainable long term economic growth and employment creation.

This study drew on earlier South African literature on the relationship between inflation, economic growth and employment, and added to these by investigating the indirect link between inflation and employment in South Africa through the effect of inflation on output. Using the Engle-Granger ECM procedure, a cointegrating long-run relationship was established between output and employment. Coupled with the negative long run effects of inflation on output demonstrated in the South African literature, it was concluded that higher inflation would indirectly harm employment creation in the long run and that lower

inflation is therefore desirable. While there was no strong evidence of a positive effect of inflation on employment creation in the short run, the undeniable long run negative impact should deter policymakers from attempting to exploit any possible short run trade-off. This paper did not attempt to model the direct impact of inflation on employment as there is no adequate and reputable economic theory explaining such a causal relationship.

Government macroeconomic policies can only influence the demand for labour side of the unemployment equation. While the South African economy has steadily been creating jobs over the past two decades, the fact that the unemployment rate has not come down sufficiently is perhaps due to the entry of inadequately-skilled people to the labour force, a variable that monetary policy has no influence over. To bring down the unemployment rate, employment opportunities simply need to be created faster than the rate at which the labour force grows. For this to happen, the SARB cannot afford a higher inflation environment given its undeniable adverse effect on economic growth which would slow down the pace of job creation. While the Phillips curve can be a valuable policy tool, it is often applied incorrectly. Analysts, commentators and policy makers should be required to carefully qualify or substantiate their positions when quoting or referring to the Phillips curve as an instrument for policy analysis.

Two issues are highlighted in this paper, but not further investigated here. The first is that, in a labour market with significant shortages of skills, a higher demand for labour might not necessarily translate into a lower unemployment rate. This is due to the fact that not all new entrants to the labour market responding to the higher labour demand are employable. This form of structural unemployment is particularly severe in the South African labour market and therefore warrants further attention. Secondly, contrary to international experience, the econometric estimation did not find evidence of a positive short-run effect of inflation on employment creation. This could be analysed further using alternative short-run estimations and different control variables.

The results obtained suggest that the majority of accusations levelled at the SARB are unfounded and patently flawed. Higher employment cannot be "bought" in South Africa by tolerating a higher level of inflation – in fact, higher inflation will have an adverse effect on employment creation in the long run. While the unemployment problem is a real issue in South Africa it can, however, not be resolved by allowing inflation to increase. Furthermore, even if the demand for labour could somehow be boosted through expansionary monetary policy or otherwise, significant skills shortages in the South African labour market unfortunately leaves many labour market participants structurally unemployable. Sound macroeconomic policies, including an institutional commitment to price stability, in addition to targeted interventions in the labour market to address the skills shortage problem, will form the bedrock of employment growth in the years to come.

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Table 1: Model estimation, 1961-2014

	Long run Dependent variable: E	Short run (ECM) Dependent variable: ΔE
α	8.364 (64.22)***	-
Y_t	0.527 (57.58)***	-
ε_{t-1}	-	-0.225 (-2.10)**
ΔY_t	-	0.488 (6.93)***
$\Delta \pi_t$	-	0.154 (1.20)
Adjusted R^2	0.98	0.31

***, ** and * indicates significance at 1%, 5% and 10% respectively; t-statistics in brackets.

Table 2: Model estimation (assuming stationary inflation series), 1970-2014

	Long run Dependent variable: E	Short run (ECM) Dependent variable: ΔE
α	8.428 (39.99)***	-
Y_t	0.522 (35.61)***	-
ε_{t-1}	-	-0.213 (-1.65)
ΔY_t	-	0.502 (3.88)***
π_t	-	0.022 (0.56)
Adjusted R^2	0.97	0.29

***, ** and * indicates significance at 1%, 5% and 10% respectively; t-statistics in brackets.
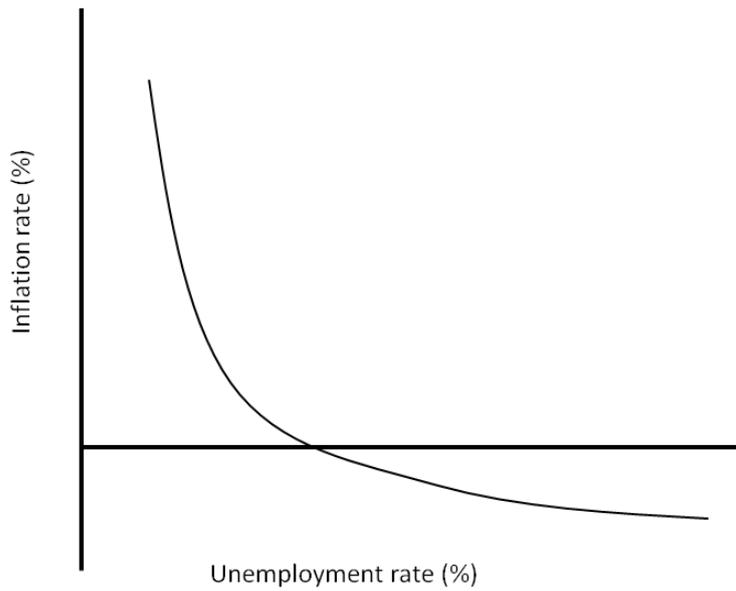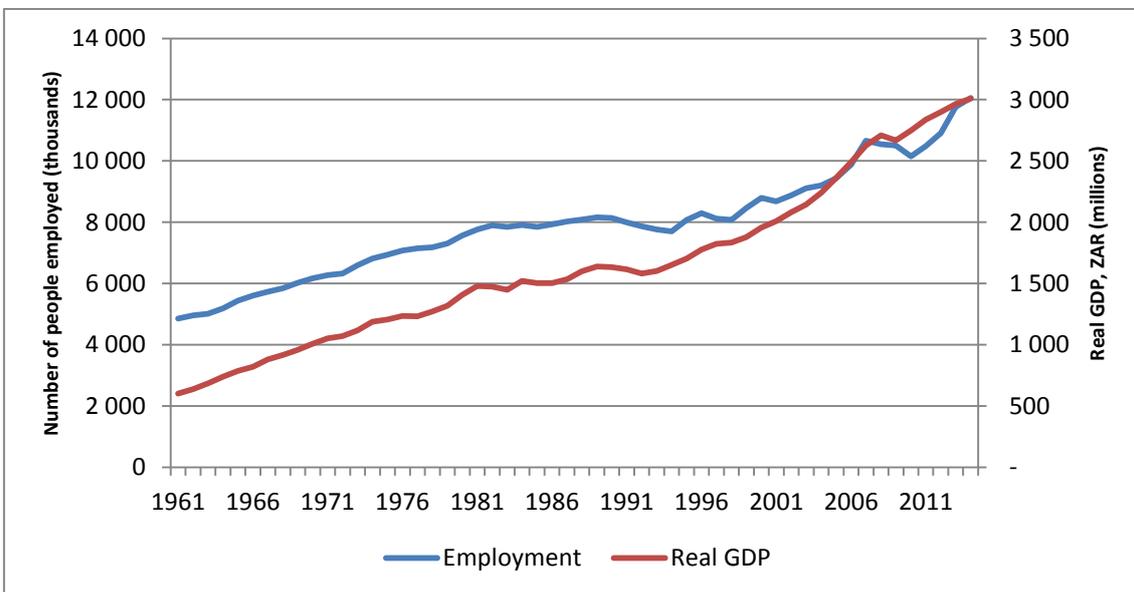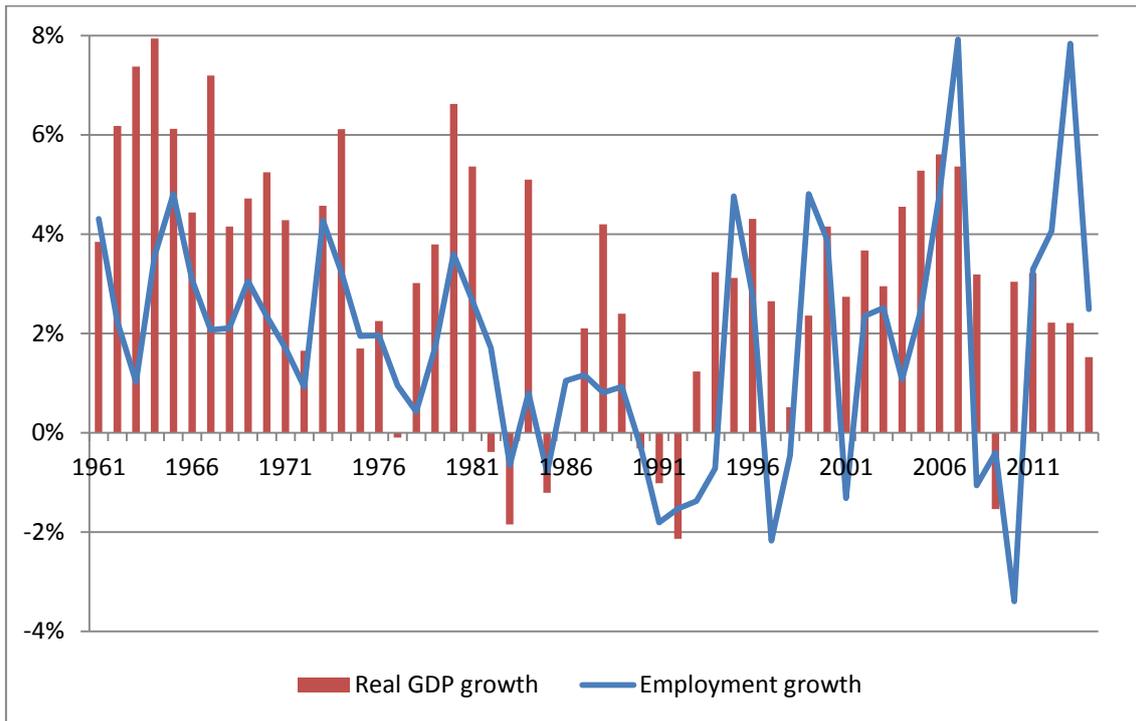
Figure 1: The traditional Phillips curve

Figure 2: Employment and output
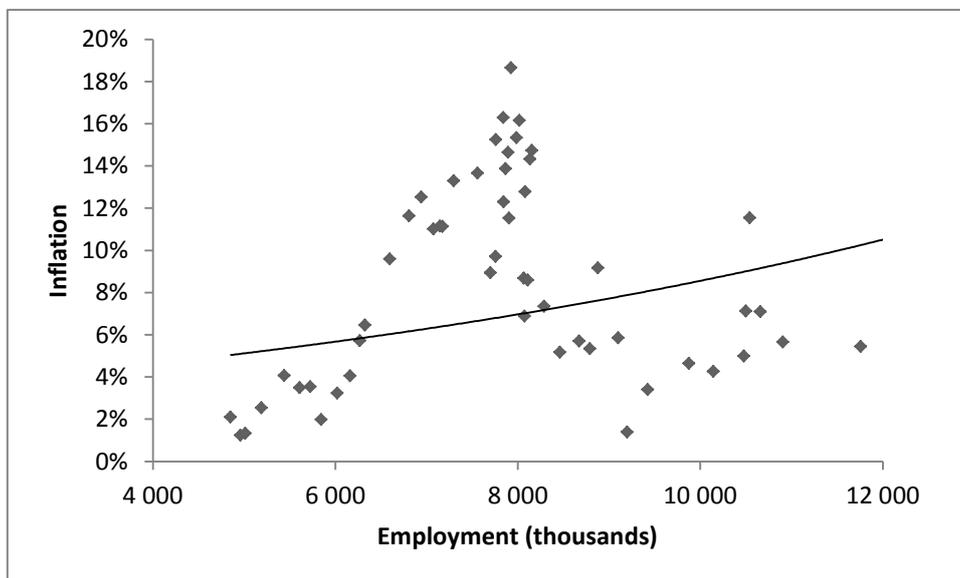
Figure 3: Real GDP growth vs. employment growth

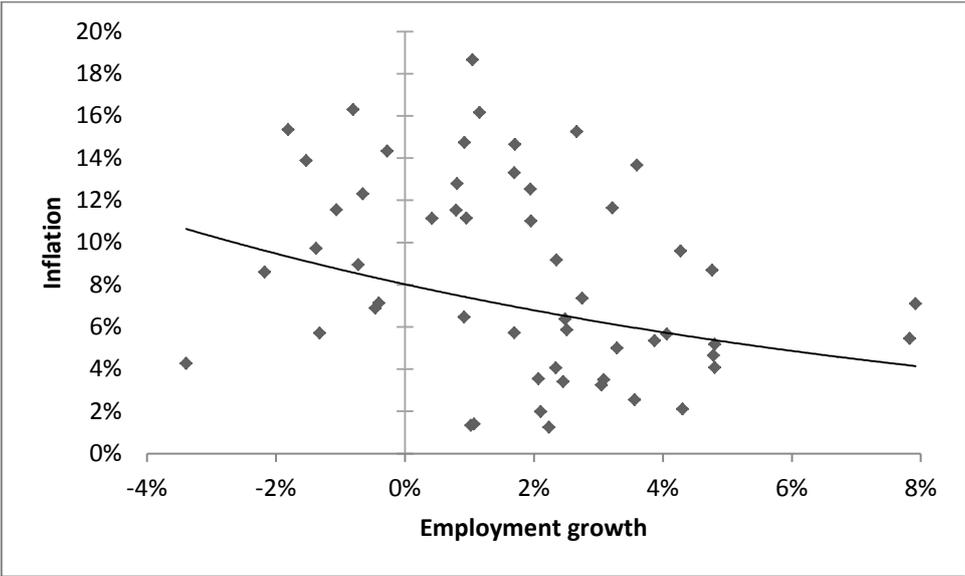**Source:** Own calculations from data obtained from the SARB online time series facility, Hodge (2009) and Statistics South Africa's QLS.

Figure 4: Scatterplot of inflation and employment

Source: Own calculations from data obtained from Statistics South Africa, The World Bank and Hodge (2009).

Figure 5: Scatterplot of inflation and employment growth

Appendix

Table A1: Augmented Dickey-Fuller (ADF) unit root tests

	Variable	ADF test statistic	ADF 1% critical value	ADF 5% critical value	ADF 10% critical value	Order of integration
1961	E_t	-2.77	-4.17	-3.51	-3.19	I(1)
-	Y_t	-3.09	-4.14	-3.50	-3.18	I(1)
2014	π_t	-2.36	-3.56	-2.92	-2.60	I(1)
	ε_t	-2.02	-2.61	-1.95	-1.61	I(0)**
1970	E_t	-2.61	-4.18	-3.51	-3.19	I(1)
-	Y_t	-2.02	-4.18	-3.51	-3.19	I(1)
2014	π_t	-2.66	-3.58	-2.93	-2.60	I(0)*
	ε_t	-1.68	-2.62	-1.95	-1.61	I(0)*

E_t and Y_t were tested with trend and intercept. π_t was tested with intercept only. ε_t was tested with no trend nor intercept.
** and * indicates significance at 5% and 10% respectively.

Table A2: Pairwise Granger causality tests, 1961-2014 (long run)

	F statistic	Prob.
Y_t does not Granger Cause E_t	7.39887	0.0016
E_t does not Granger Cause Y_t	3.09400	0.0547

Table A3: Pairwise Granger causality tests, 1961-2014 (short run)

	F statistic	Prob.
ΔY_t does not Granger Cause ΔE_t	5.10595	0.0099
ΔE_t does not Granger Cause ΔY_t	1.48746	0.2366

Table A4: Data series on employment

1961	4,852,200	**1971**	4 852 200	**1981**	6 268 700	**1991**	7 988 000	**2001**	8 674 000	**2011**	10 480 000
1962	4,960,700	**1972**	4 960 700	**1982**	6 326 300	**1992**	7 866 000	**2002**	8 878 000	**2012**	10 905 750
1963	5,011,500	**1973**	5 011 500	**1983**	6 596 900	**1993**	7 758 000	**2003**	9 101 000	**2013**	11 760 000
1964	5,190,200	**1974**	5 190 200	**1984**	6 809 300	**1994**	7 702 000	**2004**	9 199 000	**2014**	12 052 250
1965	5,439,800	**1975**	5 439 800	**1985**	6 941 900	**1995**	8 069 000	**2005**	9 425 000		
1966	5,607,700	**1976**	5 607 700	**1986**	7 077 900	**1996**	8 291 000	**2006**	9 876 000		
1967	5,723,900	**1977**	5 723 900	**1987**	7 145 400	**1997**	8 111 000	**2007**	10 658 000		
1968	5,844,700	**1978**	5 844 700	**1988**	7 175 700	**1998**	8 074 000	**2008**	10 544 750		
1969	6,023,000	**1979**	6 023 000	**1989**	7 297 600	**1999**	8 462 000	**2009**	10 502 500		
1970	4 651 700	**1980**	6 164 100	**1990**	7 560 400	**2000**	8 790 000	**2010**	10 146 250		

Source: 1961-2007: Hodge (2009);
2008-2014: Author's update from Statistics South Africa's Quarterly Labour Force Surveys (simple averages over the four quarters each year of total number of formal and private employed).