

How persistent is South Africa's inflation?

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Abstract

An estimate of the persistence of inflation captures the long-run effects of a shock on inflation. A better understanding of the persistence of inflation can be useful for a variety of reasons. Firstly, a persistence measure can provide important information about the likely impact of shocks on the economy over time. This information can be extremely useful for the purpose of setting monetary policy, especially in a small, open economy like South Africa. Secondly, estimates of persistence over time can shed some light on the performance of monetary policy under different policy regimes. Finally, persistence estimates could assist in the identification of underlying inflationary pressures in the economy. This paper addresses these three issues with a reference to the South African experience. There are basically three main conclusions that emanate from the results in this paper. Firstly, there has been a significant decline in the persistence of inflation in South Africa. This decline occurred during the inflation targeting (IT) regime which suggests that IT provided a good anchor for inflationary expectations, despite the economy being subject to sizable external shocks during this period. Secondly, inflation at the disaggregate level is lower than at the aggregate level. This implies that the impact of external shocks on aggregate inflation will depend on each commodity's level of inflation persistence as well as its weight in the consumption basket. Finally, a core measure of inflation, which considers both the persistence of inflation at the disaggregate level as well as the weight of the commodity in the consumption basket, does a better job in identifying the underlying inflationary pressures in the economy when compared to the other more readily available core measures. This measure may thus be a useful addition to the range of indicators considered for policy-making purposes.

1 Introduction

Recently, there has been a surge in the empirical work on the dynamic properties of inflation with a particular focus on how inflation adjusts to shocks. The policy relevance of this issue has gained prominence with the increased globalisation of the world economy. For example, the European Central Bank (ECB) has established the inflation persistence network (IPN) which is a research initiative focusing on the patterns and determinants of inflation persistence in the euro area.¹

An estimate of the persistence of inflation captures the long-run effects of a shock on inflation. In other words, the persistence measure indicates the impact of a shock on the future trajectory of the inflation path in terms of the magnitude of the impact on future inflation and the length of time it will take for inflation to return to its initial level. Thus, a better understanding of the persistence of inflation can be useful for a variety of reasons. Firstly, a persistence measure can provide important information about the likely impact of shocks on the economy over time. This information can be extremely useful for the purpose of setting monetary policy, especially in a small, open economy like

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¹The IPN is a collaborative initiative of all the national central banks of the Eurosystem and the ECB.

South Africa. Secondly, estimates of persistence over time can shed some light on the performance of monetary policy under different policy regimes. Finally, persistence estimates could assist in the identification of underlying inflationary pressures in the economy. This paper attempts to address these three issues with a reference to the South African experience.

The paper is structured as follows. The next section briefly documents the trend in South African inflation since 1923. Section 3 contains a short review of the empirical evidence on the persistence of inflation. Some theoretical considerations pertaining to the estimation of inflation persistence are outlined in Section 4. Estimates of the persistence of South African inflation at both the aggregate and disaggregate level are provided in Section 5. Section 6 derives a persistence weighted core measure of inflation for South Africa. The penultimate section outlines some suggestions for further research, while some conclusions and policy implications of the study are presented in the last section.

2 Trends in South African inflation

Figure 1 documents the trend in South African inflation since 1923 over the period 1923Q1 to 2008Q1.²

[FIGURE 1 ABOUT HERE]

Inflation was fairly subdued and well entrenched in single digit territory for much of the period up until the 1970s. Inflation averaged 4.5 per cent in the 1940s, 3.8 per cent in the 1950s and declined further to 2.6 per cent in the 1960s. Following the oil crisis of the 1970s and 1980s and the isolation of the South African economy as a result of the intensification of sanctions against the country, inflation increased to double digit levels – averaging 10 per cent in the 1970s and 16.6 per cent in the 1980s. High concentration in industry (Fedderke and Szalontai, 2005) coupled with economic policies that favoured import-substitution and non-competitive practices (OECD, 2003) also did not help to reduce inflationary pressures in the economy. In addition, the effectiveness of monetary policy during this period was highly limited. According to Aron and Muelbauer (2007), the implementation of pre-announced monetary target ranges in 1986 as a guide to monetary policy formulation served little purpose in light of the financial liberalisation that began in 1980.

Over the last decade and a half, inflation was on a downward trend and in single digit territory for most of this period. Inflation averaged 9.9 per cent during the 1990s and 5.6 per cent since 2000.³ During the 1990s, there was an eclectic approach to monetary policy formulation that gave prominence to intermediate objectives (Stals, 1997) which Aron and Muelbauer (2007) describe as “opaque” and directly responsible for the costly impact on the fiscus and economic growth during the end of the 1990s.

The adoption of an inflation targeting (IT) regime in February 2000 shifted the explicit focus of monetary policy on the containment of inflation.⁴ By enhancing the transparency of monetary policy, the IT regime was expected to provide a better anchor for inflation expectations and hence lead to favourable impacts on price- and wage-setting behaviour in the economy (Mboweni, 2000). In effect, the IT regime was meant to ensure that pricing decisions in the economy were “*forward looking*”. Since the targeted inflation rate was lower than the rate prevailing at the time of adopting

²These are year-on-year inflation rates at quarterly frequency for metropolitan areas.

³Except for the latter half of 2002 and first quarter of 2003 when inflation once again increased to double digit levels, mainly as a result of the depreciation of the currency.

⁴The inflation target was defined in terms of headline inflation less mortgage interest costs (CPIX). The target band was initially set as an annual increase of between 3 to 6 per cent for the years 2002 and 2003 and an increase of between 3 to 5 per cent for the years 2004 and 2005. The target range was later increased from 3 to 6 per cent for 2005 and has since remained at this level (see van der Merwe (2004) for a review of inflation targeting in South Africa).

IT, this meant by implication that the persistence of inflation should have declined under the IT regime in South Africa.⁵

3 Empirical evidence on the persistence of inflation

There has been a surge of empirical work on the estimation of inflation persistence.⁶ Much of this work has centred on econometric estimations for OECD countries. The results indicate that inflation exhibits high persistence in advanced countries (Nelson and Plosser, 1982; Fuhrer and Moore, 1995; Stock, 2001; Pivetta and Reis, 2001; O'Reilly and Whelan, 2004). Possible explanations for the high persistence have included imperfect knowledge and information constraints in the economy (Ireland, 2000; Mankiw and Reis, 2001; Woodford, 2001) and the manner in which nominal contracts are structured (Fuhrer and Moore, 1995; Fuhrer, 2000; Calvo *et al.*, 2001; Christiano *et al.*, 2001).

However, evidence suggests that inflation persistence is currently much lower than previously thought (Cecchetti and Debelle, 2006). There seems to be at least two main reasons for this result. Firstly, research indicates that changes in the monetary policy regime can have an influence on the level of inflation persistence (Bordo and Schwartz, 1999; Goodfriend and King, 2001; Erceg and Levin, 2003). For example, evidence indicates that increased credibility of monetary policy under an IT regime can lead to more forward-looking pricing practices and hence reduced persistence levels in the economy (Bratsiotis *et al.*, 2002; Babetskii *et al.*, 2007; Minford *et al.*, 2005). Secondly, the data properties were not appropriately accounted for in the earlier empirical work, for example, the incorporation of structural breaks in more recent econometric analysis has resulted in lower persistence estimates (Levin and Piger, 2004; Taylor, 2000; Kim *et al.*, 2001; Battini, 2002).

Finally, empirical evidence suggests that persistence at the disaggregate (commodity) level is lower than persistence at the aggregate level (Clark, 2006). According to Altissimo *et al.*, (2007), this may be due to the offsetting effects of a shock at the disaggregate level, in other words, the effects of a shock disappear when the individual series are aggregated.

4 Estimating inflation persistence: some theoretical considerations

Consider a univariate autoregressive (AR) process for inflation such that⁷:

$$\pi_t = \mu + \sum_{i=1}^n \alpha_i \pi_{t-i} + \varepsilon_i \quad (1)$$

where π_t is the inflation rate, μ and α_i are parameters, ε_i is the error term (white noise) and n is the optimal lag length based on information criteria. Andrews and Chen (1994), Levin and Piger (2004) and Clarke (2006) have shown that the persistence of inflation (p) is depicted by the sum of the autoregressive coefficients $\left(p = \sum_{i=1}^n \alpha_i\right)$. According to Andrews and Chen (1994), the sum of AR coefficients is the best scalar measure of persistence.⁸ So in essence, the persistence of inflation

⁵It should be noted that when South Africa adopted the IT regime in February 2000, CPIX inflation was 7.6 per cent. The target band was 3 to 6 per cent.

⁶See Benati and Kapetanios (2003) and Levin and Piger (2004) for a survey of the empirical literature.

⁷As noted by Pivetta and Reis (2006), including other variables in the specification of equation 1 will entail an assessment of predictability. See Battini and Nelson (2001) and Battini (2002) for an analysis of the response of inflation to various disturbances within a multivariate context.

⁸Other measures from univariate models include the largest autoregressive root (e.g. Cogley and Sargent, 2001) or the half-life measure defined as the number of periods in which inflation is at least half as large as the initial shock (Pivetta and Reis, 2006). Marques (2004) has proposed a non-parametric approach which measures the number of times the mean value is crossed in a time-series – the idea here is that less persistent inflation is more likely to cross the long-run mean.

at time t depends only on past values of inflation. In addition, p assumes a value between zero 0 and 1 – in the former case ($p = 0$), the impact of the shock is only felt in the period in which it occurs while in the latter case (i.e. $p = 1$), the shock has a lasting impact with inflation not returning to its initial level.

As is now common practice in time series analysis the estimation procedure should be sensitive to a structural break in the data. It has been shown that ignoring the possibility of a structural break can lead to a spurious overestimation of the level of persistence of a given time series (Perron, 1989; Levin and Piger, 2004). As Levin and Piger (2004) point out *a priori* knowledge of the break date allows for the estimation of equation (E1) over the two periods with Chow (1960) breakpoint test results confirming if the break date is indeed valid. For the purposes of this paper, the structural break is assumed to have occurred in the first quarter of 2000 - this date coincides with the adoption of an inflation targeting regime as an anchor for monetary policy in South Africa.⁹

5 An estimate of persistence of inflation in South Africa

We start off by considering inflation (year-on-year changes) at the aggregate level and for some of the major sub-components of inflation. Figure 2 depicts the trends in the rates for the different measures of inflation. These include the major categories as defined by Statistics South Africa, namely headline inflation (CPI), core inflation (CoreSSA), services inflation (Services) and inflation of commodities/goods (Commodity).¹⁰ Figure 2 shows that the disinflationary trend began in the mid 1980s. In addition, the rates of inflation are fairly similar across most of the sub-categories for most of the period under analysis. The pickup in inflation rates over the last three years is also common to all the sub-categories.

[FIGURE 2 ABOUT HERE]

In order to account for the structural break in the data with the adoption of the IT regime in early 2000 and thus avoid a spurious overestimation of the degree of persistence, the analysis is conducted over two sub-periods, 1981Q1 to 1999Q4 and 2000Q1 to 2008Q1.¹¹ The Chow breakpoint test was conducted to confirm the validity of the break date assumption. The results reported in Table 1 confirm that the null hypothesis of no structural change in the data for headline inflation cannot be accepted.

[TABLE 1 ABOUT HERE]

In terms of equation (E1), persistence (p) is measured by the sum of the AR coefficients. An important step in the estimation of the level of the persistence is the choice of the order of the autoregression. As pointed out by Pivetta and Reis (2006), there is no clear statistical criterion on which to base the choice of the lag length. The Akaike information criterion (AIC) is used to determine the lag length for each autoregression – the estimation allowed for a minimum order of 1 lag and maximum of 6 lags.¹²

Table 2 reflects the persistence estimates for inflation in South Africa over the two sub-periods at the aggregate level. In addition, for the period post-2000Q1, a persistent estimate for CPIX inflation (headline less interest rates on mortgages) is also included in the table.

⁹South Africa adopted an inflation targeting regime in February 2000. See Babetkii *et al* (2007) and Lunnemann and Matha (2004) for similar applications to the Czech Republic and European Union countries.

¹⁰The inflation rates are for metropolitan areas. The goods and services excluded from the CPI to obtain the core inflation (CoreSSA) include fresh and frozen meat and fish; fresh and frozen vegetables and fresh fruit and nuts; interest rates on mortgage bonds and overdrafts/personal loans; changes in value added tax and assessment rates.

¹¹The estimates are obtained from data at the quarterly frequency with the time period spanning from 1981Q1 to 2008Q1. The analysis was restricted to the period post-1981 in order to coincide with the analysis undertaken in section 5.1 where data at the disaggregate level is in some cases only available for period after 1981.

¹²In calculating the persistence estimates for the United States, Clark (2006) also used the AIC to determine the lag order, allowing for a minimum order of 1 lag and maximum of 6 lags.

[TABLE 2 ABOUT HERE]

The persistence estimates in Table 2 indicate that:

- Inflation was highly persistent (all point estimates exceed 0.9) during the period 1981Q1 to 1999Q4.¹³ Headline (CPI) inflation was highly persistent during this period with a persistence estimate of 0.98. Services inflation was just as persistent (0.97) as headline inflation. The persistence in commodity inflation was only slightly lower than those of the other groups during this period.
- There was a significant drop in the level of persistence across all groups during the period 2000Q1 to 2008Q1. Of note is the significant drop in the persistence measure for headline inflation to 0.83 during this period. It is interesting to note that this decline occurred during the IT regime which suggests that the adoption of an inflation targeting regime as an anchor for monetary policy led to the drop in the level of persistence of inflation in South Africa.
- The persistence estimate CPIX inflation ($p=0.871$) is higher than that of headline inflation ($p=0.831$). In effect, this implies that CPIX inflation is more persistent than headline inflation. CPIX inflation is headline inflation less mortgage interest costs. Mortgage interest costs on the other hand are directly related to monetary policy in the sense that it changes by the same magnitude of the change in the repo rate.¹⁴ Now since monetary policy actions have a direct impact (through the mortgage interest rate component in CPI) on headline inflation and given that headline (CPI) inflation is less persistent than CPIX inflation, this implies that monetary policy had a dampening effect on inflation persistence during the latter period. This reinforces the assertion that the adoption of an inflation targeting regime in early 2000 helped to reduce the persistence of inflation.
- Of interest is the steep decline in the persistence of services inflation in the latter period. The persistence estimate for services declined from 0.97 (1981Q1 to 1999Q4) to 0.67 (2000Q1 to 2008Q1). In addition, the level of persistence of services inflation is much lower than the other groups during the latter period. This runs contrary to the expectation that services inflation – as a result of its higher labour intensity in production – should be more persistent than goods inflation (Clarke, 2006).¹⁵ Coricelli and Horvath (2006) argue that competitive pressures within services could result in more frequent price revisions with a result that market prices adjust faster. On the other hand, high levels of competition could result in individual prices not diverging too much from the average price in the sector with a result that price dispersion rather than persistence is reduced (Calvo, 2000). The impact of competition on the level of persistence of service inflation in South Africa warrants further research.¹⁶

5.1 Measuring persistence at the disaggregate level

The measurement of persistence at the disaggregate level can be useful for the following reasons:

¹³The estimates for a longer period (1971Q1 to 1999Q4) show similar high levels of persistence across all the groups. The persistence estimates were 0.945 (CPI), 0.927 (CoreSSA), 0.937 (Services) and 0.919 (Commodity)

¹⁴The repo (repurchase) rate is the rate paid by commercial banks for overnight borrowings from the South African Reserve Bank.

¹⁵The results for South Africa are similar to those found for the US (Clarke, 2006), Slovakia (Coricelli and Horvath, 2006) and some EU countries (Lunnemann and Matha, 2004).

¹⁶A possible focus of such analysis could be to ascertain the impact of exchange rate impacts on price movements. With the increased globalisation of the South African economy, the depreciation of the currency could have resulted in a higher persistent level of goods/commodity inflation vis-à-vis services inflation during the IT period. Services comprise of mainly non-tradable goods and as such the impact of exchange rate changes on services inflation may have been limited vis-à-vis goods/commodity inflation.

- It provides an indication of the persistence of inflation at the disaggregate level. These estimates could be compared over the two periods to ascertain if the results at the aggregate level also hold at the disaggregate level.
- Empirical evidence for other countries suggests that there may be a positive aggregation effect in the sense that aggregate inflation displays a higher degree of inflation persistence than the weighted average of the individual commodity series (Clark, 2003; Lunnemann and Matha, 2004). Undertaking the analysis at a disaggregate level will ascertain if this is also the case for South Africa. In addition, it also helps in the identification of products which are the main drivers of inflation at the aggregate level.
- The identification of persistence at the disaggregate level allows for an estimation of a persistence weighted core measure of inflation (Cutler, 2001; Babetskii *et al*, 2007).

Table 3 captures the persistence estimates at the disaggregate level for the 33 main sub-categories (commodity groups) of the Consumer Price Index.¹⁷ Due to the non-availability of data for some of the sub-categories, the analysis in this section is restricted to the period after 1981.

[TABLE 3 ABOUT HERE]

The following is evident from Table 3:

- There is a marked decline in the persistence estimates across the two periods for most of the sub-components. The persistence levels in the second period are higher than the first period in only 9 cases (meat, fats and oils, other household equipment, household consumables, medical care, public transport, communication, reading matter and education). In the case of medical care, public transport, communication and education, this could be related to government regulation; the impact of administered price increases means that there are strong base effects with the announced increase occurring every month for a 12 month period. Possible reasons for the increase in persistence levels in the case of the other products (e.g. meat, fats and oils, household consumables and reading matter) could be related to the rise in prices on the international markets.¹⁸ In addition, the mean, median and weighted mean show a sizable decline during the latter period vis-à-vis the earlier period. These results corroborate those found at the aggregate level – there has been a significant decline in the persistence of inflation with the move towards an IT regime in South Africa.
- 94 per cent of the sub-categories have a persistence level which is lower than that of aggregate inflation during 1981Q1 to 1999Q4, while 64 per cent of the sub-categories have a persistence level which is lower than that of aggregate inflation during 2000Q1 to 2008Q1. In addition, the weighted mean persistence levels for the disaggregated components (Table 3) are lower than the persistence level for aggregate inflation (Table 2) for both periods. Thus, the results for South Africa show evidence of an aggregation bias in the persistence estimate for headline inflation in South Africa.
- As mentioned earlier, an advantage of undertaking the estimates at the disaggregate level is that it can provide an indication of which products are the main drivers of persistence at the aggregate level. The 10 products that had the highest persistence estimate for 1981 to 1999 included clothing, other items, footwear, personal care, vehicles, furniture, recreation and entertainment, other household services, housing and other food products. The 10 products that had the highest persistence estimate for 2000 to 2008 included furniture, vehicles, appliances, fats and oils, communication, household consumables, other household equipment and textiles, reading matter, coffee and cocoa and sugar

¹⁷The analysis relates to the CPI for metropolitan areas.

¹⁸The depreciation of the South African currency during this period could have also exacerbated these effects.

6 Persistence weighted measure of core inflation

A core measure of inflation is meant to capture underlying inflationary pressures in the economy. The standard approach in the estimation of a core measure of inflation is to exclude the most volatile elements from headline inflation. However, it is important to bear in mind that the core measure should only exclude those volatile elements that are of a *temporary* nature. In other words, the core measure should distinguish “the signal from the noise” by reflecting only the *durable* or *persistent* component of headline inflation (Blinder, 1997: 157). Thus, the persistent component of inflation should *include* the most volatile elements if these are of a recurring nature. It is for this reason, that an exclusion based measure of core inflation should not be done mechanically – it is imperative that one is aware of what is being excluded in each period in order to ensure that the durable component of inflation is accurately captured in the estimated measure.

Cutler (2001) finds that a persistent weighted core measure performs reasonably well in capturing underlying inflation trends for the UK. The persistent weighted core inflation measure is constructed by allocating larger weights to items exhibiting higher inflation persistence. Following Cutler (2001) a persistent weighted core measure of inflation (CoreP) for South Africa is given by:

$$\pi_t^p = \sum_{i=1}^{33} \alpha_i \pi_t^i \quad (2)$$

Where π_t^p = persistent weighted measure of core inflation in time period t

i = commodity in CPI basket ($i = 1 \dots 33$)

α_i = inflation persistence weight of the commodity i in the CPI basket

π_t^i = inflation rate of commodity i in time period t

The inflation persistent weights (α_i) are those reflected in table 3 which have been normalised to sum to unity.

However, Babetskii *et al* (2007) suggest an alternate weighting procedure which takes account of both the persistent measure and the weight of the commodity in the CPI basket in the calculation of the core measure (CorePC). In this case CorePC is depicted by:

$$\pi_t^{pc} = \sum_{i=1}^{33} \beta_i \pi_t^i. \quad (3)$$

where π_t^{pc} = persistent and commodity weighted measure of core inflation in time period t

i = commodity in CPI basket ($i = 1 \dots 33$)

β_i = a simple average of the inflation persistence weight of the commodity i in CPI basket (α_i) and the weight of commodity i in the CPI basket.

π_t^i = inflation rate of commodity i in time period t

The weighting procedure proposed by Babetskii *et al* (2007) is attractive in the sense that outliers do not get exaggerated weights. In other words, a weight based solely on the level of persistence may not accurately reflect a product’s contribution to core inflation if the product has a low (high) level of persistence but a high (low) weight in the consumption basket. This is borne out in the case of housing (see Figure 3). A simple average gives housing a weight of 13 per cent (i.e. $\beta_i=0.13$) in CorePC (equation 3) which is much higher than the persistence weight (3 per cent) but significantly lower than CPI weight (23 per cent).

[FIGURE 3 ABOUT HERE]

The two core measures of inflation (CoreP, CorePC) and headline inflation are depicted in figure 4 below. Both measures (CoreP, CorePC) track headline inflation fairly well with the peaks and troughs being correctly identified by both measures. However, from figure 3, CorePC seems to track headline inflation better.

[FIGURE 4 ABOUT HERE]

As highlighted previously, a core measure of inflation is meant to reflect underlying inflationary pressures in the economy. In this regard, the true test of any core measure is its predictive ability, that is, how well it is able to predict headline inflation. For this purpose, the two core measures (CorePC and CoreP) are compared with some of the other core measures of inflation. CoreSSA reflects the core measure of inflation as calculated by Statistics South Africa. CoreFE reflects headline inflation less food and energy and is the standard measure of core inflation used in the empirical literature.¹⁹ CoreT reflects a trimmed mean measure of core inflation.²⁰ Finally, CoreWM reflects a weighted median measure of core inflation.

The mean square error (MSE) is used to evaluate the predictive ability of the different core measures. The mean square error is given by:

$$MSE = \frac{1}{T} \sum_{t=1}^T (\pi_{t+h}^{headline} - \pi_t^{core})^2 \quad (4)$$

where: T = number of observations

h = time horizon

$\pi_{t+h}^{headline}$ = headline inflation in time $t + h$

π_t^{core} = core inflation measure

Figure 5 depicts the predictive ability of the different core measures over three forecast horizons, namely 6 months (2 quarters), 12 months (4 quarters) and 18 months (6 quarters).

[FIGURE 5 ABOUT HERE]

CoreP and CorePC outperform the other core measures across all forecast horizons. CoreT also does not perform too badly. It is interesting to note that the two readily available or commonly used core measures (CoreSSA and CoreFE) perform the worst in the group under comparison. CorePC has the smallest forecast errors across the three forecast horizons. Thus, CorePC seems to have the best predictive content of underlying inflationary pressures in the economy vis-à-vis the other identified core measures.

7 Suggestions for further research

Before discussing the policy implications, there are some possible extensions to the analysis undertaken in this paper. This paper provides some evidence to support the view that the adoption of the IT framework did lead to a decline in the persistence of inflation. However, a more rigorous analysis of the determinants of inflation within a multivariate context will shed more light on this issue.

Given the impressive predictive content of the core measures identified in this paper (CoreP and CorePC), it may be useful to allow for time varying persistence estimates in the calculation of CorePC.²¹ The data constraints prevented such an estimate in this study.

In this paper, a strictly backward-looking model was used in the measure of the persistence of inflation. One possible extension is to consider a forward-looking model in which expectations are given more prominence in price-setting behaviour. For example, according to the New Keynesian Phillips curve (NKPC), expectations of real marginal cost have a strong bearing on inflation. The empirical evidence suggests that forward-looking models are not able to adequately account for the high levels of inflation persistence in some countries (Fuhrer and Moore, 1995). However,

¹⁹In the SA case, CoreFE included headline less food and running costs.

²⁰CoreT entailed a 20 per cent symmetrical trim from each tail of the distribution of the CPI components.

²¹In essence this entails the persistence weight in year t estimated recursively by including data up until year $t - 1$. See Cutler (2001) for an application to the UK economy.

Cogley and Sbordone (2006) have shown that a model based on the NKPC with a time-varying inflation trend is able to explain the persistence in US inflation. In essence, their results show that a forward-looking model which incorporates fluctuations in trend inflation is capable of explaining the short-run dynamics of inflation quite well. Given the important role that expectations plays in an inflation targeting regime, this issue is of particular relevance to South Africa and is worthy of further exploration.

Further, in this paper, we assumed that a “regime shift” occurred with the adoption of inflation targeting as an anchor for monetary policy in the first quarter of 2000. In essence, the analysis of the impact of the “regime shift” focused on ascertaining if the dynamic properties of the inflation process changed during the inflation targeting era. However, the dynamic properties of the inflation process (i.e. “regime shifts”) can change as a result of other factors such as increased globalisation. A useful area of further research is to base the estimates of the persistence of inflation on a Markov-switching model. The main advantage here is that Markov-switching models allows for two or more regimes over the sample period with the timing of the breaks being entirely endogenously determined.²² The identification of these breaks could provide some information about the inflation process which may be worthy of further investigation.

8 Conclusions and policy implications

This paper analysed the persistence of inflation in South Africa since 1981. There are basically three main conclusions that emanate from the results in this paper. Firstly, there has been a significant decline in the persistence of inflation in South Africa. Secondly, there is evidence of an aggregation bias in the persistence estimate for headline inflation in South Africa in the sense that the weighted mean persistence levels for the disaggregated components are lower than the persistence level for aggregate inflation. Thirdly, a core measure of inflation which takes account of both the persistence of inflation at the disaggregate level does a better job in identifying the underlying sources of inflationary pressures in the economy when compared to the other more readily available core measures.

The policy implications associated with the three results of this study are as follows. Firstly, the decline in the persistence of inflation is to be welcomed. There is evidence to suggest that inflation targeting provided a good anchor for inflationary expectations – a result very similar to those found for other countries (Bratsiotis *et al*, 2002). There was a significant increase in the credibility of monetary policy under inflation targeting despite the economy being subject to sizable external shocks during this period (Aron and Muellbauer, 2007). For a small, open economy like South Africa, it is imperative that inflationary expectations are well anchored and price-setting behaviour in the economy is *forward-looking* so that external shocks do not have an unnecessary lasting impact on inflation. This issue is of particular relevance in the light of the recent build-up of inflationary pressures in the economy.²³ Under these circumstances it is important that the credibility of monetary policy is maintained so as to ensure that the ultimate goal of price stability is not compromised. The role of all the stakeholders (labour, government and business) in this process should not be underestimated.

The aggregation bias in the persistence estimate of headline inflation implies that the long-run price effects of a shock may differ quite significantly across commodity groups. This implies that the impact of external shocks on aggregate inflation will depend on each commodity’s level of inflation persistence as well as its weight in the consumption basket. In some respects, this is borne out by the persistent weighted core measure of inflation derived in this paper. This measure tracks headline inflation better than some of the other more readily available core measures. It provides a good

²²See Hamilton (1989, 1990), Simon (1996), Ricketts and Rose (1995) for the use of Markov-switching models to describe the inflation process.

²³Inflation has been outside the target band since April 2007.

indication of underlying inflationary pressures in the economy and thus may be a useful addition to the range of indicators considered for policy-making purposes.

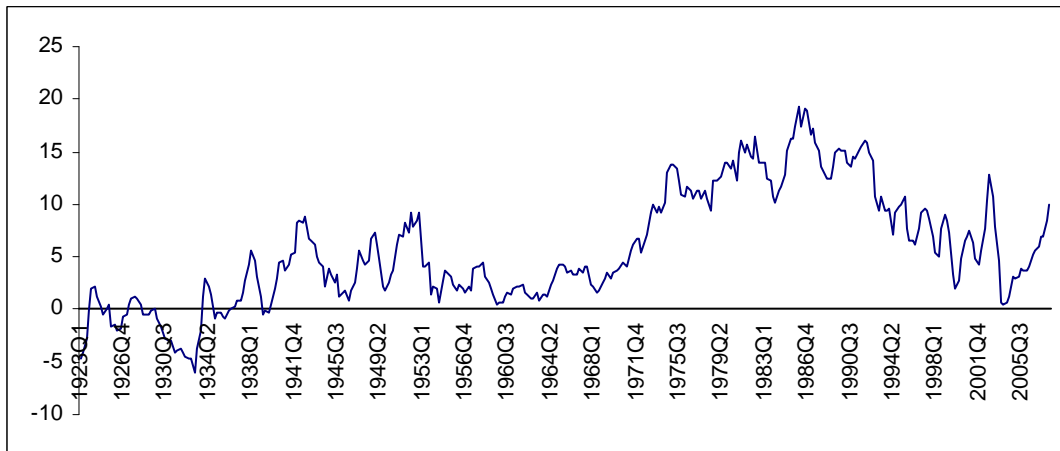
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Figure 1: Trends in South Africa's headline inflation



Source: SARB database

Figure 2: Trends in South African inflation

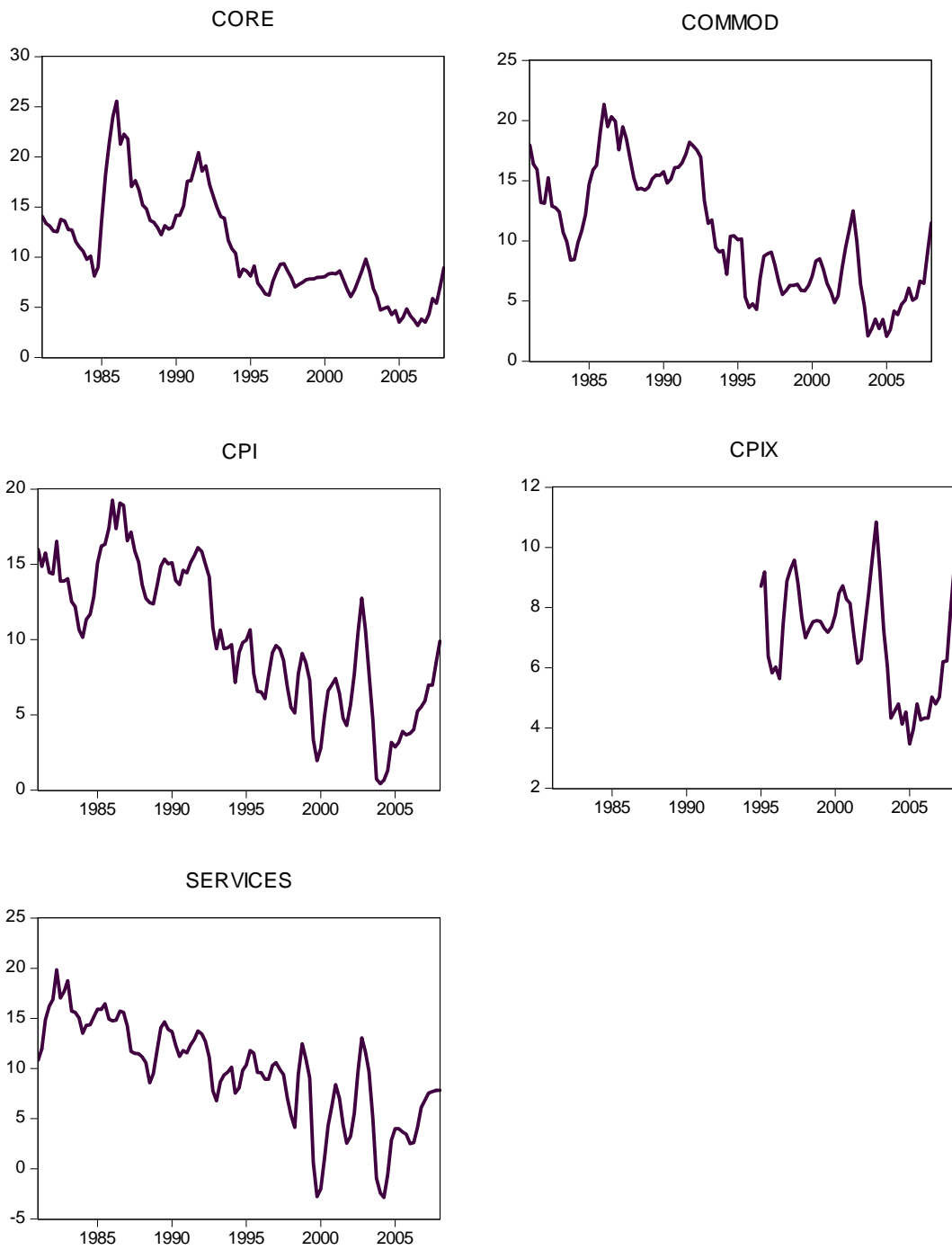
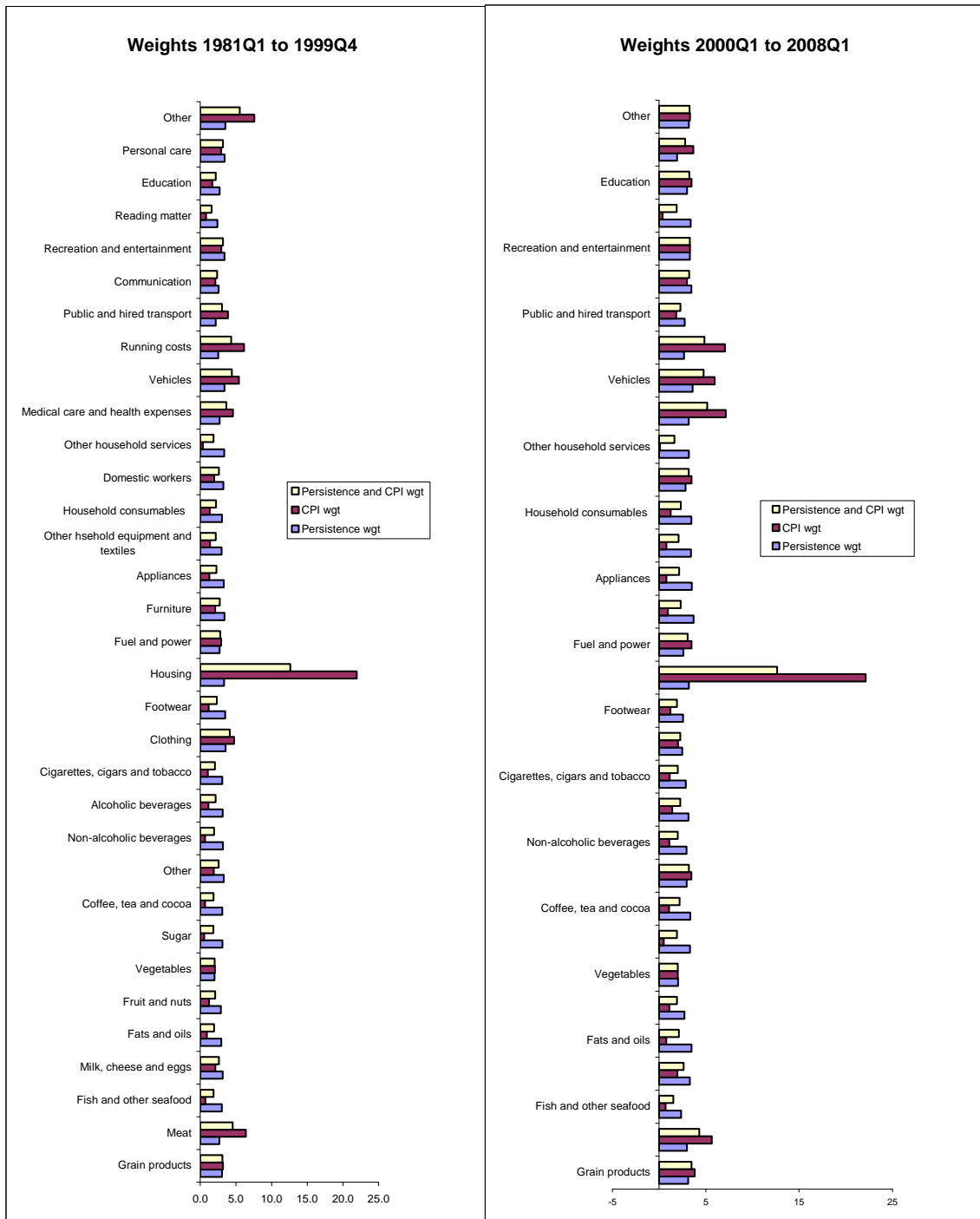
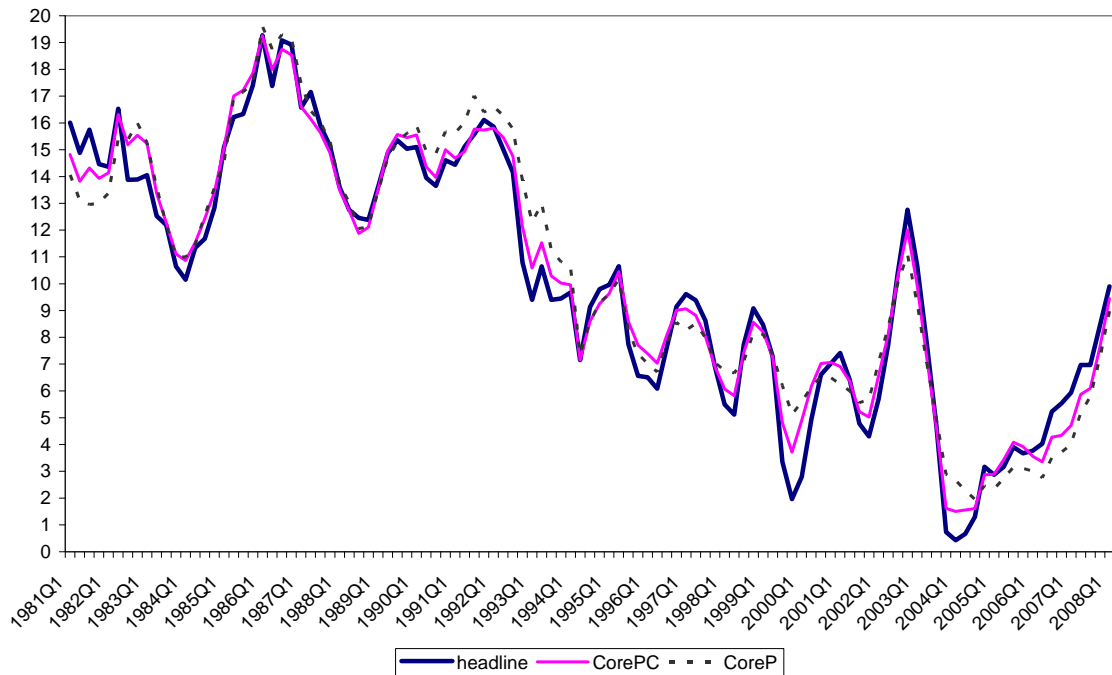


Figure 3: Weights used in calculation of core measures



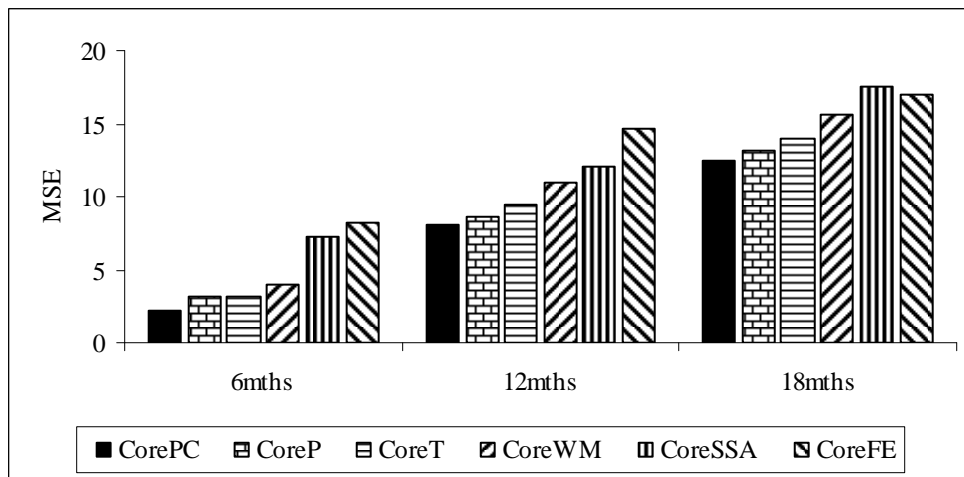
Source: own calculations

Figure 4: Headline inflation, persistent weighted core inflation (CoreP) and persistence weighted and CPI weighted core inflation (CorePC)



Source: own calculations

Figure 5: Predictive ability of core inflation measures 1981q1-2008q1



Source: own calculations

Table 1: Chow stability test results for headline inflation (CPI)

Chow breakpoint test: 2000 q1			
F-statistic	3.349263	Prob. F(5,135)	0.0070
Log likelihood ratio	16.95563	Prob. Chi-Square(5)	0.0046
Wald Statistic	16.74632	Prob. Chi-Square(5)	0.0050

Source: own calculations

Table 2: Persistence estimates for aggregate inflation

	Measure of persistence $\left(p = \sum_{i=1}^n \alpha_i \right)$
<i>1981q1 to 1999q4</i>	
CPI (headline)	0.982
CoreSSA	0.933
Services	0.971
Commodity	0.942
<i>2000q1 to 2008q1</i>	
Headline (CPI)	0.831
Core	0.873
Services	0.673
Commodity	0.836
CPIX	0.871

Source: own calculations

Table 3: Persistence estimates for sub categories of headline inflation

CPI sub-categories	1981q1-99q4	2000q1-08q1
Grain products	0.853	0.800
Meat	0.747	0.759
Fish and other seafood	0.839	0.606
Milk, cheese and eggs	0.876	0.839
Fats and oils	0.828	0.891
Fruit and nuts	0.809	0.695
Vegetables	0.555	0.518
Sugar	0.869	0.846
Coffee, tea and cocoa	0.863	0.852
Other food	0.922	0.755
Non-alcoholic beverages	0.890	0.747
Alcoholic beverages	0.877	0.803
Cigarettes, cigars and tobacco	0.857	0.728
Clothing	0.988	0.636
Footwear	0.975	0.660
Housing	0.930	0.815
Fuel and power	0.753	0.665
Furniture	0.946	0.944
Appliances	0.920	0.896
Other household equipment and tex	0.832	0.872
Household consumables (Cleaning	0.854	0.880
Domestic workers	0.907	0.727
Other household services	0.937	0.817
Medical care and health expenses	0.757	0.807
Vehicles	0.950	0.919
Running costs	0.703	0.684
Public and hired transport	0.612	0.701
Communication	0.723	0.883
Recreation and entertainment	0.944	0.840
Reading matter	0.667	0.862
Education	0.755	0.768
Personal care	0.960	0.493
Other	0.986	0.817
<i>Summary Statistics</i>		
mean	0.845	0.774
median	0.863	0.803
weighted mean	0.860	0.773
% of categories < CPI persistenc	0.939	0.640

Source: own calculations