Food inflation in South Africa: Some implications for economic policy

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Abstract

The paper identifies some macroeconomic and policy implications arising from food inflation in South Africa. There are three main results emanating from the analysis in this paper. Firstly, food price movements have played a large role in generating inflationary episodes in South Africa. Secondly, while external influences do matter, South African food price movements are mainly due to domestic influences. This implies that national policy has an important role to play in taming domestic food price inflation. Thirdly, given the strong second-round impacts, food price movements warrant special attention in monetary policymaking. Core measures of inflation that exclude food price movements may not accurately reflect the underlying inflationary pressures in the economy and could compromise the attainment of the goal of price stability.

1 Introduction

The contribution of food prices to headline inflation in South Africa has increased quite significantly over the last two decades. During the 1980s the contribution of food-product to headline inflation was proportional to its weight in the consumer price index (CPI). However, between 2000 and 2008 the contribution of food-products to headline inflation, rose to approximately 1,4 times its weight in the consumption basket. The main objective of this paper is to analyse some of the macroeconomic and policy implications arising from food inflation in South Africa.

The paper is structured as follows. Section 2 provides a brief theoretical overview of the implications of food inflation. The trends in food and headline inflation are analysed in Section 3. Section 4 considers whether food inflation has been an important source of underlying inflationary pressures in South Africa. The next section analyses the role of food price movements during inflationary episodes in South Africa. Some conclusions regarding macroeconomic and policy implications are highlighted in Section 6. The last section concludes.

2 Food inflation: some theoretical issues

Figure 1 highlights the major influences on domestic food prices and the impact of food price increases on domestic inflation. Domestic food prices are affected by both international and domestic factors. In the former case, international food prices could rise as a result of rising demand or declining supply on the international market.[1] Rising input costs (e.g. oil prices) could also lead to an increase in

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[1] Some of the factors that have recently been advocated for the change in international demand and supply conditions have included the larger number of people entering the middle class in developing countries and the diversion of food products into biofuel production.

global food prices. Additionally, the exchange rate is an important determinant of the net impact of changes in international market conditions on domestic prices. There are three points worth mentioning in this regard. Firstly, the pass-through effects from international to domestic prices depend on the pricing practices of international producers.[2] Secondly, a depreciation (appreciation) of the exchange rate could result in domestic prices increasing (decreasing) even though prices on the international market may not have changed. Thirdly, import parity pricing practices could result in domestic prices following international prices even though there may be little or no imports of food products. As far as domestic influences are concerned, domestic demand, supply and cost factors also have a bearing on domestic food price trends.

The overall impact of food price increases on consumer inflation, however, may not be proportional to the weight of food products in the consumption basket. This is essentially due to products exerting both direct and indirect price impacts on overall (headline) inflation. For example, the direct impact of an increase in food prices occurs through changes in the prices of food components in the consumption basket. Thus, the direct price effects are related to the weight of food in the consumer price index. Since most developing countries have a larger weight for food items in their consumption baskets, this implies that, *ceteris paribus,* food price increases will have a larger impact on inflation trends in these countries *vis-à-vis* developed countries. However, even within a country the impact on different segments of the population may differ. For example, increases in food prices will have adverse distributional or welfare effects on the poor because of the larger proportion of food in their expenditure patterns (see Johnson, 2008). Food has been a dominant contributor to overall inflation in the lower expenditure groups in South Africa (Oosthuizen, 2007; Bhorat and Oosthuizen, 2003).

Food prices could also have an indirect impact on headline inflation through their effect on inflationary expectations, wages and the prices of other components in the consumer price index (CPI). In the empirical literature, indirect effects are commonly referred to as second-round impacts on inflation. The fundamental issue here is that the net overall impact of food on inflation is not solely dependent on the share of food in the consumption basket, but also on the inter-linkage effects between food and non-food prices. Thus, a better understanding of the dynamics of food inflation is imperative for ascertaining the potential macroeconomic implications of food price movements. This is the focus of the rest of this paper.

3 Food and headline inflation in South Africa

Inflation was fairly subdued and well entrenched in single-digit territory for much of the period up until the beginning of the 1970s. CPI inflation averaged 4,5 per cent in the 1940s, declining to 3,8 per cent in the 1950s and 2,6 per cent in the 1960s. In the following two decades inflation increased to double-digit levels, averaging 10 per cent in the 1970s and 16,6 per cent in the 1980s. Industrial policy and non-competitive practices have been cited as some of the main reasons for the increase in inflationary pressures during this period (OECD, 2003; Fedderke and Szalontai, 2009). Over the last decade and a half – and in line with developments in the rest of the world – inflation has been on a downward trend and in single-digit territory, averaging 9,9 per cent during the 1990s and 6 per cent between 2000 and 2008.

Figure 2 depicts the trends in food (FOOD) and headline inflation in South Africa since 1971[3]. There are two characteristics that emerge from Figure 2. Firstly, there is a strong correlation between movements in headline and food inflation. Secondly, food inflation has in general exceeded headline inflation with the peaks in food inflation being much steeper for most of the period since 1970.,Since food inflation is a component of headline inflation, Figure 1 provides intuitive support for the view

[2] For example, pricing to market practices could result in producers not passing through all of the exchange rate or cost changes through adjustments in their profit margins.

[3] Food inflation reflects the increase in the food component in the CPI basket.

that food prices may be an important source of inflationary pressures in South Africa; this is with the *caveat* that correlation does not imply causation. Some supporting evidence in this regard is reflected in Table 1. While the average rate of food and non-food inflation has declined since the 1980s, the divergence between food and non-food inflation has increased during this period.[4] In addition, food inflation is much more volatile than non-food inflation – the standard deviation of food is currently around 1,7 times that of non-food inflation.

The weight and price increase of a product in the consumption basket has a bearing on the impact that this product has on headline inflation. Table 2 reflects the contribution of the different components relative to its weight in the CPI.[5] A ratio above unity implies that the component is making a larger contribution to headline inflation *vis-a-vis* its weight in the CPI basket. There are *inter alia* two important points that emerge from Table 2:

- During the 1980s the contribution of food inflation to headline inflation was proportional to its weight in the CPI basket. However, its contribution has increased quite significantly over the last two decades. During the period 2000 to 2008 the contribution of food product to headline inflation was approximately 1,4 times its weight in the consumption basket.
- With the exception of just one product (coffee, tea and cocoa) all the other food products contributed more than their weight by the end of the period. In addition, half of the food products (grain; meat; milk, cheese and eggs; fats and oils and vegetables) in the CPI basket contributed more than 1,5 times their weight in CPI basket.

4 Is food inflation an important source of underlying inflationary pressures in South Africa?

The previous section highlighted the significant increase in the contribution of food prices to headline inflation. This suggests that food inflation may be more persistent than that of other commodities and may thus be an important source of underlying inflationary pressures in the economy. This section attempts to shed some light on whether this has indeed been the case in South Africa.

4.1 Is food inflation more persistent than that of other commodities?

An estimate of the persistence of inflation captures the long-run effects of a shock on inflation.[6] In other words, the persistence measure indicates the impact of a shock on the future trajectory of the inflation path.[7] Persistence measures of inflation could be very useful in determining core inflation

[4] The Anova F-test and Welch F-test* for equality of means between the series is rejected at the 1 per cent level of significance.

[5] Due to the unavailability of data for some of the food components, the analysis has been restricted to the period 1980 to 2008.

[6] Recently, there has been an increase in the empirical work done on the dynamic properties of inflation, with a particular focus on how inflation adjusts to shocks. The European Central Bank (ECB) has established the inflation persistence network (IPN), which is a collaborative research initiative of all the national central banks of the Eurosystem and the ECB, focusing on the patterns and determinants of inflation persistence in the euro area.

[7] The results from the empirical studies on the subject 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). This is mainly due to 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) in developed countries. However, more recent evidence suggests that inflation persistence is currently much lower than previously thought (Cecchetti and Debelle, 2006). Part of the reason for the decline is attributed to the impact of monetary policy (Bordo and Schwartz, 1999; Goodfriend and King, 2001; Erceg and Levin, 2003; Bratsiotis *et al.*, 2002; Babetskii *et al.*, 2007; Minford *et al.* 2005. Other research suggests that advances in methodological and statistical techniques which take better account of the data properties also explain much of the recent decline in persistence estimates (Levin and Piger, 2004; Taylor, 2000; Kim *et al.*, 2001; Battini, 2002).

and ascertaining the contribution of different prices to the underlying inflationary pressures in the economy.

If it is assumed that inflation results from a univariate autoregressive (AR) process such that[8]:

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

where $\pi_t$is the inflation rate, μ and $\alpha_i$are parameters, $\varepsilon_i$is the error term (white noise) and $n$is the optimal lag length based on information criteria. Given the specification in equation (E1), 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.[9] Thus, the persistence of inflation at time $t$depends only on past values of inflation. A $p$value close to zero implies that a shock affects inflation only in the period in which it occurs. On the other hand, if p is close to, or exceeds, unity, then the shock has a more lasting effect on inflation.

Table 3 reflects the persistence estimates at the disaggregate level for the different components of the CPI for South Africa during two periods.[10] The first three rows show the results for headline (row 1), non-food (row 2) and food (row 3), while the results for the other sub-categories of the CPI are depicted in rows 7 to 27. Non-food inflation was highly persistent during the first period, but declined quite significantly during the second period. While there has been a decline in the persistence of food inflation since 1980, food inflation was more persistent than non-food inflation between 2000 to 2008. Thus, shocks to food inflation have had a more lasting adverse impact on the prices of food products as compared to non-food products.[11] Given the higher persistence, this implies that food inflation could be an important source of underlying inflationary pressures in the economy.

4.2 What is the impact of food price movements on core inflation?

A core measure of inflation reflects the underlying inflationary pressures in the economy. In essence, the core measure should distinguish "the signal from the noise" (Blinder, 1997: 157) by reflecting only the durable or persistent component of headline inflation. A common core measure of inflation is headline inflation *less* food and energy (CFE).[12] However, to assume that food (and energy) products do not contribute to underlying inflationary pressures in the economy may be incorrect for the following reasons:

- A core measure of inflation should *exclude* only those volatile elements that are of a temporary nature, but *include* those volatile elements of a recurring or persistent nature. Thus, recurring volatile elements that distort the *signal* should be *included* in the core estimate. This implies

[8] See Batini and Nelson (2001) and Batini (2002) for an analysis of the impact of various disturbances on inflation within a multivariate context.

[9] Other 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, 2001). Marques (2005a, 2005b) 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.

[10] The analysis was divided into two periods in order to ascertain if there was a drop in persistence over time and also to assist in the derivation of the persistence-weighted core measure of inflation in Section 7. An inflation-targeting regime was adopted in February 2000, which was the main justification for considering the break in 2000.

[11] In other words, it takes longer for food inflation to return to its mean level after a shock than is the case for non-food inflation.

[12] See Silver (2007) for an overview of statistical measurement issues relating to alternative measures of core inflation and the criteria for choosing among them.

that if food inflation is persistent then by definition it should be included in the core inflation measure.

- Fuel and food costs may not be less volatile than some of the other categories in the CPI which could result in the core measure not necessarily being much less volatile than the headline price series (Vega and Wynne, 2002; Cecchetti, 1997).

- It is inappropriate to exclude the entire food category if only some components in the food category are volatile (Cutler, 2001: 3).

In some respects the above concerns are accommodated by a persistence-weighted core inflation measure which allocates weights to each commodity on the basis of their inflation persistence and significance in the consumption basket. In this case larger weights are assigned to items exhibiting higher inflation persistence. The persistence-weighted core measure of inflation is given by:[13]

$$\pi_t^p = \sum_{i=1}^{33} \beta_i \pi_t^i \tag{2}$$

where π_t^p is the persistence-weighted measure of core inflation in period t, i reflects the commodity in CPI basket ($i = 1....33$), β_i is a simple average of the inflation persistence weight (α_i) of the commodity $i$in CPI basket and the weight of commodity i in the CPI basket. The inflation persistent weights (α_i) are those reflected in table 3 which have been normalised to sum to unity and, π_t^i is the inflation rate of commodity i in time period t

A persistence-weighted core measure of inflation for South Africa is calculated on the basis of equation (E2). The percentage contribution of food and energy products to the persistence-weighted core measure is reflected in Figure 3. The following is evident from Figure 3:

- The contribution of food products to core inflation has exceeded that of energy products since 1980.

- The contribution of food inflation to the persistentweighted core inflation has increased from 11 per cent (1995Q4) to 58 per cent (2004Q1) before declining to 13 per cent (2004 Q4). However, since then the contribution of food products to core inflation has increased steadily to an average of 43 per cent.

- In contrast the contribution of energy to core inflation has declined quite markedly averaging 11,5 per cent since 2006.[14]

In summary, Figure 3 illustrates that food prices have been an important source of inflationary pressures in South Africa. These results are not surprising given the information reflected in Table 2, which showed that the contribution of food to headline inflation has exceeded its weight in the consumption basket over the last two decades.

4.3 Second-round price effects of food inflation

As mentioned earlier, food prices could have indirect or second-round price effects, which imply that the contribution of food products to underlying inflationary pressures may be much larger than that

[13] In essence, larger weights are allocated to those components which have higher inflation persistence. See Rangasamy (2009) for a detailed description of the derivation and performance of this core measure as an indicator of inflationary pressures in South Africa. This measure tracks headline inflation better than most of the other core measures in the South African case. Cutler (2001) finds that a persistent-weighted core measure also performs reasonably well in capturing inflationary pressures for the UK.

[14] Energy costs are defined as the sum of fuel, power and running-cost components of the CPI.

reflected in Figure 3. It is generally accepted that price stability is an important characteristic of macroeconomic stability.[15] Price stability requires that second-round price effects are minimised.

To ascertain if there is evidence of second-round price effects from food inflation in South Africa, the following equation is estimated[16]:

$$\pi_t^{nf} - \pi_{(t-i)}^{nf} = \alpha + \beta \left(\pi_{(t-i)}^{headline} - \pi_{(t-i)}^{nf} \right) + \varepsilon \tag{3}$$

where i = *lags in months*; π_t^f =food inflation in period t; π_t^{nf} =non-food inflation in period t; $\pi_t^{headline}$= headline inflation in period t.

Equation 3 reflects the impact of food inflation (i.e. the gap between headline and non-food inflation) in period $(t-i)$ on the increase in non-food inflation between period $t$and $(t-i)$. The basic point here is that if is positive and significant, then food price changes affect the prices of non-food commodities – in other words there is evidence of second-round effects from food prices. Table 4 presents the estimates for equation 3 for the period 1971 to 2008.

The point estimates for the $\beta_1$coefficient are positive, implying pass-through effects from food into non-food prices. The coefficient is largest at the 12 and 18-month lag – for every 1 per cent increase in food inflation (i.e. the gap between headline and non-food inflation) 12 (18) months ago, non-food inflation increases by approximately 0,5 (0,4) per cent.[17] The Wald tests confirm that $\beta_1$does not equal zero in each of the three cases, which would hold if food inflation did not affect non-food inflation.

However, there could also be pass-through effects from non-food prices into food prices. In this case, the effects can be captured as follows:

$$\pi_t^f - \pi_{(t-i)}^f = \alpha + \beta_2 \left(\pi_{(t-i)}^{headline} - \pi_{(t-i)}^f \right) + \varepsilon \tag{4}$$

where i = *lags in months*; π_t^f =food inflation in period t; π_t^{nf} = non-food inflation in period t; $\pi_t^{headline}$ = headline inflation in period t.

β_2 captures the impact of non-food inflation on food inflation. $\beta_2$is positive and highly significant. In addition, the effects are once again long lasting and increase over time. An increase of 1 per cent in non-food inflation 12 (18) months ago, ago results in a 1,3 (1,5) per cent increase in food inflation. The pass-through effects from non-food to food inflation are much larger than is the case *vice versa*. Thus, food price trends are dependent on the movements in the prices of non-food commodities.[18] The bi-directional relationship in effect provides implicit support for the monetary policy goal of overall price stability. This aspect will be discussed in more detail in section 6.

5 The role of food price movements during inflationary episodes in South Africa

The analysis in the previous section suggests that food price movements have played an important role in the overall inflationary process in South Africa. One way of ascertaining if this is indeed the case, is to investigate whether food price movements played any causal role during inflationary episodes in South Africa. An inflationary episode is a period characterised by a significant and sustained rise in inflation. A variety of criteria have been used to categorise inflationary episodes as

[15] Price stability is defined as low inflation, with numerical targets defining what is meant by low inflation in practice. It is generally accepted that price stability is a vital component of macroeconomic stability, which in turn is necessary for the attainment of economic growth and employment creation.

[16] See Cecchetti and Moessner (2008) and Lafleche and Armour (2006) for similar applications.

[17] Stated differently, an increase of 1 per cent in food inflation one year ago results in a 0,5 per cent increase in non-food inflation between the current period and one year ago.

[18] It may be useful ascertaining which commodities have larger pass-through effects to food prices, in order to tailor suitable policy responses to keep food inflation in check.

moderate, high, extreme and hyper (Dornbusch and Fischer, 1993), but there is little consensus on the defining characteristics associated with each of these classifications (Fischer *et al.*, 2002).

Boschen and Weise (2003) define an inflationary episode on the basis of increases in inflationary pressures with *core* or *trend* inflation being used as a gauge of inflationary pressures. More specifically they identify an inflationary episode as a period when trend inflation increases by at least 2 percentage points from trough to peak, with the trough being preceded by at least four quarters of stable or declining trend inflation. However, Domaç and Yücel (2004) consider a lower threshold – namely a 1 percentage point rise from trough to peak – as being more appropriate for emerging countries given their longer periods of high inflation. From the empirical work on the subject, the following steps can be used to identify inflation episodes:

Step 1: Determine trend inflation. There are a variety of measures of core inflation but a popular measure for classifying inflationary episodes has tended to follow Ball (1994) where trend inflation is defined as a nine quarter centred moving average of headline inflation.[19]

Step 2: Identify peaks (troughs) in trend inflation with a peak (trough) being characterised by trend inflation being higher (lower) than the preceding four quarters.

Step 3: Identify inflationary episodes on the basis of the increase in trend inflation between the trough and peak.

Table 6 depicts the details of the inflationary episodes experienced by South Africa since 1960.[20]

Seven inflationary episodes have occurred between 1960 and 2008, with an average length of 4 quarters and an average increase in headline inflation of 4,7 per cent during each episode. The longest inflationary episode occurred in the early to mid 1970s. This episode also experienced the highest increase in inflation, from 2,7 per cent to 12,4 per cent – an increase of 9,7 per cent over 6 years. The mid 1970s to the early 1990s was a prolonged period of double-digit inflation in South Africa, with three inflationary episodes occurring during this period. For much of the period thereafter, there was a steady decline in inflation in South Africa, very much in line with developments in the rest of the world.[21] However, between 2005Q1 and 2008Q4, inflation increased by 8.4 per cent, resulting in an inflationary episode with the second-highest increase in headline inflation.

How did the South African experience relate to that of the rest of the world? Vansteenkiste (2009) has identified inflationary episodes for 91 countries (63 developing and 28 advanced countries) for the period 1960 to 2006. South Africa's experience is compared with this group of countries in Table 7.

Seventy-six per cent of all the inflationary episodes in the group occurred before 1990. Almost half (36 per cent) occurred during the 1970s, with the surge in oil prices being one of the main causes for the rise in inflation rates during this decade. The South African experience is very similar; five of the seven episodes (71 per cent) occurred before 1990, with two episodes (40 per cent) occurring during the 1970s. The average length of the inflationary episode in South Africa during the 1970s was 21 quarters, which was very much in line with the world experience (20 quarters). Of interest is that while 20 per cent of all inflationary episodes in the world occurred during the 1990s, none had occurred in South Africa during this period. On the other hand, while the fewest number of inflationary episodes in the world occurred during the 2000s, South Africa not only experienced two during this period but, as mentioned earlier, the 8,4 per cent increase in the inflation rate during the last episode (2005Q1 to 2008Q4) was also the second highest on record.

[19] See Boschen and Weise (2004), Domac and Yucel (2004) and Vansteenkiste (2009).

[20] The lower threshold by of a minimum 1 per cent rise from trough to peak as advocated by Domaç and Yücel (2004) was used in the identification of inflation episodes. However, as is evident from Table 3, the 2 per cent threshold advocated by Boschen and Weise (2003) would not have significantly influenced the results, with episode 5 being the only one that would not have qualified as an inflation episode.

[21] For much of this period, inflation was in single-digit territory.

What has been the contribution of food price movements to each of the inflation episodes occurring in South Africa? Figure 4 reflects the six inflationary episodes and South African food price trends during the period 1971 to 2008.[22]

There are two food price trends depicted in Figure 4. Food inflation (FI) depicts the year-on-year movements in the food component of the CPI. Trend food inflation (TFI) – a proxy for core food inflation – is the nine-quarter centred moving average of food inflation (FI). For much of the period between the mid-1970s to the beginning of the 1990s, food inflation was in double-digit territory. Thereafter, it declined, although towards the end of the sample period, food prices once again increased at double-digit levels. Of interest is that each of the identified inflationary episodes was characterised by a significant rise in food inflation.[23] A natural question that follows is whether food price rises were an important cause of inflation episodes in South Africa.

A probit model is used to estimate the conditional probability of an inflationary episode being caused by food price increases *vis-à-vis* oil and other (non-food) price increases in South Africa. The following equation is estimated:

$$P(INF = 1|x) = \Phi(\alpha_1 + \beta_1 FOOD + \beta_2 OIL + \beta_3 OTHER + \varepsilon) \tag{5}$$

Inflationary episode (INF) is the binary dependent variable assuming a value of 1 during inflationary episodes and a value of 0 otherwise; is the standard cumulative normal probability distribution; is a constant, FOOD represents food inflation, OIL is the year-on-year increase in the rand oil price, OTHER represents inflation of all other commodities (i.e. all commodities excluding food and oil) and is an error term.[24] The probit model is estimated via maximum likelihood techniques using quarterly data for the period 1971 to 2008.

Table 8 displays the marginal effects of the explanatory variables evaluated at the means of all variables. There is a significant positive relationship between all three variables and inflation episodes in South Africa. However, an increase of 1 per cent in food inflation increases the probability of an inflationary episode by 4 per cent, while the associated probabilities with a similar increase in OIL and OTHER (non-food and non-oil commodities) prices are 2 per cent and 3 per cent, respectively. The results of the probit analysis in essence indicates that the probability of food price increases causing an inflation episode in South Africa is higher than is the case for increases in oil prices and other (non-food and non-oil) prices.

6 Some macroeconomic and policy implications

The success of domestic policy in taming food inflation depends on the extent to which the price developments are driven by domestic shocks or influences. In this section, a VAR modelling framework is used to distinguish between international and domestic shocks on food prices. The model consists of the following five variables; IMF food index (IMFFOOD); nominal effective exchange rate (NEER); food production price index (PPI); household consumption of food (EXPEND) and food price index (FOOD).[25] A recursive Cholesky orthogonalisation identifies the shocks to each variable. Each variable at time t is determined by the information prevailing in period $(t-1)$ and

[22] Due to non-availability of food price trends for the whole sample period, the analysis was restricted to the period 1971 to 2008. Food inflation represents the movement in the food component of the consumer price index (CPI).

[23] It is interesting to note from figure 4 that food price inflation peaks at the end or just after the end of the inflationary episodes – this is due to inflation episodes being defined in terms of a 9-quarter centred moving average of headline inflation.

[24] The independent variables are calculated as a 9-quarter centred moving average in line with the calculations used in the classification of the inflation episodes.

[25] NEER represents the trade-weighted index of the exchange rates of South Africa's major trading partners; PPIFOOD is the food component of the producer price index; EXPEND is the nominal consumption expenditure on food and FOOD is the food component of the consumer price index.

their respective shocks in period $t(\varepsilon_t)$. The recursive VAR specification is ordered as follows[26]:

$$\pi_t^{imf} = E_{t-1}(\pi_t^{imf}) + \varepsilon_t^{imf}$$

$$\pi_t^{neer} = E_{t-1}(\pi_t^{neer}) + a_1\varepsilon_t^{imf} + \varepsilon_t^{neer}$$

$$\pi_t^{ppi} = E_{t-1}(\pi_t^{ppi}) + b_1\varepsilon_t^{imf} + b_1\varepsilon_t^{neer} + \varepsilon_t^{ppi}$$

$$\pi_t^{\exp end} = E_{t-1}\left(\pi_t^{con}\right) + c_1\varepsilon_t^{imf} + c_1\varepsilon_t^{neer} + c_1\varepsilon_t^{ppi} + \varepsilon_t^{\exp end}$$

$$\pi_t^{food} = E_{t-1}(\pi_t^{food}) + d_1\varepsilon_t^{imf} + d_1\varepsilon_t^{neer} + d_1\varepsilon_t^{ppi} + d_1\varepsilon_t^{\exp end} + \varepsilon_t^{food}$$

where ε_t^{imf} and ε_t^{neer} are the international shocks or influences on food prices; ε_t^{ppi} and ε_t^{con} reflects production and domestic demand shocks while ε_t^{food} captures all other nominal shocks on food prices. These nominal shocks could include uncompetitive practices in the food industry, monetary and fiscal policy shocks, influence of non-food price shocks, etc.

The analysis covers quarterly estimations for the period 1971 to 2008. All variables are in log first difference and are stationary. In addition, a time dummy (equal to 1 after 1990) is included to reflect the structural change that occurred with the opening up of the South African economy during this period. The Akaike information criterion is used to determine the optimal lag length of the VAR. The residual serial correlation Lagrange Multiplier (LM) test confirms that the residuals are not serially correlated (see Table A1 in annex for LM test results).

The impulse response functions depict how a shock on one variable affects the other variables in the VAR system. Figure A1 (see Annex) shows the impulse response function of food to a one standard deviation shock in the other variables. A positive shock to international food prices (IMFFOOD) has an immediate positive impact on domestic food prices, with the impacts fading away by the fourth quarter. A positive exchange rate shock (appreciation of the currency) results in a delayed pass-through effect to domestic food prices, with the maximum effect occurring in the second quarter. While adverse impacts from consumption expenditure shocks seem to be muted, shocks to production costs (PPI) on the other hand have a much larger positive impact on domestic prices. However, the largest impact on domestic food prices emanate from nominal shocks. A positive nominal shock does not only result in an immediate increase in domestic food prices, but the shocks also last for much longer (around 7 quarters).

Variance decompositions can assist in determining the importance of international shocks *vis-à-vis* domestic shocks on food price developments in South Africa. In this regard, Figure A2 (see Annex) shows that while international shocks or influences matter, food prices are predominantly driven by domestic influences in South Africa. More specifically, external shocks (IMFFOOD, NEER) account for around 12 per cent of the variation in domestic prices – around 3 per cent from international food price shocks and approximately 9 per cent from exchange rate shocks. On the other hand, around 88 per cent of the variation in food prices emanate from domestic influences (6 per cent from expenditure shocks, 24 per cent from production shocks and 58 per cent from nominal shocks). Given the predominance of domestic price shocks, this implies that economic policy could play an important role in preventing adverse shocks to domestic food price developments.

The dominating effect that nominal shocks have on food price developments is evident in Figure A2 (see Annex). As mentioned earlier, nominal shocks could include uncompetitive practices in the food industry. This has become an important policy issue with the pricing practices in the food industry recently being called into question by the competition authorities in South Africa.

In an effort to increase efficiency and competitiveness, the South African agricultural sector has been deregulated significantly since 1996. However, these efforts have not had the desired effects, with uncompetitive practices being highly prevalent in the agro-processing industry in South Africa.

[26] See Jongwanich and Park (2009), Duma (2008) and Bhundia (2002) for similar applications of the methodology employed here.

High levels of concentration have promoted anti-competitive practices in many South African industries.[27] This has been particularly the case in the processing and trading of grain products.[28] The competition authorities have also found that dairy products, bread and maize meal products have been subjected to unfair practices by cartels.[29] Concern has also been expressed about the negative price impacts emanating from the high concentration level in the retail food sector (National Agricultural Marketing Council, 2008).[30] The results of the recent investigations by the competition authorities suggest that uncompetitive business practices could be a vital component of the nominal shocks adversely impacting on consumer prices in South Africa. The activities of the competition authorities in addressing these issues are very encouraging and should be intensified. The evidence to date suggests that the required policy action to keep food prices in check may go beyond the adoption of measures directed at increasing supply. The benefits from public investment in increasing agricultural supply can only be maximised if they are accompanied by measures to address competition issues plaguing the agro-processing and related industries in South Africa.

Some of the other results identified earlier in this paper also have some important policy implications. Firstly, given the strong second-round price impacts, food prices warrant particular attention in monetary policymaking. Secondly, the large pass-through effects from non-food to food inflation imply that the taming of non-food inflation will have a significant price-reducing effect on food products. Thirdly, core inflation measures, which exclude food prices, could provide very misleading indicators of underlying pressures in the economy and thus compromise the attainment of the goal of price stability.

7 Conclusions

This paper analysed some of the macroeconomic and policy implications arising from food inflation in South Africa. The results indicate that the role of food prices in the overall inflationary process has increased quite significantly over the last decade. Food price movements have played a large role in generating inflationary episodes in South Africa. The results also indicate that while external influences do matter, South African food price movements are mainly due to domestic influences. This implies that national policy has an important role to play in taming domestic food price inflation. Finally, core inflation measures that exclude food price movements could provide misleading indications of underlying inflationary pressures in the economy.

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[27] See Competition Commission South Africa and Competition Tribunal South Africa (2009) for a review of competition policy issues in South Africa.

[28] For example, four companies were responsible for 90 per cent of the milling of maize and these companies were also highly vertically integrated in the production chain of maize meal products. The competition authorities are currently investigating whether unfair practices prevail in the fertiliser industry, with supply being dominated by two companies (SASOL and FOSKOR).

[29] For example Tiger Brands paid a fine of R99 million for its role in the fixing of bread prices and allocation of markets with its competitors. Blue Ribbon, Albany and Foodcorp were also found guilty of price fixing and market allocation in the bread products.

[30] Four retail chains (Pick 'n Pay, Shoprite/Checkers, Woolworths and Spar) control around 95 per cent of the South African retail food market (National Agricultural Marketing Council, 2009: 10).

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TABLES

Table 1: Mean and volatility of headline and food inflation

	MEAN			VOLATILITY (standard deviation)		
	Headline	Food	Non-food	Headline	Food	Non-food
1970 - 1979	10.4	11.6	10.1	2.8	4.9	2.5
1980 - 1989	14.6	15.7	14.4	2.3	5.5	2.6
1990 - 1999	9.9	11.8	9.2	3.6	7.7	3.0
2000 - 2008	6.0	8.4	5.2	3.4	5.3	3.1
1970 - 2008	10.3	12.0	9.8	4.3	6.5	4.2

Source: Own calculations with data from Statistics South Africa

Table 2: Weight and relative contribution of CPI components to headline inflation

	Contribution to CPI inflation			Weight in CPI basket			Relative contribution**		
Sub-categories of CPI	1980-89	1990-99	2000-08	1980-89	1990-99	2000-08	1980-89	1990-99	2000-08
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]=(2/5)	[9]=(3/6)	[10]=(4/7)
food	25.46	22.49	30.00	23.85	18.33	20.99	1.07	1.23	1.43
Grain products	3.55	3.52	5.91	3.37	3.12	3.81	1.05	1.13	1.55
Meat	10.98	6.86	8.61	8.42	5.75	5.66	1.31	1.19	1.52
Fish and other sea food	0.72	0.81	0.91	0.81	0.75	0.69	0.90	1.08	1.31
Milk, cheese & eggs	2.37	2.48	3.17	2.46	2.09	1.96	0.96	1.19	1.62
Fats and oils	0.86	1.07	1.42	1.13	0.86	0.76	0.76	1.25	1.87
Fruit and nuts	1.20	1.97	1.19	1.46	1.13	1.09	0.82	1.75	1.10
Vegetables	2.79	3.14	3.15	2.98	1.84	2.00	0.94	1.71	1.58
Sugar	0.62	0.59	0.54	0.59	0.54	0.50	1.05	1.10	1.09
Coffee, tea & cocoa	0.70	0.71	0.95	0.75	0.66	1.07	0.94	1.09	0.89
Other	2.08	1.88	4.14	1.91	1.61	3.45	1.09	1.17	1.20
Non-alcoholic beverages	0.58	0.94	1.24	0.53	0.76	1.10	1.11	1.25	1.13
Alcoholic beverages	1.54	1.28	1.89	1.69	1.07	1.40	0.92	1.19	1.35
Cigarettes, cigars, and tobacco	1.17	2.01	1.99	1.36	1.08	1.14	0.86	1.86	1.74
Clothing and footwear	6.63	4.13	-0.62	7.38	5.89	3.25	0.90	0.70	-0.19
Housing	18.79	15.14	14.87	19.41	22.31	22.14	0.97	0.68	0.67
Fuel and power	1.89	3.44	4.63	2.26	3.19	3.49	0.84	1.08	1.33
Furniture and equipment	4.69	3.37	0.78	5.35	4.72	2.53	0.88	0.71	0.31
Household operations	4.35	5.00	6.09	4.37	3.63	4.82	1.00	1.38	1.26
Medical care and health	2.52	8.27	10.38	2.32	5.59	7.15	1.09	1.48	1.45
Transport	16.06	14.95	18.83	16.09	14.59	14.84	1.00	1.03	1.27
Communication	1.39	2.23	1.85	1.35	2.34	2.98	1.03	0.95	0.62
Recreation and entertainment	2.85	2.35	-0.02	2.93	3.05	3.31	0.97	0.77	-0.01
Reading matter	1.22	0.93	0.40	1.03	0.75	0.39	1.19	1.24	1.03
Education	1.22	2.34	3.57	1.02	1.90	3.48	1.20	1.23	1.03
Personal care	3.09	2.82	3.42	3.02	2.85	3.67	1.02	0.99	0.93
Other	6.54	8.32	0.70	6.09	7.99	3.32	1.07	1.04	0.21

Notes ** Reflects the contribution of the different components relative to their weight in the CPI
Source: Own calculations with data from StatsSA

Table 3: Persistence estimates for components of CPI

	Persistence estimates	1980Q1-1999Q4	2000Q1-2008Q4
1	Headline CPI	0.98	0.81
2	Non-food	0.98	0.78
3	Food	0.89	0.85
4	*Sub-components of CPI*		
5	Non-alcoholic beverages	0.89	0.77
6	Alcoholic beverages	0.88	0.74
7	Cigarettes, cigars and tobacco	0.84	0.69
8	Clothing	0.98	0.57
9	Footwear	0.98	0.67
10	Housing	0.93	0.82
11	Fuel and power	0.75	1.10
12	Furniture	0.95	0.94
13	Appliances	0.92	0.85
14	Other household equipment and textiles	0.82	0.85
15	Household consumables (Cleaning materials etc.)	0.88	0.93
16	Domestic workers	0.91	0.68
17	Other household services	0.94	0.83
18	Medical care and health expenses	0.77	0.83
19	Vehicles	0.95	0.93
20	Running costs	0.65	0.57
21	Public and hired transport	0.86	0.86
22	Communication	0.81	0.88
23	Recreation and entertainment	0.94	0.83
24	Reading matter	0.67	0.86
25	Education	0.75	0.76
26	Personal care	0.95	0.39
27	Other	0.99	0.81
28	*Summary Statistics*		
29	mean (for all components in CPI)	0.87	0.77
30	median	0.87	0.80
31	weighted mean	0.86	0.78

Source: Rangasamy (2009).

Table 4: Second round price impacts of food inflation

Lags in months	$\bar{R}^2$	***α*** ***(s.e.)***	$\boldsymbol{\beta_1}$ ***(s.e.)***	***p value*** $\boldsymbol{H_0: \beta_1 = 0}$
$i = 3$	*0.02*	*-0.05* *(0.13)*	*0.13*** *(0.07)*	*0.057*
$i = 6$	*0.03*	*-0.06* *(0.23)*	*0.22** *(0.13)*	*0.083*
$i = 12$	*0.04*	*-0.15* *(0.35)*	*0.46*** *(0.20)*	*0.025*
$i = 18$	*0.02*	*-0.10* *(0.38)*	*0.37*** *(0.21)*	*0.085*

Notes: Standard errors (s.e.) are corrected for serial correlation
*, **, indicates significance at the 10 and 5 per cent level
Source: Own calculations

Table 5: Pass-through price impacts of non-food inflation into food inflation

Lags in months	$\bar{R}^2$	*α (s.e.)*	β_2 *(s.e.)*	*p value* H_0: $\beta_2 = 0$
$i = 3$	*0.08*	*0.44** *(0.25)*	*0.23**** *(0.06)*	*0.000*
$i = 6$	*0.21*	*1.02*** *(0.43)*	*0.55**** *(0.10)*	*0.000*
$i = 12$	*0.51*	*2.31**** *(0.35)*	*1.31*** *(0.12)*	*0.000*
$i = 18$	*0.55*	*2.58**** *(0.61)*	*1.46**** *(0.12)*	*0.000*

Notes: Standard errors (s.e.) are corrected for serial correlation
*, **, indicates significance at the 10 and 5 per cent level
Source: Own calculations

Table 6: Inflation episodes in South Africa

	Date	Length (quarters)	Initial inflation rate	Ending inflation rate	Increase in inflation
episode 1	1963Q2-1966Q2	13	1.4	3.7	2.3
episode 2	1970Q1-1975Q4	24	2.7	12.4	9.7
episode 3	1977Q3-1981Q4	18	10.9	15.0	4.1
episode 4	1984Q1-1986Q3	11	12.3	17.6	5.3
episode 5	1989Q1-1991Q3	11	13.9	15.0	1.1
episode 6	2001Q1-2002Q1	5	5.5	7.8	2.3
episode 7	2005Q1-2008Q4	16	2.5	10.9	8.4

Source: own calculations

Table 7: Comparison of inflation episodes in SA with the rest of the world

	Full sample	1960s	1970s	1980s	1990s	2000s
No of episodes (world)	147	20	53	38	29	9
No of episodes (% of total)**	100	14	36	26	20	6
Length in quarters (world)	18	28	20	14	14	15
No of episodes (SA)	7	1	2	2	0	2
Length in quarters (SA	14	13	21	11	0	11

Notes **figures do not add to 100 due to rounding.
Source: Table 3 and Vansteenkiste (2009)

Table 8: Probit estimates

Constant	*-2.38***
	(0.48)
FOOD	*0.04**
	(0.03)
OIL	*0.02****
	(0.01)
OTHER	*0.03**
	(0.04)
Log likelihood	*-79.09*
LR Statistic	*51.88*
Prob (LR statistic)	*0.00*
Pseudo R^2	*0.25*

Notes: *,**,***significant at 10, 5, 1 per cent level; standard errors in brackets.
Source: Own calculations

Figure 1: Impact of food price increases on consumer inflation

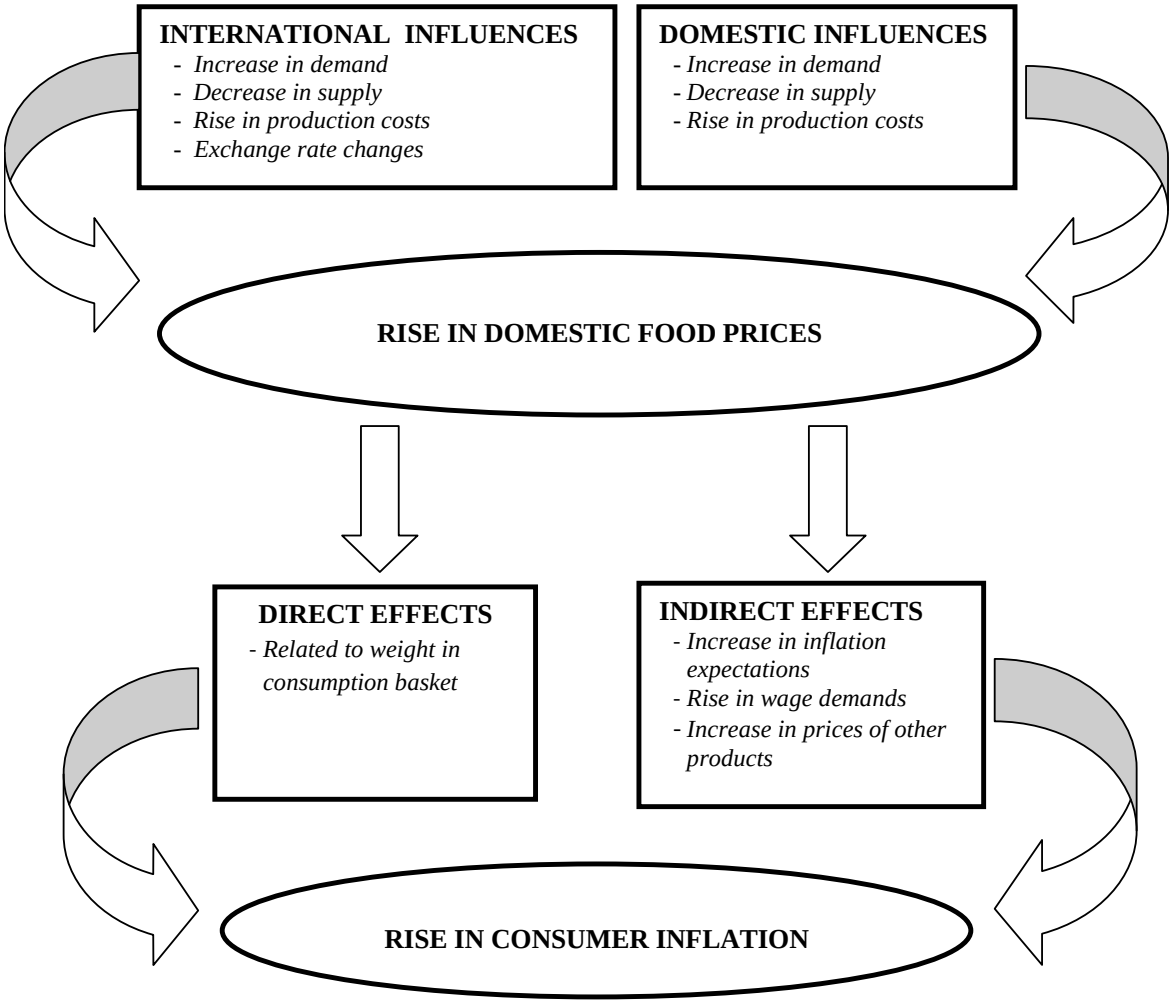
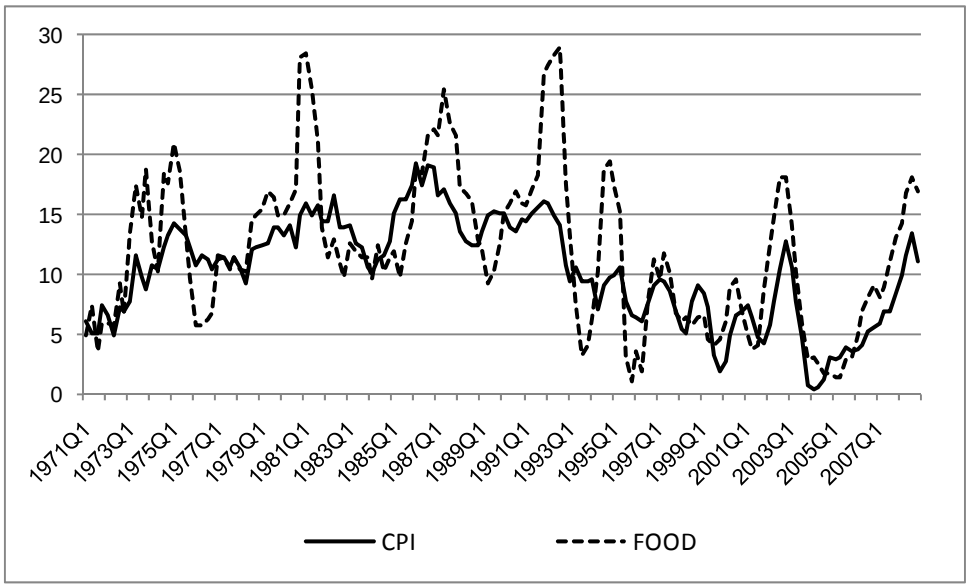
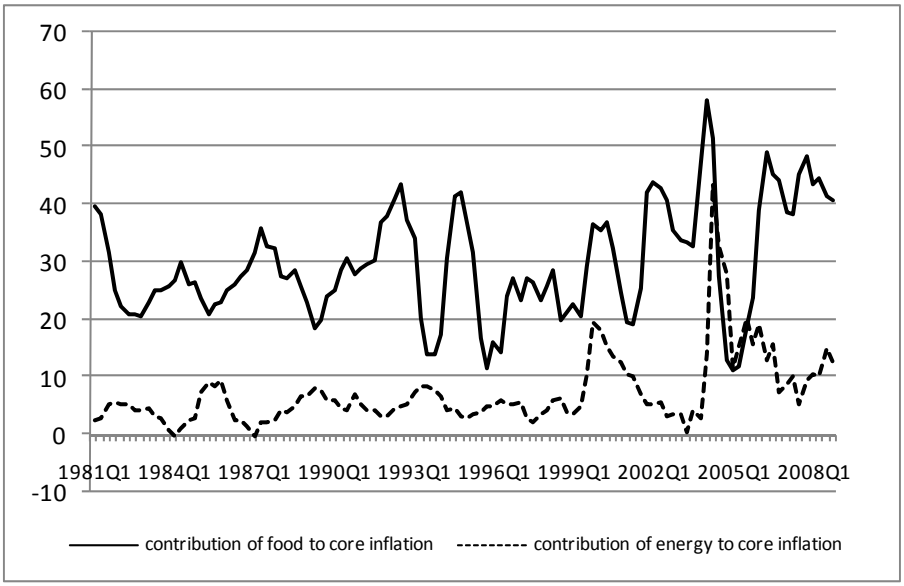


Figure 2: Food and headline inflation in South Africa



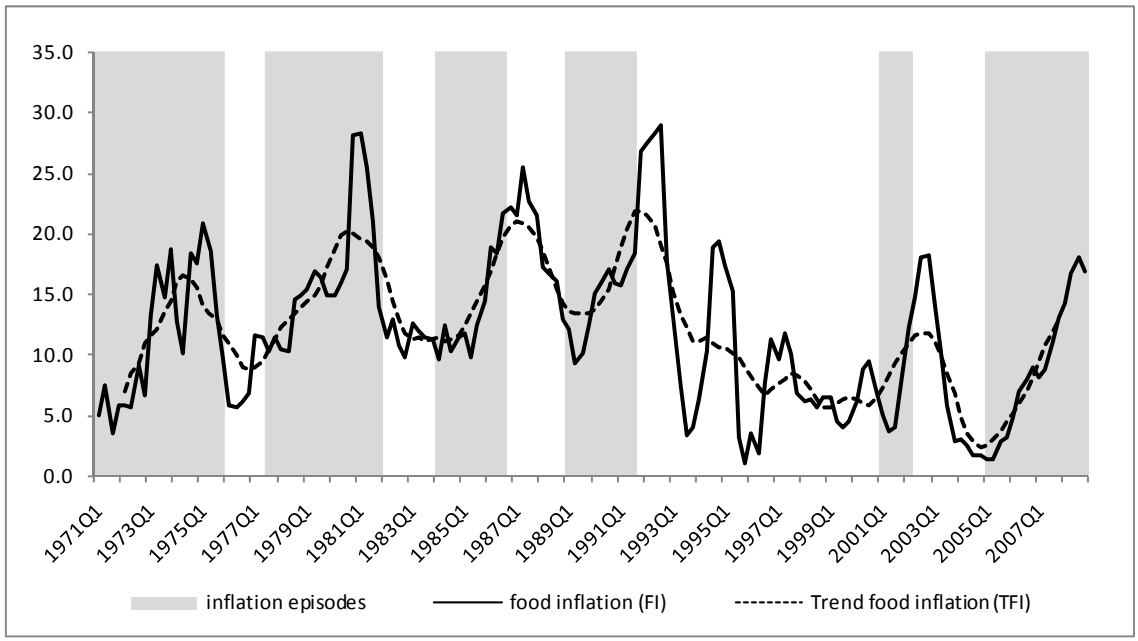
Source: Statistics South Africa

Figure 3: Percentage contribution of food and energy to core inflation



Source: own calculations

Figure 4: Inflation episodes and food inflation trends in South Africa



Source: Statistics South Africa, Table 8.

ANNEX

Table A1: VAR residual serial correlation (LM test)

Lags	LM-Stat	Prob
1	33.73	0.12
2	24.73	0.48
3	19.33	0.78
4	22.95	0.58
5	28.75	0.27
6	21.93	0.64
7	21.14	0.69
8	20.92	0.70
9	18.04	0.84
10	17.10	0.88

Figure A1: Impulse response functions of food prices to a one standard deviation shock in IMFFOOD, PPIFOOD, NEER, EXPEND and FOOD.

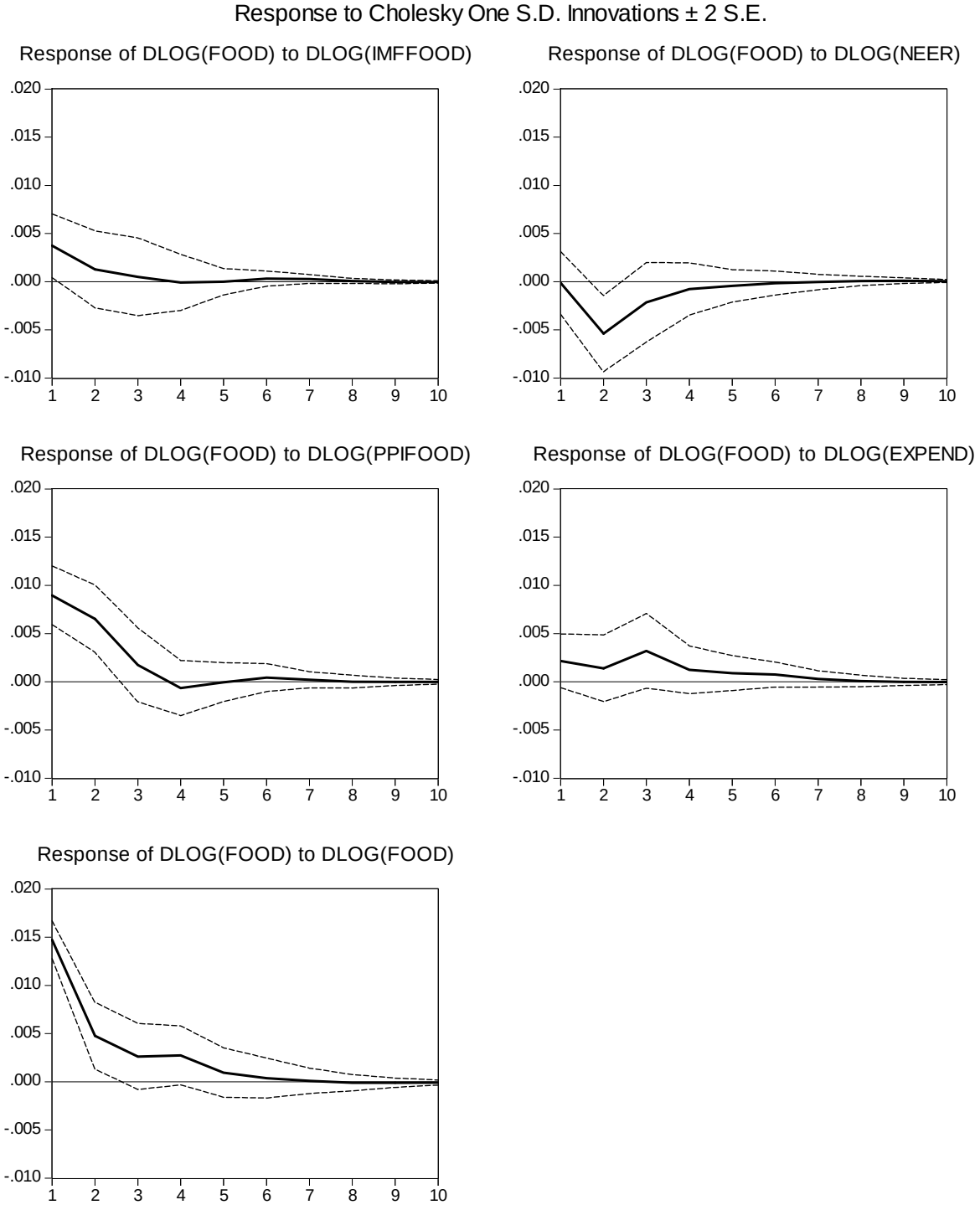


Figure A2 Variance decomposition of dlog(food)