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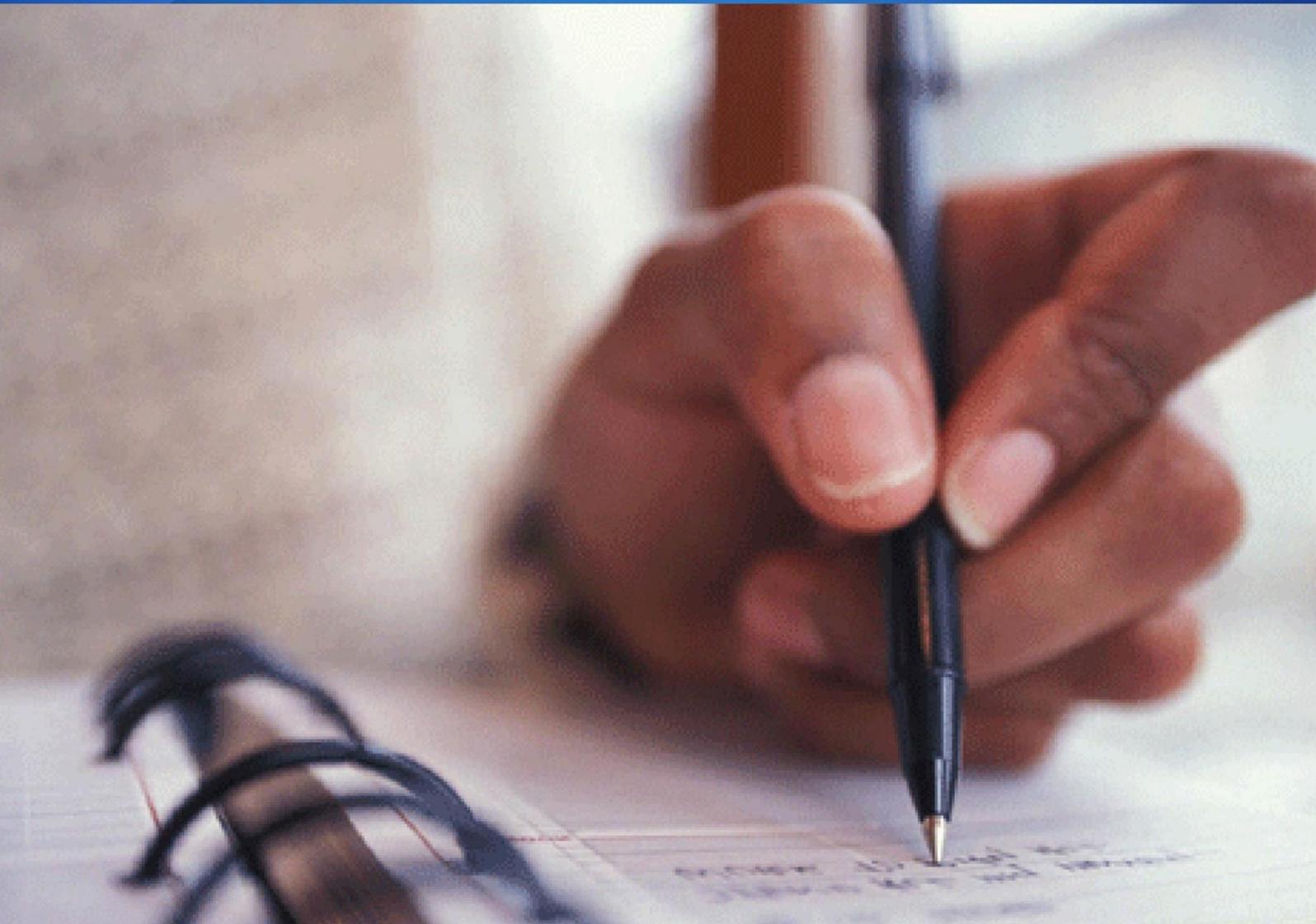
MEASURING INFLATION PERSISTENCE IN KENYA

Maureen Were, Sheila Kaminchia and Lydia Ndirangu

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Measuring Inflation Persistence in Kenya

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Abstract

The concern about inflation persistence has received increased attention, particularly in the context of African countries. That notwithstanding, little effort seems to have been devoted to the analysis of inflation persistence in African economies like Kenya. This paper seeks to investigate the extent of inflation persistence to facilitate the understanding of inflation dynamics in Kenya. The paper finds a strong effect of inflation persistence even after controlling for other factors that contribute to inflation. This has policy implications and hence, should be factored in strategies towards addressing inflationary pressures.

JEL Classification: E30, E31, E39.

Key Words: Inflation, Inflation persistence, Kenya.

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1. Introduction

The question of inflation persistence has received increased attention in recent times. Persistent inflation episodes are particularly common in most African countries. Surprisingly, little effort seems to have been devoted to the measurement or understanding of the dynamics of inflation persistence in developing economies like Kenya. The limited literature in this area largely focuses on inflation persistence in the context of developed economies, especially the Euro area and United States (e.g. Altissimo et al., 2006; Marques, 2004; Levin and Piger 2004; Dossche and Everaert 2005; Stock 2001). Evidence of persistence has been found for the various measures of inflation, such inflation derived from consumer price, producer price and wholesale price indices as well as the GDP deflator (Baum, Barkoulas and Caglayan 1999; Fuhrer, 1995). With respect to China, Zhang (2011) measures and tests for structural change in inflation persistence and show that the structural change was primarily attributed to better conduct of monetary policy and anchoring of inflation expectations. For many African countries which are buffeted with structural rigidities and shocks, inflationary episodes tend to persist.

Among the sources of inflation persistence cited in the literature particularly in the context of developed economies include wage contracts, price contracts¹, inflation expectations that are slow to adjust, low central bank credibility and changes in the stock of money (Whelan, 2007; Christiano, Eichenbaum and Evans, 2005; Mankiw and Reis, 2002; Baum et al., Caglayan, 1999; Fuhrer, 1995; Fuhrer and Moore, 1995). Other studies suggest that persistence in overall inflation may be due to the method of aggregating sectoral price indices (Santos and Holland, 2011; Rangasamy, 2009; Balcilar, 2004; Fuhrer, 2009).

Persistent inflation weakens the transmission of monetary policy thereby making the tradeoff between inflation and output worse. This arises when current inflation is tied to past outcomes of inflation so that the current rate of inflation does not adjust “freely” with changing inflation expectations (Fuhrer, 1995).

Stability of prices is an important indicator of stable macroeconomic environment, which is necessary for fostering investment and economic growth. The key objective of most central banks including the Central Bank of Kenya is to maintain stability in the general level of prices. Inflationary episodes in Kenya have at times persisted even with monetary aggregates being within targets and monetary policy tools at work. The persistence is reflected in prolonged inflation cycles. This is of policy concern since it has implications on economic and social welfare. This paper seeks to investigate the extent of inflation persistence to facilitate the understanding of inflation dynamics in Kenya.

¹ Mankiw and Reis (2002) argue that contracts carry information on past expectations about inflation, which explains why new information filters slowly throughout the economy.

1.1. An Analysis of Inflation Trends in Kenya

Kenya's consumer price index (CPI) basket of goods and services is classified into 12 groups according to their purpose². Each group is assigned a weight, which reflects the proportion of household budgets spent on each category. The expenditure proportions were obtained from the 2005/06 Kenya Integrated Household Budget Survey.

Figure 1 shows the monthly evolution of the 12-month inflation rate from 1999 to June 2012. The figure shows a number of inflation cycles with peaks of each cycle being further above the anticipated inflation level. Monetary policy operations have been focused on keeping inflation at 5 percent. The cycles are such that it takes several months before the upward trend in inflation takes a downward turn. The decline in inflation also takes some time before the reaching the minimum. For instance, the inflation spike in November 2011 started from an inflation rate of 3.84 percent in November 2010, which rose consistently to 19.72 percent in November 2011 (lasting 13 months) before taking a downward trend. The surge in prices was fuelled by the drought conditions experienced in early 2011 leading to food shortage, which consequently drove price of staple foods like maize and maize flour upwards. The rise in global food and international oil prices together with the weakening of the Kenya shilling against the dollar further exacerbated the inflationary pressures. Inflation landscape is generally characterized by cycles, with peaks of each cycle being further above the 5% anticipated inflation level (Figure 1). One of the shortest cycles (29 months) from January 2002 to May 2004 peaked in May 2003 while the longest cycle (43 months) ran from April 2007 to October 2010, peaking in November 2008 (Table 1). Trend inflation has been upward sloping, having consistently risen from 6.2 percent in the second cycle (Jan 2002 to May 2004) to 9.0 percent in the fourth cycle (April 2007 to October 2010).

Figure 1: Trend in Overall 12-month Inflation

² Namely, food and non-alcoholic beverages; alcoholic beverages, tobacco and narcotics; clothing and footwear; housing, water, electricity, gas and other fuels; furnishings, household equipment and routine household maintenance; health; transport; communication; recreation and culture; education; restaurants and hotels; miscellaneous goods and services.

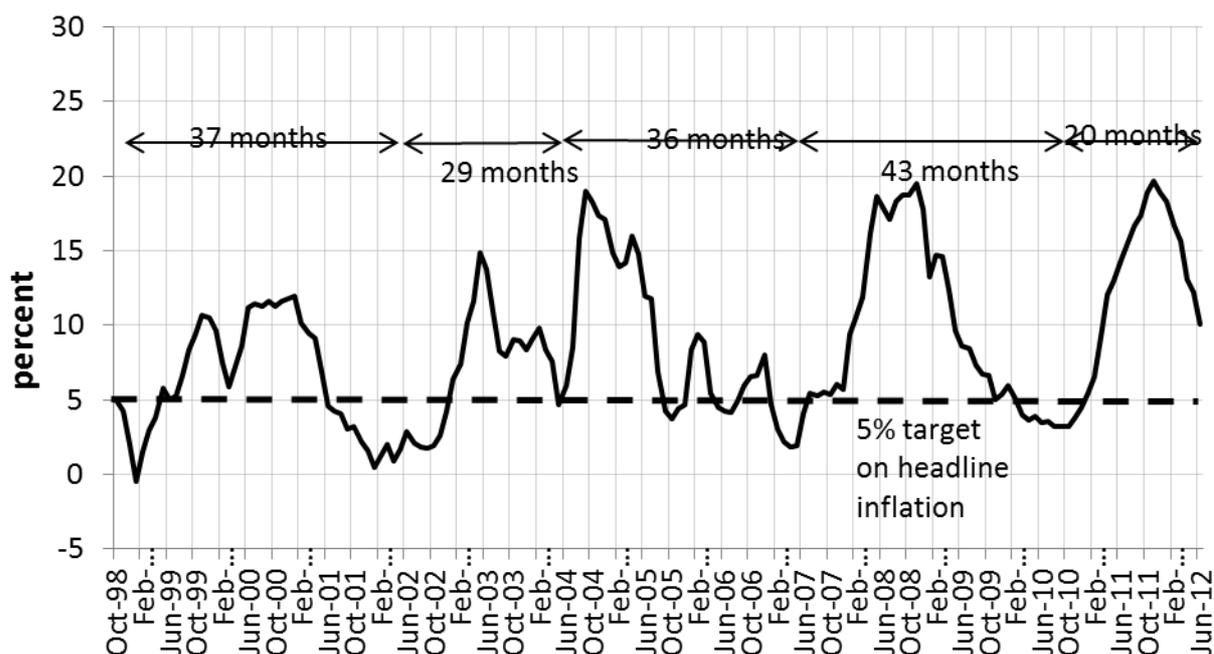


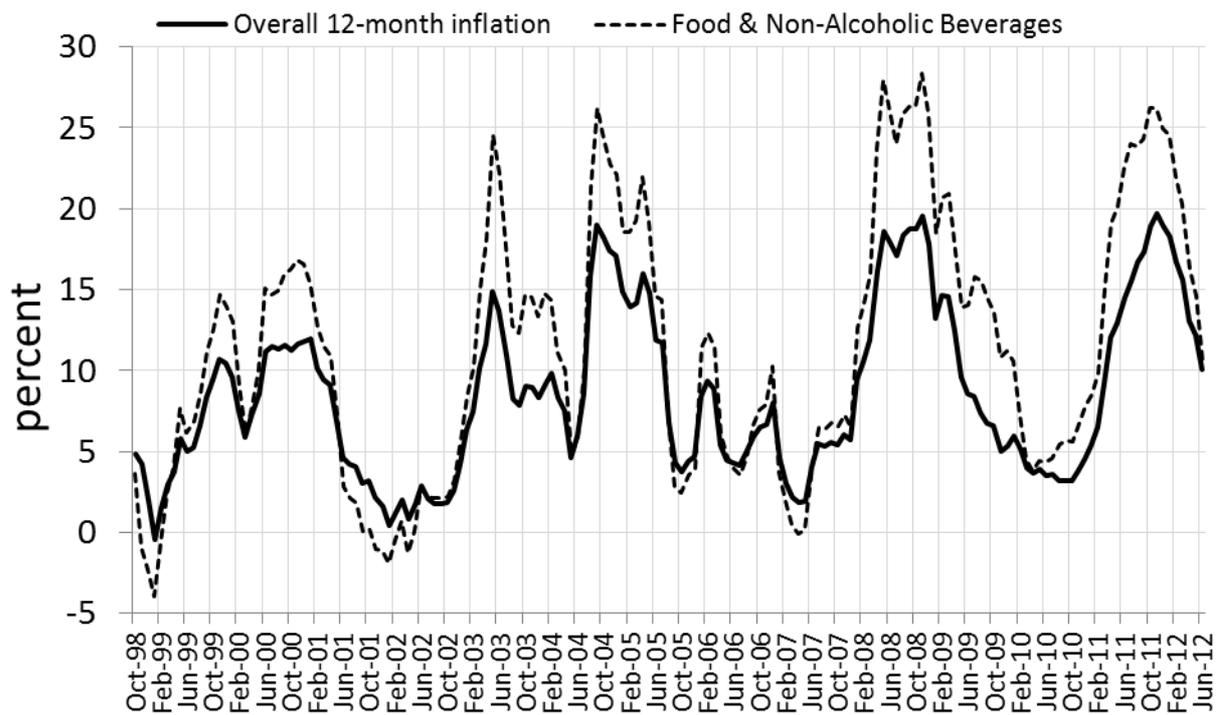
Table 1: Identification of major inflation cycles in Kenya- October 1998 to December 2012

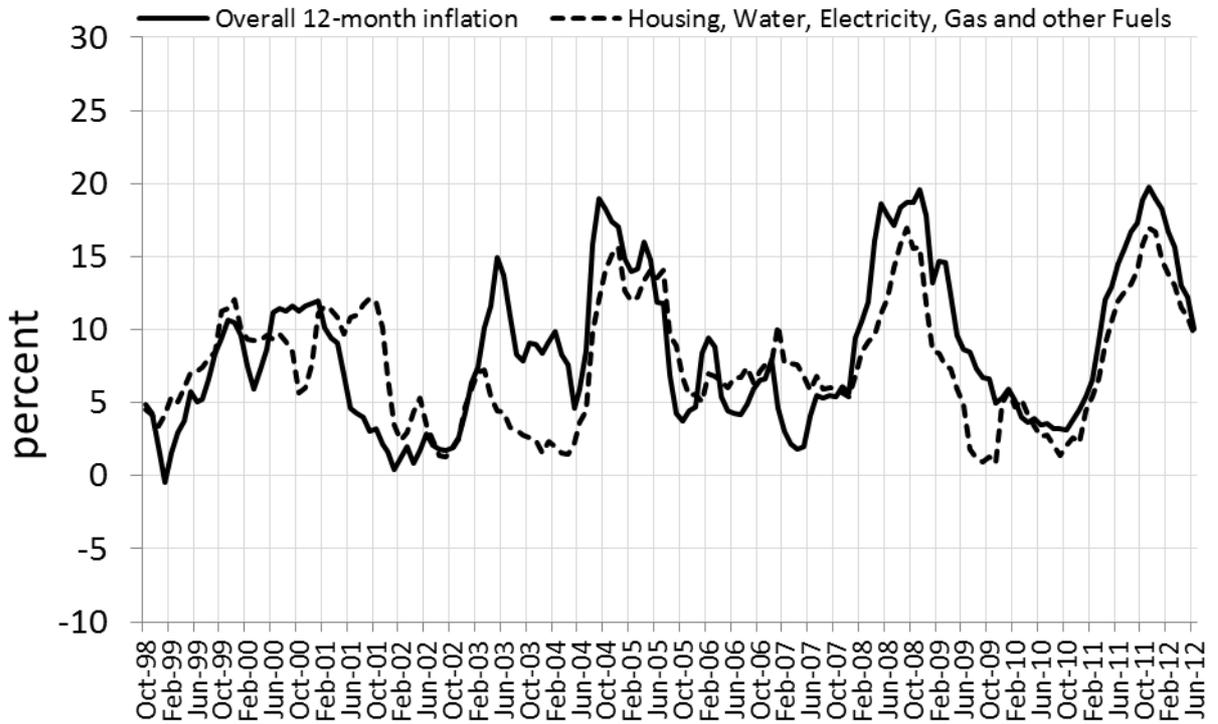
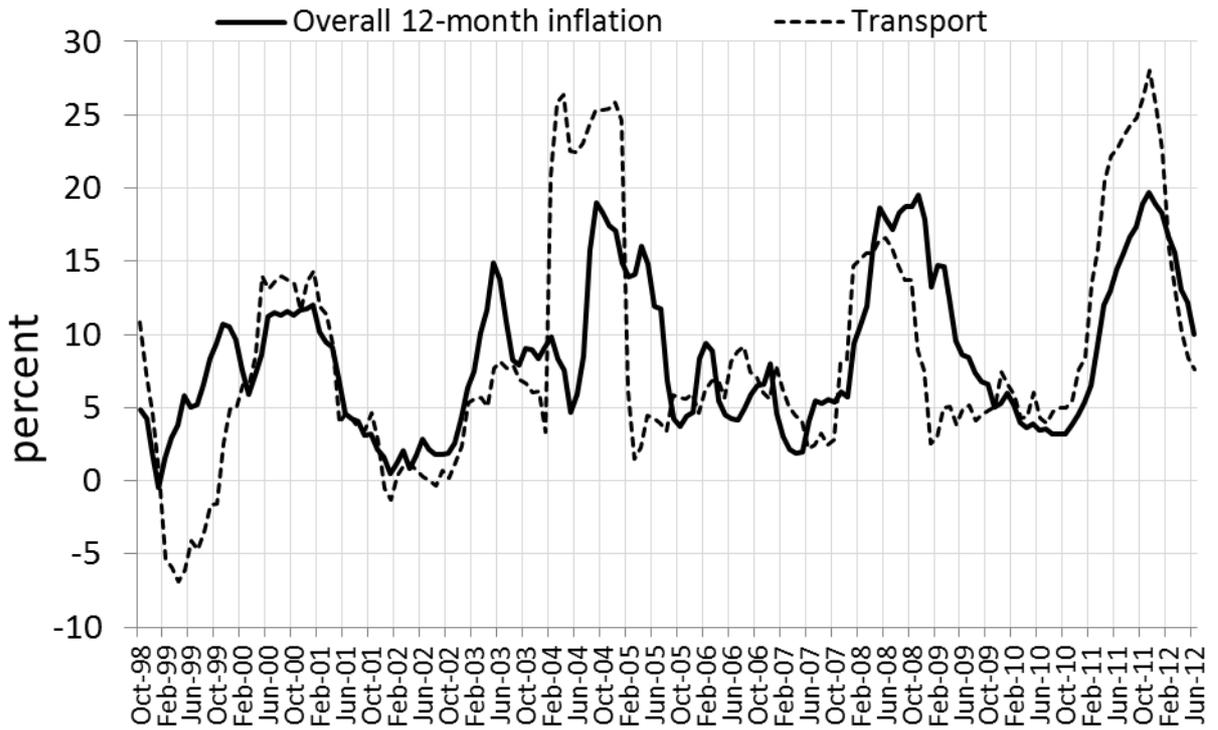
Inflation Cycle	Dates of Inflation Cycle			Total duration (in months)	Duration of rising inflation (in months)	Duration of declining inflation	Peak inflation
	Trough	Peak	Trough				
1	Jan 1999	Jan 2001	Jan 2002	37	25	13	11.97
2	Jan 2002	May 2003	May 2004	29	17	13	14.92
3	May 2004	Sep 2004	Apr 2007	36	5	32	18.96
4	Apr 2007	Nov 2008	Oct 2010	43	20	24	19.54
5	Oct 2010	Nov 2011	Dec 2012	27	14	14	19.72

Inflation episodes have been linked to both domestic and external shocks. Domestically, poor weather conditions affect agriculture and livestock farming with devastating effects on prices especially of food and energy. For instance, severe drought conditions experienced in 2000 partly explain the inflation developments in inflation cycle 1 (i.e. January 1999 to January 2002). On the other hand, the rise in inflation in the early 2008 was occasioned by the supply-side factors caused by the domestic political crisis, which led to the displacement of many people in the agricultural rich zones and disrupted the food supply chains.

Food is an important component in total private urban consumption expenditure in Kenya and carries a weight of 36 percent in the CPI basket. Thus, food inflation has consistently dominated in its contribution to overall inflation. Overall inflation is largely driven by food inflation (Figure 2). The other important component is fuel inflation as reflected in the contributions of housing, water, electricity, gas and other fuels, and transport inflation.

Figure 2: Overall 12-Month, Food, Transport and Housing Inflation





2. Empirical Methodology

Conventionally, inflation persistence is evaluated in the context of univariate time-series representation of inflation (univariate approach), i.e. assuming simple autoregressive model for inflation. Inflation persistence is measured as the sum of the autoregressive coefficients, i.e. how long it takes inflation to return to its steady state level after being disturbed. Under this approach, the white noise component of the autoregressive (AR) process is assumed to summarize all the shocks (Marques, 2004)³. Inflation persistence is also loosely defined as the ‘positive serial correlation’ or ‘high auto relation’ of inflation.

Inflation is assumed to follow a stationary autoregressive process of order p such that

$$\pi_t = a + \beta(L)\pi_{t-1} + \varepsilon_t \quad (1)$$

Where π is the officially reported month-on-month inflation rate, $\beta(L)$ is the polynomial in lag operator and ε is the error term and the parameter $\eta = \beta_1 + \beta_2 + \dots + \beta_p$ measures the level of inflation persistence.

For robustness, we augment the above with a multivariate approach in which an econometric model aimed at explaining inflation behaviour on a set of determinants is estimated. This is important as the exclusion of important factors that drive inflation may bias results by exaggerating the impact of inflation persistence. Most of the previous empirical studies conducted to uncover causes of the rise in consumer prices in Kenya date back to 1990s (Killick and Mwega, 1990; Ryan and Milne, 1994; Ndung’u, 1994; and Durevall and Ndung’u, 1999). These studies seem to back the fact that increases in inflation in the early 1990s were associated with monetary and fiscal expansion, as well as the depreciation of the shilling experienced during that time. We focus on the more recent period from 1999 to 2011 and also use high frequency monthly data that is more informative. We also estimate inflation equation directly instead of focusing on the consumer price index.

To assess the robustness of the baseline findings of the AR process, we specify an inflation equation that takes into account both the demand-side factors and supply-side factors. The starting point is the basic quantity theory of money in which price level is endogenized i.e. price (P) is determined as a function of money supply (M) and real GDP (y).

³ We do not extend the concept of inflation persistence to impulse response function of AR(p), since the impulse response function is not regarded as a useful measure of persistence as it is an infinite-length vector (Marques, 2004).

$$P = f(M, y) \quad (2)$$

Where P is the price level, M is the nominal money supply, y is real income proxied by real GDP.

Being a small developing open economy, we take into consideration the impact of imported inflation by incorporating the exchange rate, given that Kenya is strongly dependent on imported intermediate and capital goods. We also incorporate the short term interest rate denoted r , which to some extent also capture monetary policy actions.⁴ Assuming that real output variations adequately capture supply-side constraints, a simple reduced form dynamic inflation equation capturing monetary, external and domestic factors is specified compactly with variables in changes (growth rates) as below.

$$\pi_t = \sum_{k=0}^K \alpha_k X_{t-k} + \sum_{l=1}^L \delta_l \pi_{t-l} + \varepsilon_t \quad (3)$$

Where π_t is the month-on-month inflation rate as officially reported by the statistical bureau, α_k is a vector of coefficients on explanatory variables (lagged k times), X is a matrix of explanatory variables and δ_l is a vector of coefficients on inflation lagged l times.

3. Empirical Results

Since all the variables are stationary, the inflation equations under both approaches were estimated directly using ordinary least squares method. The empirical results are reported in Table 2. The results are consistent across both approaches. There is a very strong effect of inflation persistence. In the univariate model, past inflation lagged two months accounts for over 90 percent of the variation in current inflation. Inflation has a very strong memory, especially as evidenced by the positive impact of inflation lagged one month, with a coefficient of 1.40. The summed effect amounts to 0.93. These results do not change much even after controlling for other factors that are thought to contribute to inflationary pressures.

Growth in real activity as measured by real GDP growth rate (current and lagged) is associated with a decline in inflation except for the fifth lag. However, the overall net effect is negative. The results further show that growth in money supply has a positive lagged effect of up to four months, though the impact was found to be less statistically significant and negative for two-month lag when interest rate was included. Similarly, the impact of changes in the exchange rate (lagged twice) though

⁴ It would have been ideal to use the policy rate but due short sample, Treasury bill rate, which closely follows trends in the policy rate was used.

positive was statistically insignificant. Short term interest rate has the desired negative effect on inflation but with a lagged effect of up to six months.

Table 1: Estimation Results for Inflation

	Univariate		Multivariate	
	Coefficient	t-statistic	Coefficient	t-statistic
Lagged inflation (t-1)	1.40***	19.59	1.29***	16.65
Lagged inflation (t-2)	-0.47***	-6.59	-0.39***	-5.12
Real GDP growth			-0.15***	-2.90
Real GDP growth (t-4)			-0.25**	-2.16
Real GDP growth (t-5)			0.51***	2.84
Real GDP growth (t-6)			-0.23**	-2.00
Interest rate (t-6)			-0.09**	-2.52
M3 growth(t-2)			-0.17*	-1.77
M3 growth (t-4)			0.14	1.52
Exchange rate change(t-2)			0.09	1.56
Constant	0.67***	2.94	2.05***	3.45
<i>GDP growth (overall net effect)</i>			-0.12	
<i>Lagged inflation(net effect)</i>		0.93	0.90	
Adjusted R-squared	0.92		0.93	
Number of observations	144		144	

Note: ***, ** and * denote 1%, 5% and 10% significance levels respectively.

4. Conclusion

The inflation trend in Kenya is characterized by peaks and troughs, leading to inflation cycles that last for several months. Generally, the empirical results point towards a strong effect of inflation persistence and significant influence of supply-side factors on inflation determination. The strong inflation inertia is important in the understanding of inflation dynamics in Kenya and has implications on whichever monetary policy framework the central bank pursues as a means towards achieving its objective of stable and low inflation. For instance, under the inflation targeting framework, it implies that inflation is likely to persist in subsequent periods, which would imply missing inflation targets in

subsequent periods. This persistence could be explained by structural rigidities in the economy especially emanating from the supply side. This would imply that addressing supply-side constraints can play an important role in lowering inflation and minimizing deviations from the average path.

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