

INFLATION PERSISTENCE IN GHANA: AGGREGATE AND SECTORIAL LEVEL ANALYSES

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Abstract

This paper tests Taylor's (2000) expectations theory of pass-through at aggregate and sectorial levels in Ghana. In doing so it employs Stock's (1991) 95% confidence interval for the largest root of the autoregression and identifies a reduction in inflation persistence during low and stable inflationary episodes in Ghana, as well as an increase in persistence during higher levels of inflation. We adopt the Dornbusch-Fisher (1993) framework to the case of Ghana in mapping out moderate persistent spells of inflation between 1960 and 2015. We find evidence of a reduction in inflation persistence after the introduction of the Structural Adjustment Program (SAP) of the 1980s. Moreover, the Central Bank's formal adoption of the inflation targeting framework in 2007 similarly led to a fall in inflation persistence across the aggregate economy. Furthermore, we find diminished levels of sector-specific inflation persistence since the formal adoption of inflation targeting in 2007. We provide evidence to suggest that Ghana's food sector is the most affected by persistence in inflation. The findings suggest that low and stable inflationary episodes lead to reduced pricing power of firms due to expectations that inflation in the foreseeable future will remain low and stable. We also provide an autoregressive framework to determine the effectiveness of a policy intervention across different time periods in an economy and across different sectors. Lastly we compare Ghana's inflation persistence with South Africa, Nigeria and New Zealand. From the findings, contours of an inverse relationship between an economy's inflation level and its inflation persistence begin to emerge. Policy makers should therefore not be preoccupied with attaining single-digit inflation while inflation persistence is left unattended.

JEL classification: E31; E52; C22

Key words: Inflation, Persistence, Autocorrelation, Pass-through, Sector-Specific, Ghana

1. INTRODUCTION

Inflation persistence has been a problem in many developing countries (Phiri, 2016; Gerlach and Tillmann, 2012; Ocran, 2007; Vega and Winkelried, 2005) and due to the link between inflation and economic growth, much ink has been poured on the literature that studies these two closely watched macroeconomic variables in developing countries (Bick, 2010; Gokal and Hanif, 2004). Ghana is one of such developing countries where inflation persistence and its management has been a problem (Sowa and Kwakye, 1993, 1994; Sowa 1994, 1996; Boafo-Arthur, 1999; Ocran, 2007; Marbuah, 2011).

Examining the causes and consequences of failure to properly manage inflation is useful for policy making (Taylor, 2000) particularly for developing countries in Africa. Persistence in inflation may arise for several reasons including the inertia that wage and price contracts impart to the inflation rate, the inertia that slowly adjusting expectations may impart to inflation, or the inertia that imperfect credibility may impart to inflation (Fuhrer, 1995). Different sources of inflation persistence

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bear different implications for the conduct of monetary policy. If inflation persistence arises from a lack of central bank credibility, then the central bank should determine whether and how it can improve its credibility. If persistence arises from other aspects of price-setting behaviour, then monetary policy must adopt behavioural changes (Fuhrer, 1995). "Persistence" of an economic variable refers to the tendency for a variable to stay away from its average level for an extended period when perturbed (Fuhrer, 1995). For example, when the unemployment rate deviates significantly from its "natural" rate, most economists would not expect it to return immediately. Failure to incorporate this "inflation persistence" in economic modelling can produce misleading policy prescriptions.

In this paper we examine the pass-through effects of high and low inflation persistence in the Ghanaian economy. Following Taylor (2000), we examine the possibility that low and stable inflation leads to reduced pass-through of costs to consumers. Specifically, we test if changes in pricing power are due to changes in the expectations of the persistence of price and cost movements. We hypothesize that the extent to which a firm in a particular sector matches an increase in either its costs and/or its competitor's prices by increasing its own price depends on how persistent the increase will be expected to last. In other words, we posit that low and more stable inflation should be associated with less persistent inflation.

In low income countries, Walsh (2011) posits that food price inflation is more volatile, more persistent, and higher on average than non-food inflation. However in the Ghanaian economy as we will prove later, only the first two hold. Given such a unique context of the Ghanaian economy, it is plausible that sectorial dynamics in Ghana may not follow conventional economic thinking with regards to inflation and thus a shift from aggregate thinking and research to further sector-specific investigations may be warranted.

The remainder of the paper is structured as follows: Section 2 looks at inflation management in Ghana. Section 3 delves into the theoretical and empirical review on inflation persistence, pass-through and pricing power, while section 4 outlines the methodology. Results follow in section 5, with the conclusion and recommendations in the final section

2. INFLATION MANAGEMENT IN GHANA

We begin by assessing inflation persistence in Ghana following the framework developed by Dornbusch and Fisher (1993) who define moderate inflation as at least 3 consecutive years of annual inflation rates between 15% and 30% (see table 1). How has inflation persisted in Ghana over the years, and what is the nature of the progression before and after the observed persistent inflation episodes? Clear patterns are identified - particularly 5 episodes of persistent moderate inflation since 1960. The moderate inflation episode experienced prior to the period of vigorous macroeconomic reforms was incidentally the longest moderate inflation spell ever experienced. The episode lasted over a decade (1973-1984) with average annual inflation rates of 60%. It had succeeded a period of low inflation (7.6% per annum) but for the next 3 years, inflation averaged 25% and the economy drifted into another spell during which inflation averaged 29% between 1986 and 1991.

Table 1: Persistent moderate inflation spells since 1960

Average Period Inflation (%)

Period of moderate inflation	Duration	During the period	3 years before period	3 years after period
1973-1984	12 years	59.8	7.6	24.9
1986-1991	6 years	29.4	57.6	20.0
1993-1998	6 years	33.1	21.8	23.5
2000-2003	4 years	24.9	18.3	12.9
2014-2016	3 years	16.0	9.8	n/a

Source: Authors' computation based on WDI 2016, n/a: not available

The dawn of democracy in 1992 did little to halt the persistence in inflation that had been generated, with average annual inflation hovering at 33% per annum between 1993 and 1998. The six year period from 1993-1998 was both preceded and succeeded by average annual inflation rates of over 20% for three consecutive years. Moderate inflation spells seemed to have been stemmed between 2004 and 2013. However, from 2011, average annual inflation has consistently risen from 9% to 15.5% in 2014, and 17.1% in 2015 which indicates that the economy has recently been ushered into another spell of inflation persistence, with the official 2016 inflation rate recording 15.4% (see table 1). Unlike other countries that did not stay in moderate inflation spells for long (Dornbusch and Fisher, 1993), Ghana appears to have been saddled with moderate inflation for a long time (Ocran, 2007).

Ghana's inflation experience since its independence in 1957 has been described by Ocran (2007) as episodic. He isolates four distinct episodes: the immediate post-independence, national reconstruction and development phase (1957-1966), the first International Monetary Fund (IMF) supported-stabilization phase (1967-1971), the deterioration phase (1972-1982), and the second stabilization inflation phase (1983-2003).

From figure 1, lower inflation rates on average prior to 1972 are observed compared to subsequent periods of hyperinflation and declining economic growth, ultimately leading to the adoption of an Economic Recovery Program (ERP) in 1983. Following the example of Ocran (2007), we divide the discussion into five phases: the post-tranquil era (1957-1966), rising inflation (1967-1971), the hyperinflation period (1972-1982), stabilization phase (1983-2003), and the current inflation experience (2004-date).

The post-tranquil era (1957-1966): Prior to this first period, Ocran (2007) describes Ghana's inflation experience as tranquil due to the existence of the West African Currency Board (WACB), to which Ghana belonged. With the help of the WACB, the Ghana government was able to keep inflation at bay by relying solely on taxing or borrowing, and not on the printing of money to finance its expenditure. Indeed, in the years of the WACB, Ghana persistently experienced single digit inflation rates which were estimated at less than 1%. However, following Ghana's independence and exit from the WACB in 1957, the board could no longer dictate the path of Ghana's monetary policy. The then Nkrumah administration swiftly embarked on a massive and unprecedented industrialization drive. All over the country, import substitution industries were established, and due to the sudden volumes of major infrastructure investments, the economy inevitably began to heat up (Sowa, 1993; Ocran, 2007).

Being state owned and managed, and excessively protected by overlapping levels of tariff structures, these industries performed woefully, due in part to incompetent management and difficulties in obtaining input supplies due to dwindling foreign exchange reserves. Following the collapse of the commodity market, surpluses which Ghana had stored up due to the heavy taxation of its cocoa crop eventually dried up. Yet the investment drive went on unabated, being financed heavily with

overseas loans. Gradually, inflation started to rise from its previous less than unitary value under the WACB to an average of 8% per annum between 1960 and 1963. The excessive investment activity during this period was evidenced more in demand pressure than in output expansion, causing a strong upward pressure on prices (Sowa, 1993).

The growing inflation was managed by maintaining import supplies and financing fiscal deficits with external reserves which had been accumulated prior to independence. As these reserves dried up, the government resorted to central bank financing since attempts to increase import duties failed in closing the budget gap. This led to strong inflationary pressure particularly in the last three years leading up to the overthrow of the Nkrumah administration in February 1966. From an average of 8% per annum between 1960 and 1963, inflation increased to 15.8% in 1964, and almost tripled to an average of 23% per annum between 1964 and 1966. Ripples of the 1964 inflationary pressure led to a persistence in inflation, particularly sustained by constraints on foreign exchange which led to shortages of most consumer items. Following the 1966 military takeover, the first inflationary phase was immediately succeeded by the IMF-supported stabilization attempt in 1967 which nevertheless failed to stem the steady rise of inflation.

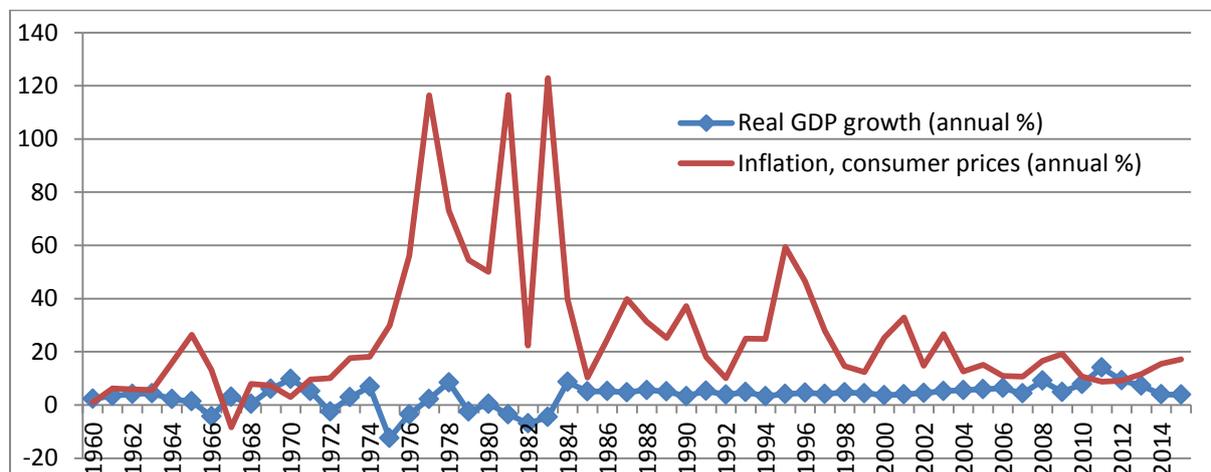


Figure 1: Inflation and rates of real GDP growth (1960-2015) Source: WDI 2016

Rising inflation (1967-1971): In a bid to cool down the economy, the new military government, the National Liberation Council (NLC) promptly entered into a standby agreement with the IMF, which among other things was aimed at driving external trade liberalization, and the tightening of monetary and fiscal policies by reducing public spending and excessive bank financing. This yielded some fruit as Ghana registered her first ever and only deflation rate of -8% in 1967 (figure 2). In July of that same year, the currency was devalued by 30%. Meanwhile extensive state participation in the economy was reduced and minimal investments made, leading to a massive nationwide economic retrenchment. Evidently, the measures which managed to contain inflation also took a heavy toll on the growth of the economy as monetary policy was further tightened through credit restrictions and interest rate increases. The ensuing civilian government that took over deepened its predecessor's pro-liberalization policies, while it relaxed its fiscal policy stance. External borrowing and foreign reserves sustained the government's recurrent and investment outlays which had increased substantially over the period.

Inflation was kept in check as a result of the contractionary orientation it adopted towards its monetary policy, despite having a rather relaxed approach to its fiscal policy. Economic activity experienced a marked boost in growth between 1969 and 1970, the highest in Ghana's history at the time. As this era drew to a close in 1970, inflation had marginally risen to 10% from a low of 3%. During this period, the commodity market collapse forced the government to draw up an austere budget aimed at cutting expenditure and exploring potential revenue sources in order to cushion the economy from the effect of the cocoa price down-turn. This was coupled with a further 44% devaluation of the local currency in 1971, and an additional 10-20% tax levy on selected forex transactions. These actions turned out to be highly unpopular and ultimately led to the government's demise and overthrow in 1972, ushering Ghana into an unforgettable episode of hyperinflation.

Hyperinflation period (1972-1982): Arguably, the 1972-1978 period oversaw the most reckless expansionary economic policy stance ever in Ghana's history (Ocran, 2007). Under the new military regime, a major reversal of the ousted government's economic policy was effected. This began with the revaluation of the local currency by 42%, and the re-instating of external trade controls. A succession of military takeovers led to incumbent regimes repetitively pursuing expansionary fiscal programmes attended by increased budget deficits which primarily were financed by central bank loans to government and state institutions. Economic stagnation, widespread shortage of goods and distorted relative prices with strong upward price rigidity were some of the inevitable effects of the reckless central bank financing.

Following the 1973 oil price shock and the accompanying erosion of its balance of payment position, the then government resorted to excessive borrowing through the central bank as well as arbitrary printing of money to close its budget gap. The ensuing printing of money led to an inflation spiral, and an all-time inflation high of 117% was registered in 1977 and 1981. The inflation crises worsened when extensive price control mechanisms were employed with the hope of curtailing the inflationary spiral. Indeed, despite widespread price controls during this decade, corruption, foreign currency trading in parallel markets, and smuggling of goods became the order of the day so much so that average inflation hovered at a staggering 51% per annum between 1972 and 1982. Another military takeover occurred in 1978, and that regime quickly moved to devalue the currency by 58% in search of a short term (1 year) standby agreement with the IMF. After yet another military takeover in June 1979, a civilian elected government came to power barely three months later in September 1979.

This government also embarked on expansionary economic policies, especially in the public sector, where the country experienced a doubling of the producer price for cocoa, and an overnight tripling of public workers' wages. Sowa (1993) and Ocran (2007) attribute the inflationary experience during this phase to excessive demand pressure sustained by an expansionary fiscal stance and loose monetary policies.

Foreign exchange scarcity as a result of over-dependence on volatile cocoa earnings constrained the ability to supply essential imports for consumption and production due to the behaviour of the world commodities market during that period. This was coupled with structural economic constraints, low output and a weak production base - all major actors on the influence of the inflationary trend of this era.

Inflation management was primarily undertaken using price controls and fixed exchange rates during this decade. However these mechanisms did little to remove the causes of inflationary pressure at the time, leading to several distorted prices underscoring widespread structural constraints particularly in domestic production and external trade. By the end of 1982 therefore, declining per capita incomes, increasing external deficits and poor infrastructure led to pronounced calls for a revised direction of economic management.

Stabilization phase (1983-2003): The revised direction of economic management came in the form of the Economic Recovery Program (ERP) which was launched in 1983 by the Provisional National Defence Council (PNDC) government in April 1983. This stabilization phase was attended by a dual combination of unfavourable man-made and natural conditions.

The price distortions of the late 1970s, and a rather dysfunctional economic system forced the government to turn to the IMF and World Bank for assistance particularly when inflation reached a record-high of 123%. This high inflation can be attributed to a 991% devaluation of the local currency that year (Ocran, 2007). The primary goal of the ERP was to stem the slide in the economy, minimize imbalances, control inflation and establish a path of sustainable growth (Sowa, 1993).

It employed mechanisms which included price de-regulation, financial management reforms, exchange rate corrections, trade liberalization, and the rehabilitation of economic and social infrastructure. Although one year after the introduction of the ERP, inflation plummeted from 123% to 40%, Sowa (1993) contends that the remarkable drop cannot fully be attributed to the programme since the ERP did not really take off until 1984, and moreover since the agricultural sector had also started to recover from the infamous 1983 drought.

During the reform years of 1983-2000, annual inflation averaged 34%, although in some years (such as in 1985 and 1992), inflation hovered around 10%. Inflation dropped to an annual average of 27% between 1987 and 1993, as against 50% during the early reform years of 1983-1986. Nevertheless, Sowa (1993) asserts that while the ERP failed in reigning in inflation during the period, it enabled the agricultural sector to recover quickly by attracting external inflows which eased supply constraints.

All in all, during this phase, inflation management was highly unsuccessful (Ocran, 2007) as the overall period average was 34% per annum. Indeed the target for inflation by the year 2000 was 5%, while the economy actually registered a 25% inflation rate. Even in 1985, 1992 and 1999, when inflation came close to being single digit, it could not be sustained over the next calendar year. Such has been the pattern of consistently missed inflation targets to date (Frimpong and Oteng-Abeyie, 2010).

Current inflation experience (2004-date): Presently, Ghana finds herself in the post second stabilization inflation phase, where annual inflation over the period 2004-2015 has averaged over 13%, hitting a high of 19% in 2009. By and large, inflation in this phase is best characterized as persistent, experiencing a somewhat cyclical pattern, with sharp hikes in inflation rates particularly in years immediately succeeding an election year.

In May 2007, in its bid to curb inflation, the central Bank of Ghana (BOG) formally adopted the inflation targeting framework using interest rates as its monetary instrument (Bank of Ghana, 2007). Even so, the inflation target each year has consistently been missed (Frimpong and Oteng-Abeyie,

2010), and average annual inflation has reduced only marginally from 12.9% between 2004-2006, to 12.8% between 2007-2014, with single digit inflation rates recorded only in 2011 and 2012. In trying to achieve economic stability, monetary and fiscal policies have been directed at keeping inflation low (price stability) while sustaining high rates of economic growth.

3. LITERATURE REVIEW

Fuhrer (1999) defines an economic variable as persistent if *ceteris paribus* it exhibits a tendency to stay near where it has been recently, absent other economic forces that move it elsewhere. With inflation, this is observed if the rate of change of price levels tends to remain constant (inflation tends to be persistent) in the absence of an “economic force” to move it from its current level.

Economists for several decades had been in consensus with regards to inflation being an inertial or persistent economic variable. Gordon et al. (1982) introduced the concept of a sacrifice ratio – the number of point-years of elevated unemployment required to reduce inflation by a percentage point – implying that inflation does not move freely, but requires significant economic effort in the form of lost output to reduce its level. Early attempts at modeling this apparent inertia within the framework of the Philips curve included lags of inflation. Gordon’s “triangle model” of inflation, replicated in canonical form is:

$$\pi_t = \sum_{i=1}^k a_i \pi_{t-i} - b(U_t - \tilde{U}) + cx_t + \varepsilon_t \quad (1)$$

Inflation π_t depends on its own lags², a measure of real activity (in this case the deviation of unemployment, U_t from the NAIRU), and supply-shifters such as key price shifts, summarized in x_t . In such a model, inflation moves gradually, partially anchored by its recent history, in response to real activity and supply shocks. If these other variables are themselves persistent, inflation may inherit some of their persistence.

A key question is whether and why inflation has its own or “intrinsic” persistence, beyond that inherited from U_t and x_t (or perhaps ε_t if it is also serially correlated). If inflation exhibits intrinsic persistence, then a model of inflation may require the equivalent of the lags in the equation above. The inclusion of lags of inflation in such a model is justified both empirically and theoretically (Fuhrer, 1999). On the empirical front, the lags help the model fit the data. Theoretically, the inclusion of lags is a proxy for expected inflation, for contracting and for other price-setting functions.

With regards to rational expectations and inflation persistence, the introduction of Muth's (1961) rational expectations theory into the macroeconomics literature and the consequent move toward explicit modelling of expectations posed considerable challenges in modelling prices and inflation. In the earliest rational expectations models of Lucas (1972) and Sargent and Wallace (1975), the price level was a purely forward-looking or expectations based variable like an asset price, which in these models implied that prices were flexible, and could “jump” in response to shocks. A number of economists recognized the tension between the obvious persistence in the price level data and the implications of these early rational expectations models.

² typically with the sum of coefficients constrained to unity in line with the Friedman-Phelps accelerationist principle

Fischer (1977), Gray (1977), Taylor (1980), Calvo (1983), and Rotemberg (1982, 1983) developed a sequence of models that rely on nominal price contracting in attempts to impart a data-consistent degree of inertia to the price level in a rational expectations setting. The overlapping contracts of Taylor and Calvo/Rotemberg were successful in doing so, allowing contracts negotiated in period t to be affected by contracts set in neighboring periods, which would remain in effect during the term of the current contract. The subsequent trajectory of macroeconomic research drew heavily on these seminal contributors, who had neatly reconciled rational expectations with inertial (or persistent) macroeconomic time series.

Theoretical underpinnings of the effect of the general inflationary environment on the pricing behavior of firms in a sector make use of two strands of economic research - monetary theory and the theory of price setting with imperfect competition (Taylor, 2000). Theories of price adjustment readily accommodate models of imperfect competition in which firms have some market power (Arrow, 1959). Blanchard and Kiyotaki (1987) and Svensson (1986) show the importance of such theories in macroeconomic models.

In an economy facing demand pressures, a decline in pricing power is often cited as a potential explanation for benign inflationary levels as firms will hold back price or wage increases which typically will be associated with low unemployment and high levels of capacity utilization. Taylor (2000) argues that in such a low inflation environment, employers are reluctant to pass on cost increases to customers, and in doing so, will vehemently resist worker demands for wage increments due to their loss of pricing power. Moreover, firms fear that any attempts to increase their prices may backfire and lead to them losing market share and profits since their competitors may not necessarily follow suit.

This view was widely held in explaining a phenomenon particularly experienced in the United States in the late 1990s. Estimates of the growth rate of potential GDP during the period fell well below the actual. By the start of 1999, the gap had risen to 3% while the unemployment rate had declined to levels well below estimates of the natural rate of unemployment. Despite all this, there was no evidence of increased wage inflation and most importantly, the overall inflation rate kept plummeting throughout the entire period. Greenspan (1999) summarizes this experience by stating that 'Because neither business firms nor their competitors can currently count any longer on a general inflationary tendency to validate decisions to raise their own prices, each company feels compelled to concentrate on efforts to hold down costs...' The same holds in a developing country context.

Taylor (2000) posits that the amount by which a firm increases its own price to reflect an increase in either its marginal cost and/or in the price at other firms depends greatly on how permanent the cost increase is expected to be. The World Bank (2007) also suggests that activities of cooperatives may be improving the bargaining power of farmers, thus raising food prices - which can translate into non-food-price inflation by pushing up inflationary expectations and prompting higher wage demands (Zhang and Law, 2010).

Fuhrer and Moore (1995) also propose a contracting model in which workers care about the level of their real wage relative to those of previous and successive cohorts of workers, while Gali and Gertler (1999) postulate that a fraction of firms set their prices based on a backward-looking rule of thumb, thus automatically introducing a backward-looking component into aggregate inflation

dynamics. Christiano et al., (2005) base on the notion that firms that are not allowed to re-optimize their price will change it nonetheless, reflecting, either fully or partly, past inflation.

4. METHODOLOGY

Data from 1960 to 2015 is sourced from the Ghana Statistical Service (GSS), and the World Bank's 2016 World Development Indicators (WDI), with analysis ran using GRET 2017. We follow Stock (1991), Taylor (2000), Dossche and Everaert (2005), and Phiri (2016) who construct a 95% confidence interval for the largest root of the autoregression (AR) in comparing inflation persistence in multiple periods.

Most measures of inflation persistence derive from the autocorrelation function for inflation where the i^{th} autocorrelation, u_i , of a stationary variable, x_t – the correlation of the variable with its own i^{th} lag, x_{t-i} – may be expressed as

$$u_i = \frac{E(x_t x_{t-i})}{V(x)}, \quad (2)$$

Where $V(x)$ is the variance of x and $\rho_i \in (-1,1)$. The variable's autocorrelation function is correspondingly defined as the vector of correlations of current period x with each of its own lags x_{t-i} from $i = 1$ to k :

$$A = [u_1, \dots, u_k] \quad (3)$$

A time series will be said to be relatively persistent if its correlations with its own past decay slowly. Generally speaking, a time series may be deemed persistent if the absolute value of its autocorrelations is high, so that a strongly negatively autocorrelated series would also be characterized as persistent (Fuhrer, 1999). The magnitudes of roots in the confidence intervals thus represent the degree of inflation persistence in the respective time periods under analysis. The sum of coefficients on the lagged dependent variables in the AR further reinforce the above, with larger sums corresponding to higher levels of persistence.

Inflation persistence or inflation inertia, measured by the coefficient on lagged inflation, is usually interpreted as capturing the effects of indexation or inflation expectations. When there is no inertia, the parameters on lagged inflation should be zero. On the other hand, when the level of inflation is only determined by inertia, the parameters on lagged inflation should sum to unity and all others should be zero (Loening et al., 2009).

To see how the effect of an increase in marginal costs on the price depends on how permanent the increase in marginal costs is, suppose that marginal cost follows a simple first order univariate AR (Taylor, 2000):

$$c_t = u c_{t-1} + \varepsilon_t \quad (4)$$

Its autocorrelation function is:

$$A = [u, u^2, \dots, u^k] \quad (5)$$

The autocorrelations of c_t die out geometrically at the rate determined by the AR parameter u hence, a smaller u (persistence parameter) reduces the size of the pass-through coefficient. Taylor (2000) notes that a firm (or at least an economist observing the firm) will likely refer to the smaller u as a loss of pricing power. In reality however, the smaller u implies a reduction in the persistence of cost increases.

A more generalized univariate AR model is as follows, where low inertia is implied if $\sum_{i=1}^p |u_i| < 0.7$ (Petrovska and Ramadani, 2010).

$$c_t = u_0 + u_1 c_{t-1} + u_2 c_{t-2} + \dots + u_p c_{t-p} + \varepsilon_t \quad (6)$$

We run the analysis on food and non-food sector inflation in Ghana, and subsequently on aggregate inflation in Ghana, Nigeria, New Zealand and South Africa³.

Table 2: Descriptive statistics for Inflation

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob	Obs
Aggregate Inflation	31.1	22.3	122.9	8.7	28.2	2.1	6.8	58.4	0	45
Food Inflation	8.8	7.6	18.9	3.5	4.3	0.8	2.7	4.4	0.1	36
Non-Food Inflation	0.05	3.9	7.4	-0.1	0.26	-5.7	33.7	1608.25	0	36

Source: Authors' computation

5. RESULTS

In testing for unit roots, we employ the Zivot Andrews (ZA) unit root test which accounts for possible structural breaks in the data. Inflation, by its data generation process (DGP) is the logged difference of consumer prices, hence we expect it to be stationary. From the results below, the null hypothesis of a unit root with a structural break is indeed strongly rejected, implying that inflation is stationary (see table 3).

Table 3: Zivot Andrews unit root test results

Variable	Break in constant	Break in trend	Break in both
Aggregate Inflation	-5.294097** (1985)	n/a ()	-7.153509*** (1984)
Food sector inflation	-6.875476*** (2013q3)	-6.171283*** (2009q3)	-12.76429*** (2013q3)
Non-food sector inflation	-6.865613*** (2013q3)	-6.194347*** (2009q3)	-13.64492*** (2013q3)

Note: ***, **, * indicate significance at 1%, 5%, and 10% respectively. Values in () are the suggested break dates. n/a implies that the ZA test could not compute the t-statistics.

We begin our analysis by testing for any observable differences in inflation persistence in the aggregate economy before and after the Structural Adjustment Program (SAP) in the 1980s.

Table 4: Aggregate Inflation Persistence before SAP: AR, using observations 1962-1984 (T = 23)

Dependent variable: Inflation	
	Coefficient

³ We employ Nigeria, New Zealand and South Africa merely for comparison purposes

const	58.7957
u(-1)	0.126382
u(-2)	0.671911
Sum of AR coefficients = 0.798293	

Table 5: Aggregate Inflation Persistence after SAP: AR, using observations 1987-2015 (T = 29)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	21.4704
u(-1)	0.595548
u(-2)	-0.144200
Sum of AR coefficients = 0.451348	

The sum of the AR coefficients drastically dropped from 0.798293 to 0.451348, implying a huge fall in inflation persistence before and after the SAP.

We now test for differences in inflation persistence in the aggregate economy before and after the formal adoption of inflation targeting (IT) in 2007 using annual data.

Table 6: Aggregate Inflation Persistence before IT (monthly data): AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	23.6614
u(-1)	1.35802
u(-2)	-0.333983
u(-3)	0.148082
u(-4)	-0.251717
u(-5)	0.184606
u(-6)	-0.129406
u(-7)	-0.0703321
u(-8)	0.214980
u(-9)	-0.267826
u(-10)	0.278724
u(-11)	-0.86108
u(-12)	0.223044
Sum of AR coefficients = 0.968080	

Table 7: Aggregate Inflation Persistence after IT (monthly data): AR, using observations 2008:05-2017:03 (T = 107)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	12.8684
u(-1)	1.22004
u(-2)	-0.131373
u(-3)	0.0524975
u(-4)	-0.275229

u(-5)	0.0676265
u(-6)	0.253509
u(-7)	-0.178010
u(-8)	0.0522918
u(-9)	-0.0725749
u(-10)	-0.143246
u(-11)	0.218752
u(-12)	-0.108296

Sum of AR coefficients = 0.955988

The sum of the AR coefficients also falls in this scenario from 0.968080 to 0.955988, implying that inflation persistence has fallen since the formal adoption of inflation targeting.

We then run the same analysis for the food sector, comparing inflation persistence before and after the adoption of IT.

Table 8: Food Sector Inflation Persistence before IT: AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	21.4564
u(-1)	1.25690
u(-2)	-0.218830
u(-3)	0.114106
u(-4)	-0.182960
u(-5)	0.0284900
u(-6)	-0.106365
u(-7)	0.129553
u(-8)	-0.00285772
u(-9)	-0.0965497
u(-10)	0.0431050
u(-11)	-0.0826376
u(-12)	0.0715260
Sum of AR coefficients = 0.953481	

Table 9: Food Sector Inflation Persistence after IT: AR, using observations 2008:05-2015:12 (T = 92)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	7.78142
u(-1)	0.960357
u(-2)	0.0797098
u(-3)	0.0649586
u(-4)	-0.226791
u(-5)	-0.0868467
u(-6)	0.305878
u(-7)	0.0268327
u(-8)	0.0577487
u(-9)	-0.296985

u(-10)	0.0550345
u(-11)	0.128562
u(-12)	-0.132741

Sum of AR coefficients = 0.935717

The sum of the AR coefficients also falls in the food sector implying a reduction in inflation persistence.

We also analyse the situation in the non-food sector before and after the formal adoption of the inflation targeting framework below.

Table 10: Non-Food Sector Inflation Persistence before IT: AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	25.3607
u(-1)	1.34801
u(-2)	-0.314433
u(-3)	0.100813
u(-4)	-0.229629
u(-5)	0.241302
u(-6)	-0.106152
u(-7)	-0.161268
u(-8)	0.207726
u(-9)	-0.176006
u(-10)	0.205973
u(-11)	-0.403161
u(-12)	0.252689
Sum of AR coefficients = 0.965868	

Table 11: Non-Food Sector Inflation Persistence after IT: AR, using observations 2008:05-2015:12 (T = 92)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	17.6353
u(-1)	0.354161
u(-2)	0.192497
u(-3)	0.282244
u(-4)	0.135337
u(-5)	0.0783780
u(-6)	-0.00011433
u(-7)	-0.0148815
u(-8)	0.00138928
u(-9)	0.00852562
u(-10)	-0.0621295
u(-11)	-0.0780345
u(-12)	-0.0146151
Sum of AR coefficients = 0.882757	

The same conclusion of a reduction in inflation persistence can be drawn in the non-food sector given the drop in the sum of AR coefficients since the formal adoption of IT.

In the table below, we show the percentage drop in inflation persistence in each of the policies tested.

Table 12: Percentage decline in Inflation Persistence

Policy Intervention	Before Intervention	After Intervention	% change
SAP	0.798293	0.451348	-43.46
IT (Aggregate)	0.96808	0.955988	-1.25
IT (Food Sector)	0.953481	0.935717	-1.86
IT (Non-Food Sector)	0.965868	0.882757	-8.60

Evidently, the most decline in persistence was as a result of the SAP in the 1980s. More recently, inflation targeting has resulted in the greatest drop in inflation persistence in the non-food sector.

We then attempt to identify which sector experiences the most persistent inflation.

Table 13: Food Sector Inflation Persistence: AR, using observations 1991:01-2015:12 (T = 300)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	16.5694
u(-1)	1.25570
u(-2)	-0.205008
u(-3)	0.111204
u(-4)	-0.188381
u(-5)	0.0179442
u(-6)	-0.0796385
u(-7)	0.114273
u(-8)	0.00686852
u(-9)	-0.113353
u(-10)	0.0497277
u(-11)	-0.0806097
u(-12)	0.0784157
Sum of AR coefficients = 0.967146	

Table 14: Non-Food Sector Inflation Persistence: AR, using observations 1991:01-2015:12 (T = 300)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	22.7725
u(-1)	0.990452
u(-2)	0.0817777
u(-3)	0.0879445
u(-4)	-0.117380
u(-5)	0.0480089
u(-6)	-0.0618942

u(-7)	-0.0718899
u(-8)	0.0484592
u(-9)	-0.0403294
u(-10)	-0.00531828
u(-11)	-0.135578
u(-12)	0.129011
Sum of AR coefficients = 0.953264	

The food sector records a higher sum of AR coefficients than the non-food sector, hence we safely conclude that the food sector in Ghana experiences more persistent inflation than the non-food sector. This could be due to the seasonal nature of output in the food sector due to its high dependence on rainfall.

We present below a reprint of table 1 (see table below) which tabulates persistent moderate inflation spells in Ghana since 1960 using a framework designed by Dornbusch and Fisher (1993). We observe that the durations and 'during the period' averages of moderate inflation have consistently fallen over time since the early 1970s, with the most recent spell lasting 3 years between 2014 and 2016 with a period average of 16.7% inflation. In the face of such dwindling inflation levels however, we wish to ascertain if a declining inflation rate necessarily implies a declining level of inflationary persistence.

Table 15: Persistent moderate inflation spells since 1960

Period of moderate inflation	Duration	During the period	Average Period Inflation (%)	
			3 years before period	3 years after period
1973-1984	12 years	59.8	7.6	24.9
1986-1991	6 years	29.4	57.6	20.0
1993-1998	6 years	33.1	21.8	23.5
2000-2003	4 years	24.9	18.3	12.9
2014-2016	3 years	16.7	9.8	n/a

In the following sections therefore, we delve into the nexus of inflation and inflationary persistence by presenting a novel way of assessing the effectiveness of a policy intervention across different time periods using the autoregressive approach employed in the sections above. We attempt this by comparing the sum of AR coefficients of the period prior to the policy intervention to different tranches of time post the policy intervention in order to ascertain within which tranche the policy was most effective. This approach is very effective in enabling us ascertain if a positive relationship exists between declining inflation levels and inflation persistence in the aggregate economy and across different sectors.

In our case, we let δ be the sum of AR coefficients prior to the policy intervention, and let α , β , and γ be the sum of AR coefficients after the first η , $\eta+k$, and $\eta+k+p$ years respectively after the intervention, where $k>0$, and $p>0$.

Scenario 1: For a policy intervention which was effective, we expect inflation persistence to reduce within period η (such that $\alpha<\delta$), and to continue to reduce over periods $\eta+k$ (where $\beta<\alpha$), and $\eta+k+p$ (where $\gamma<\beta<\alpha$), and into the future.

Scenario 2: While an ineffective policy intervention may record $\alpha < \delta$ within period η , in period $\eta+k$, β will most likely exceed α , and in period $\eta+k+p$, γ will also exceed β , with inflation persistence possibly rising to levels of δ in periods after $\eta+k+p$.

With the background above, we attempt to map out how inflation persistence has changed over time in the aggregate Ghanaian economy since the SAP in the 1980s, and we establish which of the above scenarios the SAP subscribes to.

Table 16: Aggregate Inflation Persistence before SAP: AR, using observations 1962-1984 (T = 23)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	58.7957
u(-1)	0.126382
u(-2)	0.671911
Sum of AR coefficients = 0.798293	

Table 17: Aggregate Inflation Persistence 15 years after SAP: AR, using observations 1987-2000 (T = 14)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	28.3423
u(-1)	0.497437
u(-2)	-0.425616
Sum of AR coefficients = 0.0718204	

Table 18: Aggregate Inflation Persistence 20 years after SAP: AR, using observations 1987-2004 (T = 18)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	26.5587
u(-1)	0.392929
u(-2)	-0.285697
Sum of AR coefficients = 0.107232	

Table 19: Aggregate Inflation Persistence 30 years after SAP: AR, using observations 1987-2015 (T = 29)

Dependent variable: Inflation	
	<i>Coefficient</i>
cons	21.4704
u(-1)	0.595548
u(-2)	-0.144200
Sum of AR coefficients = 0.451348	

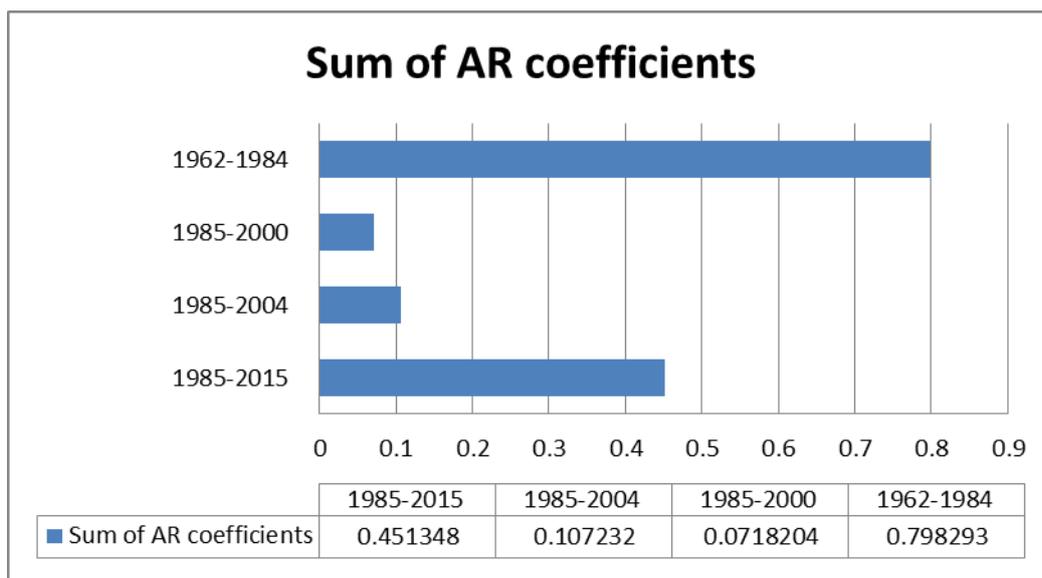


Figure 2: Aggregate Inflation Persistence: pre- and post-SAP

Although persistence has fallen over time in the aggregate Ghanaian economy since the SAP in the 1980s, it is clearly evident that the SAP subscribes to scenario 2 as described above.

We also attempt to map out how inflation persistence has changed over time in the aggregate Ghanaian economy since the formal adoption of inflation targeting in 2007 using monthly data and we establish which of the scenarios inflation targeting subscribes to.

Table 20: Aggregate Inflation Persistence before IT: AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	23.6614
u(-1)	1.35802
u(-2)	-0.333983
u(-3)	0.148082
u(-4)	-0.251717
u(-5)	0.184606
u(-6)	-0.129406
u(-7)	-0.0703321
u(-8)	0.214980
u(-9)	-0.267826
u(-10)	0.278724
u(-11)	-0.386108
u(-12)	0.223044
Sum of AR coefficients = 0.968080	

Table 21: Aggregate Inflation Persistence 3.5 years after IT: AR, using observations 2008:05-2010:12 (T = 32)

Dependent variable: Inflation	
	<i>Coefficient</i>

const	14.3235
u(-1)	1.56791
u(-2)	-0.646653
u(-3)	-0.0368211
u(-4)	0.0262547
u(-5)	0.107584
u(-6)	-0.0257581
u(-7)	0.206502
u(-8)	-0.500093
u(-9)	0.18175
u(-10)	-0.589445
u(-11)	0.277515
u(-12)	-0.0887864

Sum of AR coefficients = 0.916383

Table 22: Aggregate Inflation Persistence 4 years after IT: AR, using observations 2008:05-2011:06 (T = 38)

Dependent variable: Inflation

	<i>Coefficient</i>
const	13.1719
u(-1)	1.51577
u(-2)	-0.483862
u(-3)	-0.149639
u(-4)	0.037409
u(-5)	0.0964920
u(-6)	0.0808869
u(-7)	-0.00926191
u(-8)	-0.303203
u(-9)	0.14433
u(-10)	-0.363359
u(-11)	0.148986
u(-12)	-0.0404038

Sum of AR coefficients = 0.946574

Table 23: Aggregate Inflation Persistence 10 years after IT: AR, using observations 2008:05-2017:03 (T = 107)

Dependent variable: Inflation

	<i>Coefficient</i>
const	12.8684
u(-1)	1.22004
u(-2)	-0.131373
u(-3)	0.0524975
u(-4)	-0.275229
u(-5)	0.0676265
u(-6)	0.253509
u(-7)	-0.178010
u(-8)	0.0522918
u(-9)	-0.0725749
u(-10)	-0.143246

u(-11)	0.218752
u(-12)	-0.108296
Sum of AR coefficients = 0.955988	

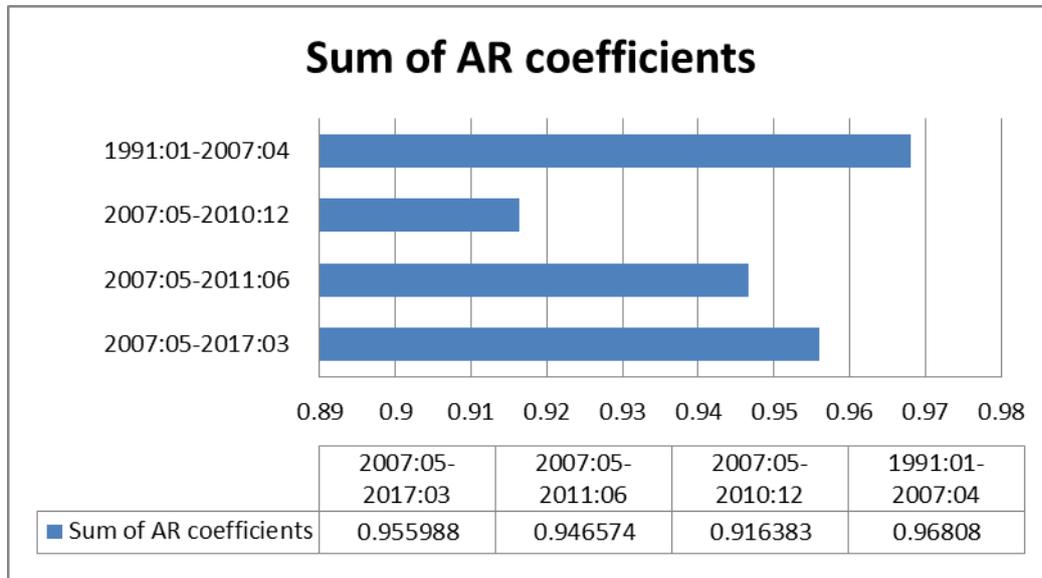


Figure 3: Aggregate Inflation Persistence: pre- and post-IT

From the above, inflation persistence has consistently fallen since the formal adoption of inflation targeting, but just like the SAP, it also subscribes to the 2nd scenario, making it an ineffective policy thus far as per our framework. Indeed, as is very prevalent in Ghana, as public perception about the inflation target is not well anchored, inflation persistence will grow relatively higher over time. Some studies such as Dossche and Everaert (2005) find that if monetary policy gives rise to unstable inflation, it afterwards becomes very hard to dis-inflate due to the slow adjustment of inflation expectations in response to changes in the inflation target.

We now attempt to map out how inflation persistence has changed over time in the food sector since the formal adoption of inflation targeting in 2007 and we establish which of the scenarios inflation targeting subscribes to with regards to the food sector.

Table 24: Food Sector Inflation Persistence before IT: AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	21.4564
u(-1)	1.25690
u(-2)	-0.218830
u(-3)	0.114106
u(-4)	-0.182960
u(-5)	0.0284900
u(-6)	-0.106365
u(-7)	0.129553
u(-8)	-0.00285772
u(-9)	-0.0965497

u(-10)	0.0431050
u(-11)	-0.0826376
u(-12)	0.0715260
Sum of AR coefficients = 0.953481	

Table 25: Food Sector Inflation Persistence 2.5 years after IT: AR, using observations 2008:05-2009:12 (T = 20)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	14.3474
u(-1)	0.819167
u(-2)	0.187235
u(-3)	-0.0982982
u(-4)	-0.452008
u(-5)	-0.00928159
u(-6)	0.485304
u(-7)	0.128983
u(-8)	-0.299854
u(-9)	-0.288418
u(-10)	0.232449
u(-11)	0.372386
u(-12)	-0.538487
Sum of AR coefficients = 0.539178	

Table 26: Food Sector Inflation Persistence 5 years after IT: AR, using observations 2008:05-2012:06 (T = 50)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	9.32539
u(-1)	1.06933
u(-2)	0.212286
u(-3)	-0.172086
u(-4)	-0.391717
u(-5)	-0.0898982
u(-6)	0.598760
u(-7)	0.0634807
u(-8)	-0.175030
u(-9)	-0.13535
u(-10)	0.180693
u(-11)	0.431541
u(-12)	-0.383517
Sum of AR coefficients = 0.930310	

Table 27: Food Sector Inflation Persistence 8.5 years after IT: AR, using observations 2008:05-2015:12 (T = 92)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	7.78142

u(-1)	0.960357
u(-2)	0.0797098
u(-3)	0.0649586
u(-4)	0.2267 1
u(-5)	-0.0868467
u(-6)	0.305878
u(-7)	0.0268327
u(-8)	0.0577487
u(-9)	-0.29 985
u(-10)	0 0550345
u(-11)	0.128562
u(-12)	-0.132741
Sum of AR coefficients = 0.935717	

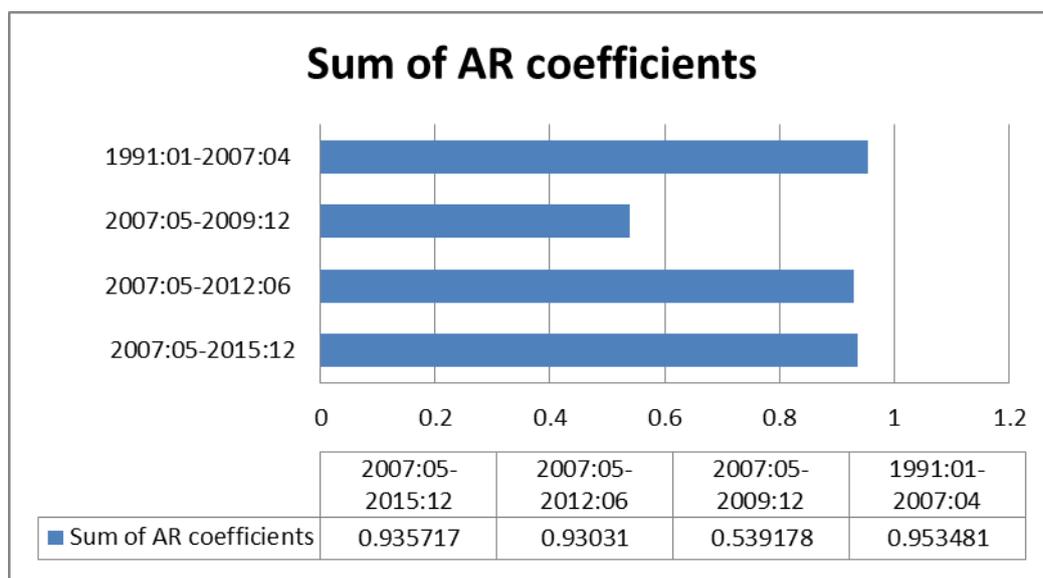


Figure 4: Food Sector Inflation Persistence: pre- and post-IT

Just as with the SAP and inflation targeting at the aggregate level, even though the sum of the AR coefficients has fallen in the food sector, inflation persistence has not been as effective as it ideally should with regards to perpetually taming inflationary expectations and ultimately persistence in inflation.

We also attempt to map out how inflation persistence has changed over time in the non-food sector since the formal adoption of inflation targeting in 2007 and we establish which of the scenarios inflation targeting subscribes to with regards to the non-food sector.

Table 28: Non-Food Sector Inflation Persistence before IT: AR, using observations 1991:01-2007:04 (T = 196)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	25.3607
u(-1)	1.34801
u(-2)	-0.314433
u(-3)	0.100813

u(-4)	-0.229629
u(-5)	0.241302
u(-6)	-0.106152
u(-7)	-0.161268
u(-8)	0 207726
u(-9)	-0.176006
u(-10)	0.205973
u(-11)	-0.403161
u(-12)	0.252689

Sum of AR coefficients = 0.965868

Table 29: Non-Food Sector Inflation Persistence 2.5 years after IT: AR, using observations 2008:05-2009:12 (T = 20)

Dependent variable: Inflation

	<i>Coefficient</i>
const	24.7806
u(-1)	1.07443
u(-2)	-0.376046
u(-3)	0.00437003
u(-4)	0.000236326
u(-5)	-0.179597
u(-6)	-0.197349
u(-7)	0.0111095
u(-8)	0.2 7022
u(-9)	-0.285051
u(-10)	0.207154
u(-11)	0 104502
u(-12)	0.0973805

Sum of AR coefficients = 0.738160

Table 30: Non-Food Sector Inflation Persistence 3.5 years after IT: AR, using observations 2008:05-2010:12 (T = 32)

Dependent variable: Inflation

	<i>Coefficient</i>
const	16.8184
u(-1)	1.24471
u(-2)	-0 282652
u(-3)	-0.0866930
u(-4)	0.177784
u(-5)	-0.147719
u(-6)	0.131629
u(-7)	-0.0738152
u(-8)	0.165 67
u(-9)	-0.321186
u(-10)	0.0839777
u(-11)	0.0478607
u(-12)	-0.0591719

Sum of AR coefficients = 0.880587

Statistics based on the rho-differenced data:

Table 31: Non-Food Sector Inflation Persistence 8.5 years after IT: AR, using observations 2008:05-2015:12 (T = 92)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	17.6353
u(-)	0.354161
u(-2)	0.192497
u(-3)	0.282244
u(-4)	0.135337
u(-5)	0.0783780
u(-6)	-0.00011433
u(-7)	-0.0148 15
u(-8)	0.00138928
u(-9)	0.00852562
u(-10)	-0.0621295
u(-11)	-0.0780345
u(-12)	-0.0146151
Sum of AR coefficients = 0.882757	

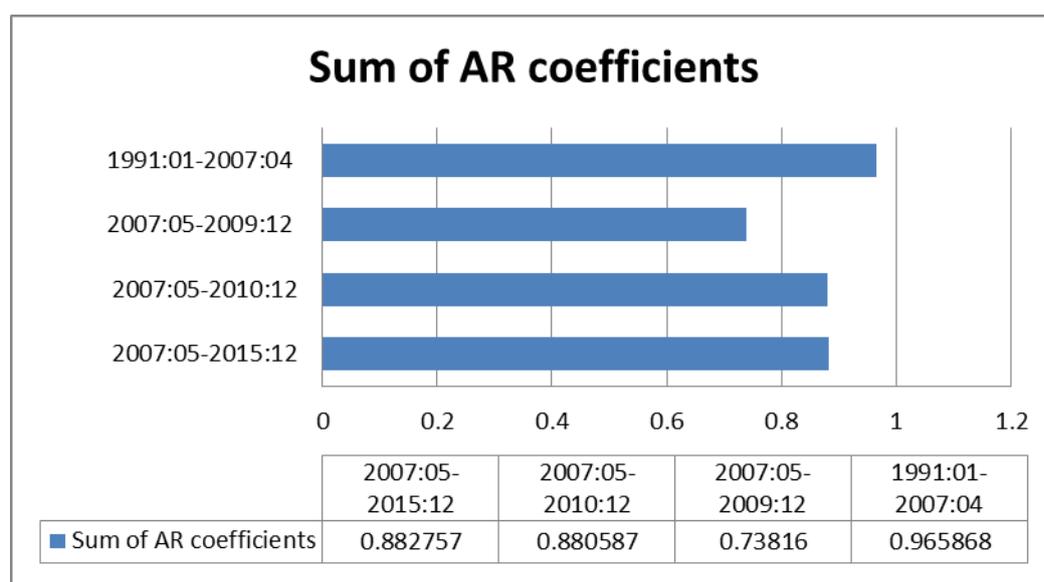


Figure 5: Non-Food Sector Inflation Persistence: pre- and post-IT

We find that over time, the sum of the AR coefficients have fallen in the non-food sector, suggestive of a reduction in inflation persistence. Nonetheless in the non-food sector, just as with the food sector, inflation targeting has really not been effective in taming inflationary expectations and inflation persistence.

From our analysis so far, we determine that the effectiveness of a policy is typically observed soon after its implementation, but over time, as rational observers identify deficiencies in the policy, distrust in its implementation becomes evident. Sooner than later, perceptions heighten even further and the inflationary trend returns to the high pre-policy implementation levels. During this period of policy upheaval, as is very common in most developing countries, calls will be made for newer policies to be implemented.

In this final section, we go on to compare and contrast inflation persistence of three other inflation targeting economies⁴ (South Africa, Nigeria, and New Zealand) with that of Ghana.

Results from Ghana:

Table 32: Aggregate Inflation Persistence in Ghana: AR, using observations 1964-2015 (T = 52)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	28.9919
u(-1)	0.260282
u(-2)	0.294716
u(-3)	0.0328865
u(-4)	0.0876350
Sum of AR coefficients = 0.675519	

Results from Nigeria:

Table 33: Aggregate Inflation Persistence in Nigeria: AR, using observations 1964-2015 (T = 52)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	17.2566
u(-1)	0.832442
u(-2)	-0.421110
u(-3)	0.231788
u(-4)	-0.0199817
Sum of AR coefficients = 0.623139	

Results from South Africa:

Table 34: Aggregate Inflation Persistence in South Africa: AR, using observations 1964-2015 (T = 52)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	9.33924
u(-1)	1.05655
u(-2)	-0.43875
u(-3)	0.189823
u(-4)	0.0884526
Sum of AR coefficients = 0.896074	

⁴ New Zealand and South Africa are selected to represent relatively well developed economies with single digit inflation. New Zealand is the first economy to formally adopt inflation targeting. Nigeria is selected since just like Ghana, it is also a developing economy which has had its share of inflation problems in the past. As at the writing of this paper, South Africa, Ghana, and Uganda are the only SSA economies to have fully adopted inflation targeting. However, while Ghana, South Africa, Nigeria and New Zealand all have inflation data from 1960, Uganda has it only from 1981 and as such is eliminated from the analysis due to issues of comparability.

Results from New Zealand:

Table 35: Aggregate Inflation Persistence in New Zealand: AR, using observations 1964-2015 (T = 52)

Dependent variable: Inflation	
	<i>Coefficient</i>
const	5.71624
u(-1)	0.745218
u(-2)	0.0182442
u(-3)	-0.0183723
u(-4)	0.156816
Sum of AR coefficients = 0.901907	

Over the period 1960-2015, Nigeria has proved to possess the least persistence in inflation, with levels of up to 30% lower than the persistence recorded in the more advanced economies of South Africa and New Zealand. Ghana also records persistence levels 25% lower than South Africa and New Zealand. Although further investigation is warranted, our findings suggest that low levels of inflation persistence may not necessarily be implied by single digit inflationary levels. Policy makers must therefore be wary of trumpeting their achievements at reducing inflation to single digits without first determining if persistence has also reduced in tandem with inflation levels. The figure below illustrates the phenomenon of a possible inverse relationship between inflation and inflation persistence (at least in inflation targeting economies). Indeed, contours of such a dynamic relationship may not be readily perceptible and thus warrant further research.

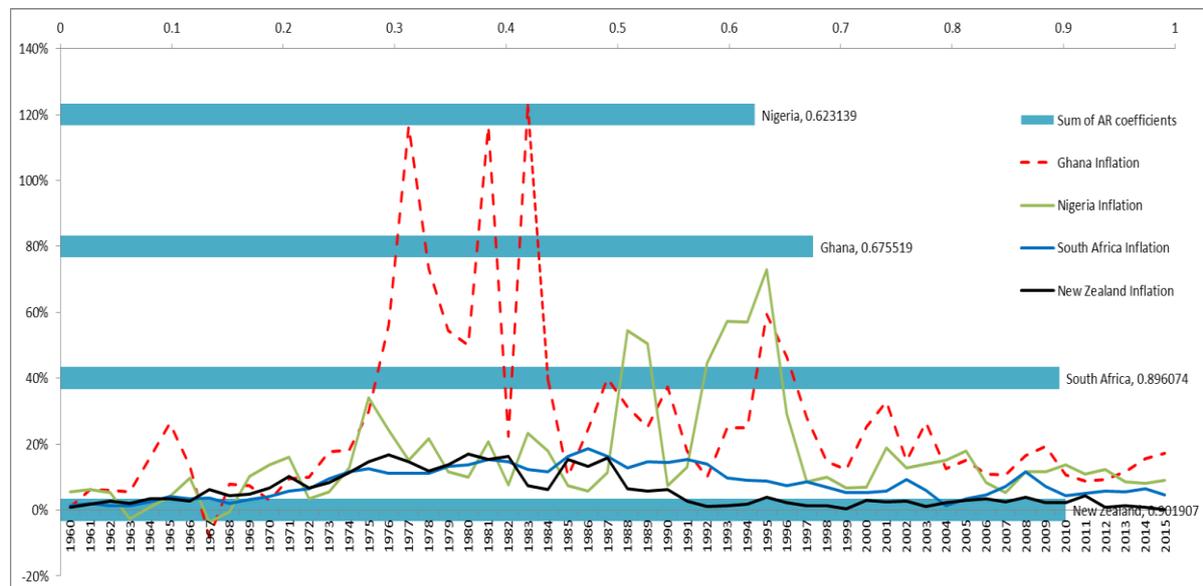


Figure 6: Cross Country Inflation and Inflation Persistence

6. CONCLUDING REMARKS

The highest returns to an inflation policy in Ghana is typically observed soon after its implementation, but over time, as rational observers identify deficiencies in the policy, distrust in its implementation becomes evident. Sooner than later, perceptions heighten even further and the inflationary trend returns to the high pre-policy implementation levels. During this period of policy

upheaval, as is very common in most developing countries, calls will be made for newer policies to be implemented. Policy makers are thus encouraged to ensure that the effectiveness of policies is maintained right from its implementation.

Inflation persistence has reduced (albeit marginally) since the formal adoption of inflation targeting in the aggregate economy as well as in the food and non-food sectors. The central bank should intensify efforts to further enhance the overall effectiveness of the inflation targeting framework in Ghana.

Moreover, since inflation persistence is evidently higher in the food sector than in the non-food sector, it is prudent for the government to tame inflationary expectations in the food sector, particularly in the minor rainy season where due to a relative scarcity of food crops, expectations of rising food prices are heightened as compared to the major rainy season where food is in relative abundance. Government can thus tame inflationary expectations by reducing import duties for food sector importing firms who wish to import essential food crops during the minor rainy season. This will reduce import costs (cost push inflation) for such firms and ultimately assist in driving down expectations of rising inflation.

While single digit inflation is being heralded as essential for all economies, a careful inquiry into single digit inflation targeting should be undertaken. We suggest that an inverse relationship exists between inflation and inflation persistence. In other words, a declining inflation rate does not necessarily imply that inflationary expectations are being subdued. Policy makers and politicians must therefore be wary of trumpeting their achievements at reducing inflation to single digits without first determining if persistence has also reduced in tandem with inflation levels. We presented evidence of economies enjoying continual levels of low inflation and yet having distressingly high levels of persistent inflation. Contours of such a dynamic relationship between inflation and inflation persistence (at least in inflation targeting economies) may not be readily perceptible and thus warrant further research.

Given the fact that each of the various sectors in the Ghanaian economy possess varying inflation persistence dynamics, studies to determine sector specific threshold rates of inflation are recommended for future research and policy consideration. Chaudhry et al. (2013) observe that no empirical study has been carried out to ascertain the inflation threshold level within the various sectors of an economy. Research directed at estimating sectorial threshold inflation levels is crucial since the nationwide inflation target band set by the central bank may favour only certain sectors of the economy, to the detriment of other sectors, thereby unduly sacrificing sectorial output growth. Indeed Christiaensen et al. (2011) and Cervantes-Godoy and Dewbre (2010) assert that stifling the output potential of any sector which is a lynchpin for inclusive growth, could impede efforts at achieving poverty reduction in the economy. In the same manner that cross-country inflation threshold studies fail to recognize the idiosyncrasies of the various countries within the study, nationwide inflation threshold studies may also fail to recognize the idiosyncrasies of the various sectors within the economy. More studies on inflation persistence are therefore strongly encouraged.

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