



**AN EMPIRICAL EXAMINATION OF THE DYNAMICS OF NEGATIVE
INFLATION IN ZIMBABWE**

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ABSTRACT

This paper provides an analysis of inflation dynamics in Zimbabwe under the multiple currency regime for the period 2011 to 2015. The analysis includes the main drivers of the inflationary trends and its potential effects on the economy. The analysis helps to determine the relative contributions of external and domestic factors to negative inflation dynamics. The main conclusion from the study is that the effects of shocks to the US\$/South African rand exchange rate and international commodity prices of food and oil have been more important in explaining the negative inflation dynamics. Specifically, the results from econometric analysis suggest that about 58 percent of the variation in the country's inflation profile is attributed to external factors. Domestic demand accounted for a paltry 6.1 percent of the variation in inflation during the period 2011 to 2015, while the remainder is attributed to inflation persistence. The fact that a significant proportion of negative inflation is explained by supply side factors, implies that it may not necessarily harm economic growth. A welcome development that could not be avoided in light of the recent slowdown in international oil and food prices and strengthening of the US\$ against currencies of major trading partners is the downward correction in prices. It is also important to note that negative inflation can only pose significant challenges for the economy if it develops into a deflation spiral, supported by expectations of greater deceleration of economic growth. This risk is, however, low for Zimbabwe since the country largely depends on imports, whose prices are directly influenced by developments in the global economy. Given that negative inflation is emanating from external factors, the way forward is to improve productivity and boost the competitiveness through reducing costs of production. Authorities should aggressively pursue policies that improve the ease of doing business and review regulations that inhibit the attraction of Foreign Direct Investment. This may, however, deepen negative inflation in the near-term but will improve competitiveness and growth, with inflation expected to climb out of the negative territory in the medium term.

Keywords: Inflation Dynamics, Vector Autoregression, Vicious cycle

JEL Classification: C32, E51, E52, E58

Disclaimer: The views and conclusions expressed in this paper are those of the authors and do not necessarily reflect the official position of the Reserve Bank of Zimbabwe. For more information concerning the paper, please contact the Director, Economic Research, Mr. Simon. Nyarota, email address: snyarota@rbz.co.zw

SECTION I: INTRODUCTION

Zimbabwe experienced price stability since the adoption of multicurrency system in February 2009. The country has, however, been experiencing sustained decline in inflation since January 2012. This is against a background of massive declines in global food, mineral and oil commodity prices; appreciation of the US\$ against the country's major trading partner currencies and low domestic capacity utilization. The sustained decline in inflation to negative territory has led to concerns on its impact on macroeconomic performance.

Reflecting the widespread fall in international commodity prices, most countries have also experienced falling domestic prices, raising deflationary fears (Borio et al, 2015). This phenomenon has been more pronounced in developed economies and some countries whose currencies are pegged to the US\$ or the euro (Goretti and Zhan, 2015). Although inflation rates for regional countries have also been on a downward trend, these have been generally stable and in positive territory. The main reason for this seeming dichotomy is that these countries have their own currencies which have depreciated in recent times, thereby limiting the full impact of changes in international commodity price developments. Zimbabwe has, however, suffered the full impact of falling international commodity prices and strengthening of the US\$, given the lack of monetary policy autonomy. In addition, the appreciation of the US dollar against currencies of regional trading partners has made imported goods relatively cheaper in Zimbabwe.

Economists, policy makers and the academia are, however, divided regarding the possible causes, risks, and consequences of the current negative inflationary environment. On one hand, some argue that it will create conditions favourable to economic growth, given that the country's prices have significantly been above regional comparators. According to this school of thought, the falling prices would increase real incomes and also make export commodities more competitive. On the other hand, others posit that persistent negative inflation could possibly trigger outright deflation, which is harmful to economic recovery. They argue that falling prices raise the real value of debt, which undermines borrowers' balance sheets. In addition, consumers might delay spending, in anticipation of further deceleration in prices, thereby negatively impacting on output.

Empirical evidence, however, suggests that the effects of negative inflation on an economy depends on whether it is caused by decreases in aggregate demand or a rise in productivity (Elwell, 2010; Marcin, 2015). The negative inflation caused by falling aggregate demand is essentially detrimental to economic growth and may, in a worst case scenario, develop into a hard-to-break, self-reinforcing deflationary spiral (Marcin, 2015). However, negative inflation caused by supply side factors is believed to be conducive to economic growth (Elwell, 2010; Marcin, 2015).

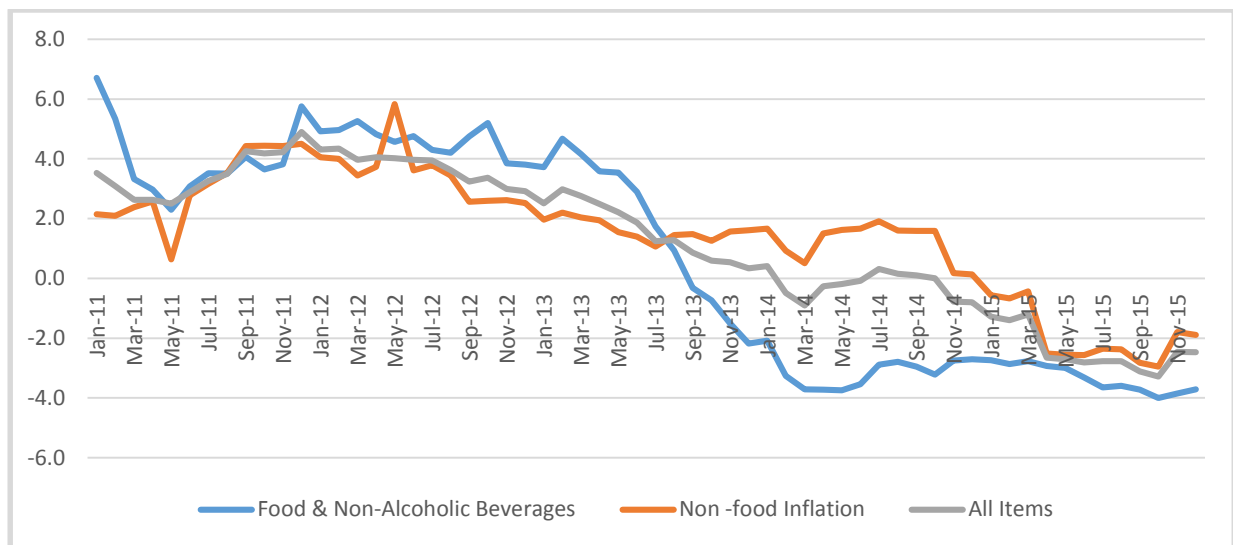
Against this background, this study attempts to empirically determine the major factors that have been driving the negative inflation in Zimbabwe. The study undertakes sensitivity tests to simulate the inflation profile if there are shocks or reversal to the factors driving inflation. The study also discusses policy implications and proffers policy recommendations to sustain accelerated economic growth, in the face of negative inflation.

The rest of the paper is organized as follows: Section II discusses stylized facts on inflation dynamics and consumer price formation in Zimbabwe. Section III focuses on a review of country experiences with deflation. Literature review is covered under Section IV. Section V and VI focus on methodology and analysis of results, respectively. Section VII discusses the conclusion and policy recommendations.

SECTION II: INFLATION DEVELOPMENTS DURING THE STUDY PERIOD

The annual headline inflation, has continuously been in negative territory from November 2014 to December 2015. Both food and non-food inflation have also been declining. Figure 1 shows developments in both food and non-food inflation from January 2011 to December 2015.

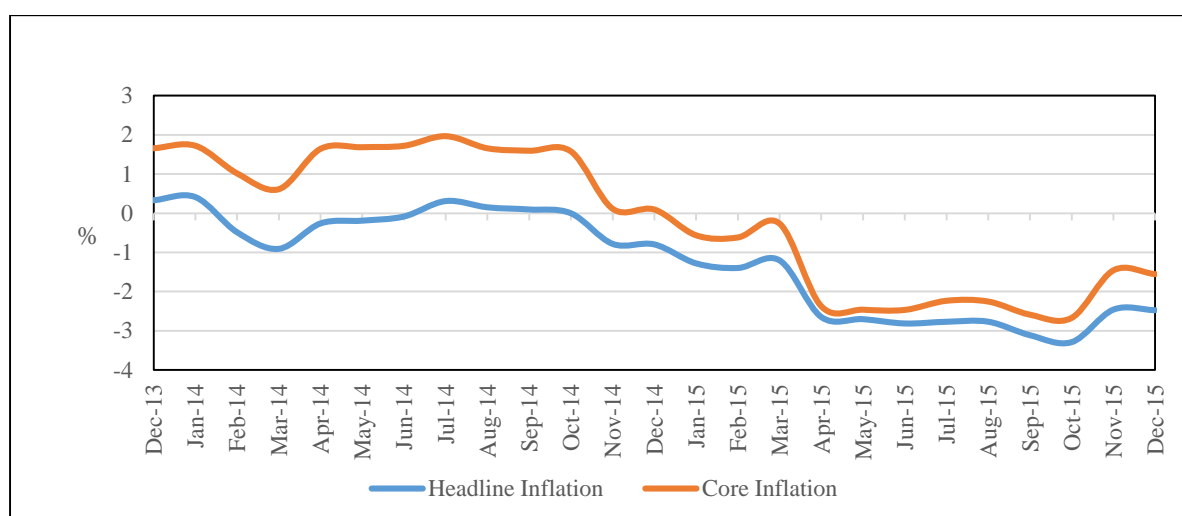
Figure 1: Inflation Developments (January 2011 to December 2015)



Source: ZIMSTAT, 2016

As reflected in Figure 1, annual food inflation receded into negative territory in September 2013, while non-food inflation only started recording negative inflation in January 2015. This may partly imply that food inflation has been the major contributor to negative inflation in the country. Underlying or core inflation, which excludes the volatile food and fuel prices from the overall inflation basket also entered into negative inflation in January 2015.

Figure 2: Headline and Core Inflation (December 2013 to December 2015)



Source: ZIMSTAT, 2016

The negative inflation pressure came from both food and non-food components, with increasing importance of the former. Table 1 shows that the main contributors to negative inflation were food and non-alcoholic beverages accounting for 48.9%; housing, water and electricity, 18.5%; and other services, 15.1%. Other services includes health, education, communication, recreation and culture and restaurant and hotels.

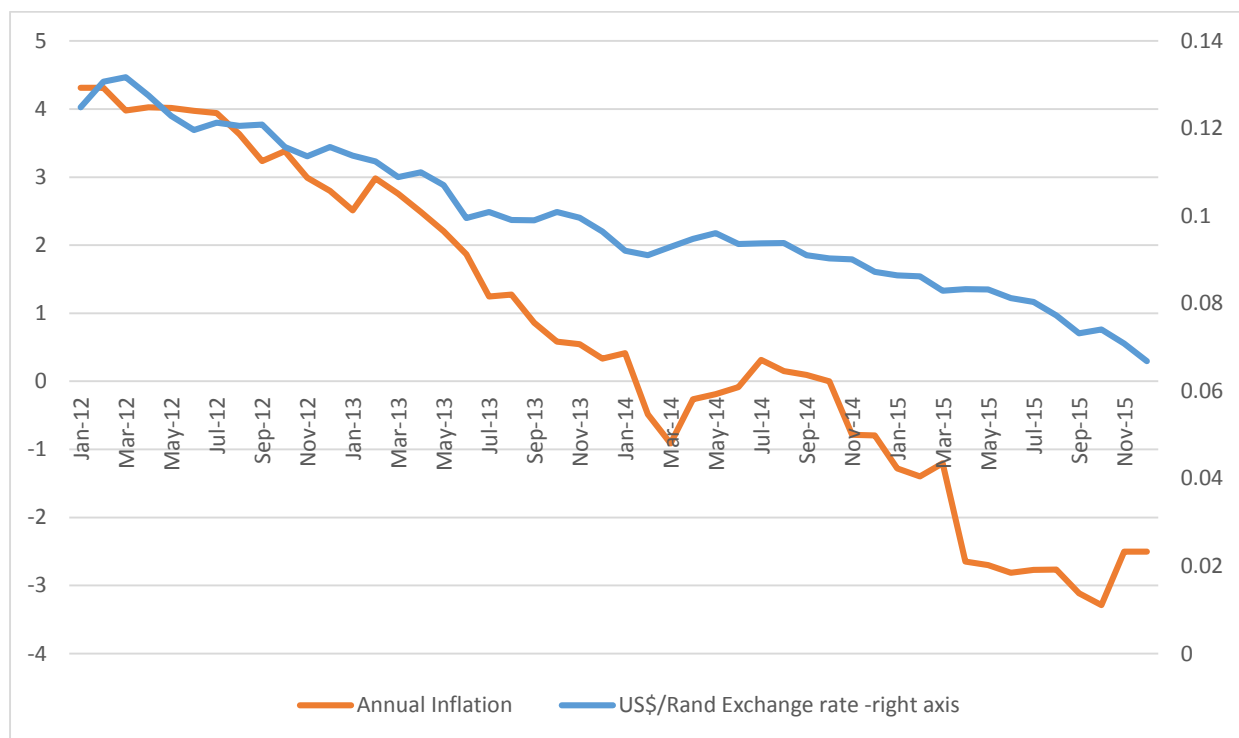
Table 1: Contribution of Major Components to the Inflation (Nov 2014 to Dec 2015)

Category	Average Annual Inflation (%) Nov 2014 to Dec 2015	Contribution to Inflation	Contribution to Inflation (%)
Food & non-alcoholic bev	-3.31	-1.07	48.90
Alcoholic bev & tobacco	0.33	0.01	-0.64
Clothing & footwear	-1.25	-0.07	3.33
Housing, water, elec & gas	-2.36	-0.40	18.49
Furniture & HH Equip	-2.22	-0.21	9.73
Health	0.74	0.02	-0.70
Transport	-1.18	-0.11	5.07
Communication	-11.22	-0.37	16.88
Recreation & culture	-0.84	-0.02	0.78
Education	1.75	0.10	-4.38
Restaurants & hotels	-0.96	-0.01	0.58
Misc. Goods & Services	-1.13	-0.04	1.95
Total	-2.18	-2.18	100

Source: ZIMSTAT, 2016

There has also been a close correlation between inflation trends and the movement in the US dollar/ South African rand, international food and oil prices and domestic output development. The US\$ appreciated against the South African rand by more than 70%, in nominal terms, between January 2012 and December 2015⁵. The appreciation of the US\$ against the South Africa rand affects domestic prices through Zimbabwe’s strong trade and economic linkages with South Africa. Figure 3 shows a strong relationship between the US\$/South African rand exchange rate movements and inflation trends in Zimbabwe since 2012.

Figure 3: US\$/rand Versus Zimbabwe Inflation Developments

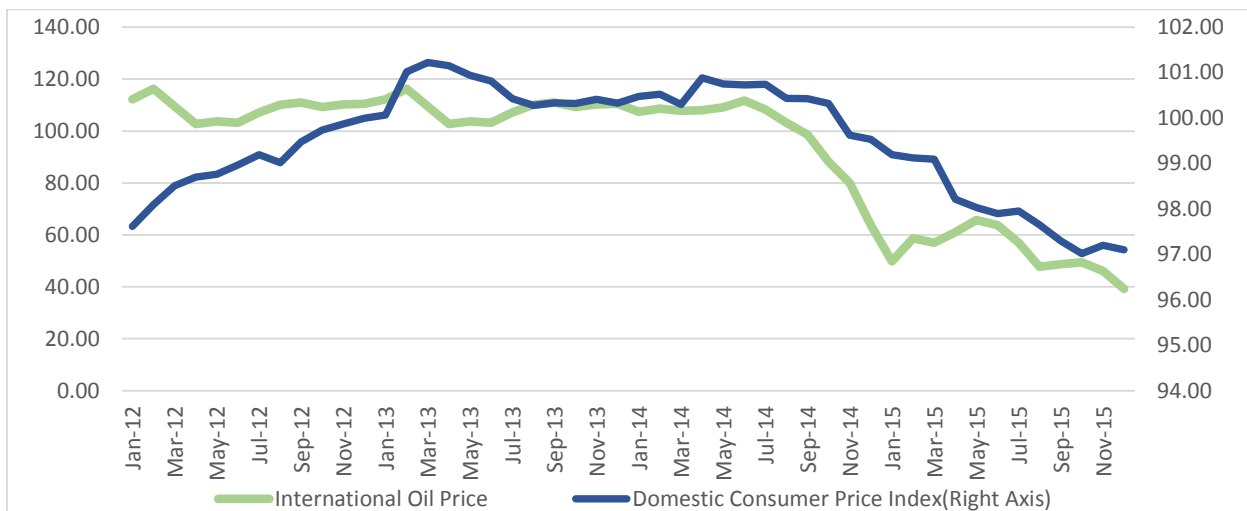


Source: ZIMSTAT and South African Reserve Bank, 2016

Zimbabwe is also a significant importer of fuel and other petroleum products. Crude oil price declined significantly from an average of about US\$96.2 a barrel in 2014, to a monthly average of \$39.22 a barrel in December 2015 (Bloomberg, 2016). Fuel contributes about 2.5% of the total CPI Basket. Figure 4 shows that there has been a positive relationship between oil prices and domestic inflation.

⁵ The appreciation is conveniently calculated as a direct movement in the US\$/ South Africa rand exchange rate

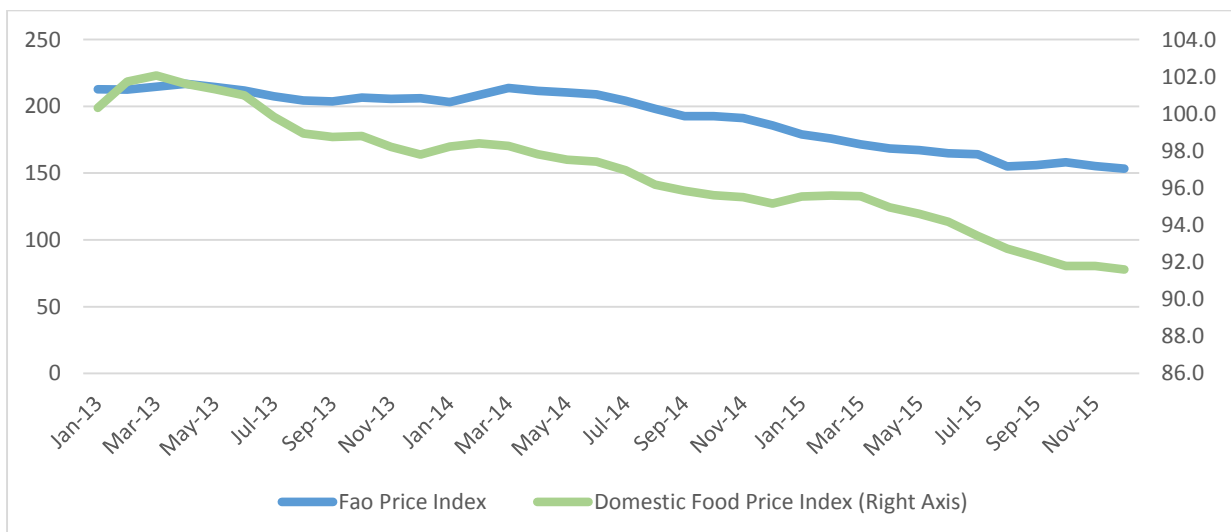
Figure 4: Crude Oil Price Developments (US\$/Barrel)



Source: *www.bbc.co.uk, KITCO, Bloomberg.com and ZIMSTAT*

The international prices of food have also been declining since 2013. According to the Food Agriculture Organization (2016), international prices of food declined by 28% between January 2013 and December 2015. The decline was across the board with cereals dipping by 38%; oils, 29%; and meat, 19%. Given the reduced agriculture output in the economy, an increased proportion of cereals and oil is imported as input into the manufacturing industry. Figure 5 shows a strong correlation between international and domestic food price indices.

Figure 5: Food and Agricultural Organization Food Index

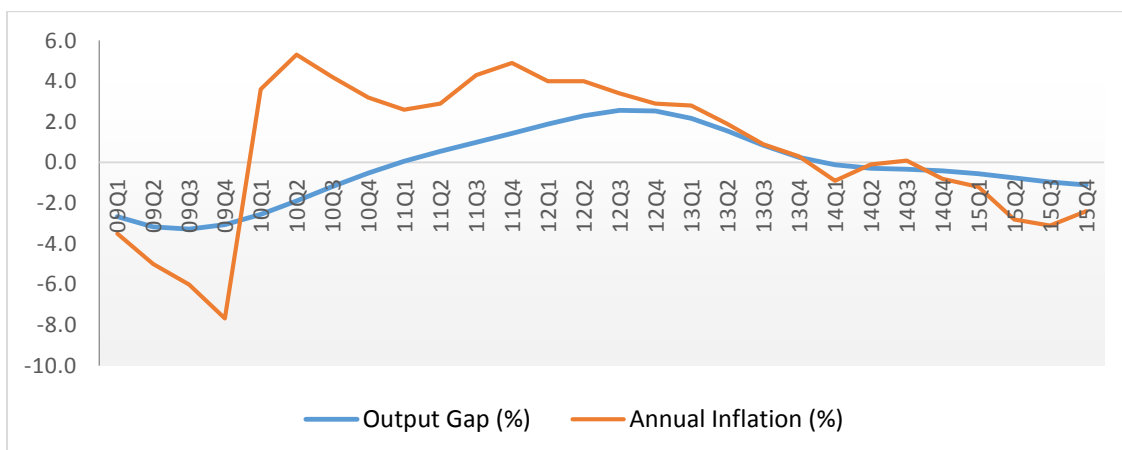


Source: *FAO and ZIMSTAT, 2016.*

The dampening of inflationary pressures in the economy also coincided with the general slowdown in economic activity. Economic activity, declined from an average growth rate of 10% over the period 2009-2013, to below 5% in 2014 and is estimated at 1.1% for 2015 (ZIMSTAT, 2015; MOFED, 2016). The slowdown in economic activity could have reduced aggregate demand in the economy, adversely affecting business volumes and profit margins. The situation could have been compounded by a wave of retrenchments witnessed in the recent past.

The economy has also been operating below its potential output as reflected by a negative output gap. Potential output is the maximum amount of goods and services an economy can produce when it is most efficient, that is, close to full capacity. Potential output is often referred to as the maximum output an economy can sustain without generating a rise in inflation (De Masi, 1997). From a policy perspective, it is the level of output which stabilizes the inflation rate. In this context, the output gap is a summary indicator of the relative demand and supply components of economic activity. If the output gap is positive over time, prices will begin to rise in response to demand pressure in key markets. Similarly, if actual output falls below potential output over time, prices will begin to fall to reflect weak demand. Figure 6 shows the estimated output gap for Zimbabwe.

Figure 6: Zimbabwe’s Output gap (Percentage) and Annual Inflation (2009-2015)



Source: RBZ Computations, 2016

As shown in Figure 6, the negative output gap has been widening since 2014, mirroring the inflation profile witnessed in the economy. Other factors such as downward revision of tariffs for communication and falling rentals for housing could also have contributed to the negative

inflation. This review of stylized facts could imply that both external and domestic factors could have contributed to the country's negative inflation.

SECTION III: INTERNATIONAL EXPERIENCES WITH NEGATIVE INFLATION

There are a number of countries that have experienced negative annual inflation rates in recent times. Though in most cases, negative inflation episodes were transitory, there are countries that have had protracted deflation such as Japan, Taiwan and Hong Kong.

Japan

Deflation in Japan started in the early 1990s, and persisted until July 2006. The inflation rate reached -0.8% in 1999 and was sustained until 2005.

Japan's deflation, which occurred between 1999 and 2005, largely emanated from a large burst in asset price bubbles in both equities and real estate markets, which had peaked to unprecedented levels in late 1989 (Slany & Sudo, 2006). The burst was followed by severe balance sheet problems for both households and firms due to the collapse of equity and, eventually housing prices, which undermined the value of collateral used to secure bank loans. This constrained the demand for investment funds, with adverse implications on national output.

Accompanying the weakening balance sheets of households and firms, was also a growing percentage of non-performing loans (NPLs) in Japanese banks, as default rates increased due to poor balance sheet performance. NPLs increased from an average of 3% for the period 1991 to 1996, to around 7% for the period 1997 to 2005 leading to cautionary lending by banks, low levels of investment and capital formation, and hence low GDP growth rates (Nelson & Tanaka, 2014; Fuji & Kawai, 2010).

The low national output led to the importation of relatively cheap consumable goods and raw materials from China, which had comparatively lower wages and faster growth rates. As such, the goods component of Japan's CPI started falling faster than that for services, as domestic producers had to review their prices downwards in order to remain competitive, leading to sustained declines in the general price level.

Japan dealt with deflation through undertaking unconventional policies under the Abenomics program. Abenomics was underpinned by monetary (quantitative) easing, fiscal expansion and deep rooted structural reforms (Boeckx et. al, 2015).

Hong Kong

Hong Kong experienced a long period of deflation, from the onset of the Asian financial crisis in late 1997, until the 4th quarter of 2004. Inflation declined from above 9% in 1995 to a trough of -4% in 1999 (Fukuda & Yamada, 2012). Deflation occurred for five years from 1999 to 2004, with prices falling steadily. Prices in Hong Kong finally began to rise in 2005 and inflation recovered to 2%, on an annualized basis in 2007 (Fukuda & Yamada, 2012). The country suffered a burst in the property price bubble, where residential property prices and rentals fell by around 60% and 40%, respectively, from their peak levels in mid-1997 (Fukuda & Yamada, 2012; Chiu, 2003). This dampened private consumption and investment, which was worsened by the global economic downturn, in the aftermath of the Asian financial crisis.

Hong Kong's deflationary period was, however, associated with a remarkable real economic growth in spite of the large declines in prices. In this regard, the historical experiences of Hong Kong exhibit that deflation not always results from economic recession. Hong Kong's deflation was caused by external factors, not internal demand factors. What is interesting for the Hong Kong's case was that its monetary policies lacked flexibility, with the US dollar peg under the Currency Board System, interest rate in HKD was passively linked to interest rate in USD (N'Diaye, 2003; Genberg & Pauwels, 2003). The deflation was halted by an increase in export and import prices as a result of a devaluation of the HKD effective exchange rate in 2003 (Imai, 2009).

Taiwan

Taiwan also experienced deflation from 1999 to 2003, with the Consumer Price Index (CPI) declining in each of the years from 2001 to 2003, and the core CPI also exhibiting a negative growth rate in each quarter until 2003 (Yang and Shea, 2005). Average inflation was recorded at -0.2% in 2002 and -0.3% in 2003, with another episode occurring in 2009, where inflation reached -0.9% (Yang and Shea, 2005). The deflation in Taiwan largely emanated from a combination of technological advancement leading to improved efficiencies; influx of cheap products from China; and the appreciation of the local currency.

SECTION IV: LITERATURE REVIEW

Using a narrow definition, deflation occurs when the annual rate of inflation falls into negative territory for a period of at least a quarter (Rogoff, 2003), implying that Zimbabwe has experienced deflation since November 2014. This definition does not, however, make a distinction between the causes and nature of shocks driving inflation dynamics. It is important to note that, negative inflation is not always harmful. Furthermore, it is vital to determine the sources as well as the extent and duration of the decline in inflation, that is, whether it originated from shocks to aggregate supply or aggregate demand. In this regard, the consequences of the decline in inflation depend on whether it is demand-side or supply-driven.

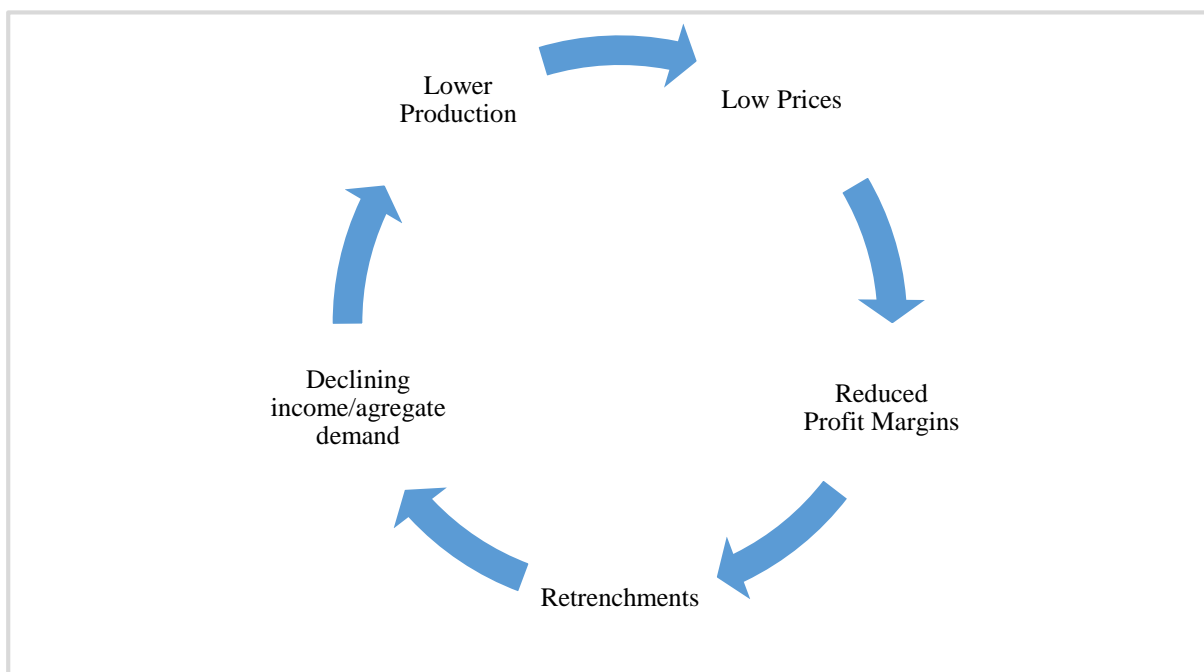
Demand-driven

Negative inflation from the demand side is normally associated with a reduction in money supply, credit or consumer spending (Marcin, 2015). It is this negative inflation that occurs when the economy is in a depression and lead to a deflationary spiral. A depression occurs when there is a prolonged and severe decline in GDP exceeding 10% and lasting more than 2 years (Economist, 2008). It is associated with large increases in unemployment, reduced credit availability, often due to banking or financial crisis, shrinking output as aggregate demand falls and firms cut back on production and investment, large number of bankruptcies, significantly reduced amounts of trade and commerce, as well as highly volatile exchange rate fluctuations. Prolonged deflation creates a vicious cycle of lower prices, reduced profit margins, worker retrenchments, reduced demand for goods and services and lower production.

Bagus (2015), argues that if the stock of money in an economy falls, there is insufficient money to purchase the goods and services that have been produced in the economy. As a result, this would lead to a fall in aggregate demand, resulting in excess supply which may drag the price level down. If this situation is sustained for long period of time, the fall in prices might lead to deflation. As regards asset bubbles, Burdekin and Siklos (2004) point out that when a bubble bursts, asset prices fall, reducing the value of a borrower's assets. Weaker balance sheets, result in households reducing their demand for goods and services which would be accompanied by a fall in the general price level (Roubini, 2005).

The decline in aggregate demand in an economy results in a general fall in prices of goods and services, as firms need to attract customers by reducing prices. As prices start to fall in the economy, consumers may in turn delay spending, anticipating further lower prices. This results in excess capacity in an economy, prompting decreases in profits and therefore, demand for labour. Another way in which negative inflation from the demand side effects economic activity is through the increase in real wages. A rapid fall in prices increases the real wages, when prices are falling faster than wages. This is mainly due to the fact that most wages are sticky downwards. This increases the cost of production. The scenario of declining product prices, against rising production costs impacts negatively on profit margins, resulting in reduced production and employment. The degree to which wages are sticky downwards in nominal terms determines the effect on the economy. Figure 7 shows a vicious cycle of deflation.

Figure 7: Vicious Cycle of Deflation



As shown in Figure 7, decline in aggregate demand results in lower production costs, which translates to lower prices and reduced profit margins. The lower profit margins force companies to lay off workers, thus, creating a vicious cycle. A prominent example of such a deflationary spiral is the persistent post-1998 deflation in Japan.

Supply-side Negative Inflation

Supply side negative inflation occurs when falling prices are driven by improvements in supply (Bordo & Filardo, 2005). The increase in supply is driven by growth in productivity, technological advances, improved labour productivity and lower per unit costs of production. Positive supply shocks can arise from technological advancement in the production of goods and services (Bagus, 2015). Technological advancements tend to reduce production costs and the final price of goods and services (Shea, 1999). In this regard, supply increases due to the lower production costs as well as the entrance of new producers. In Zimbabwe, the fall in international oil and food prices and appreciation of the US dollar against the South African rand can also result in a positive supply shock in the economy.

Moreover, successful structural policies can also result in falling prices in the economy. The removal of entry barriers to certain industries and reduction of the cost of doing business may lead to positive supply shocks (Sexton, 2015). Reduction of tariffs may also have the same effect. Positive supply-side negative inflation may result in stable spending in the economy as the decline in prices is offset by an increase in the level of output. The fall in prices results in increased real incomes. In the same vein, company profits may remain stable, as lower prices are offset by lower per unit costs of production due to increased labour efficiency. As a result, supply side negative inflation is conducive to economic growth and stable profit margins. Supply side negative inflation has, historically, resulted in periods of persistent price decline co-existing with relatively stable economic growth as was the case when the US economy expanded annually at 4.6%, while prices declined by 2.9% between 1869 to 1896 (Marcin, 2015).

Countries which experienced protracted negative inflation include the United States during the Great Depression, of 1929-1933; Japan 1990-2006; and Hong Kong following the Asian financial crisis of 1998-2004 (Marcin, 2015).

Empirical Literature Review

A number of empirical studies have advanced the idea that deflation is not necessarily a bad thing. This strand argues that deflation increases the purchasing power of those with fixed incomes. Bruegel (2014) also argues that deflation is good when associated with positive supply shocks as several historical episodes suggest. Borio (2004) shows that much of the 19th

century was an era of good deflation, with gently falling prices amid productivity gains and flourishing world trade. For instance, Britain was in deflation for 51 years between 1801 and 1879, the era of British economic ascendancy. Similarly, in German prices fell by 2% from 1880 to 1913, with growth increasing at an average of 4%. Borio (2004) noted that the extent to which deflationary episodes should raise policy concerns would depend very much on the nature of the corresponding deflationary pressures and the broader economic context in which they took place.

Shilling (2013) noted that there is an important distinction between good deflation caused by excess supply and bad deflation created by deficient demand. Good deflation is the result of new technologies that power productivity and output as the economy grows rapidly and as supply outpaces demand. The bad kind stems from financial crises and deep recessions, which increase unemployment and depress demand below the level of supply. De Grauwe (2014) noted that the consumption-postponement effect does require prices to fall. Only if consumers actually expect prices to decline will consumer-postponement effect start operating. The debt deflation dynamics, however, start operating when inflation is lower than the rate of inflation that was expected when debt contracts were made.

N'Diaye (2003) undertook a comprehensive econometric analysis of the determinants of deflation in Hong Kong SAR to determine the relative contributions of factors such as increased productivity, scarce money supply, and excess capacity in determining deflation. The author concluded that the effects of permanent shocks, such as productivity shocks and shocks related to changes in the money supply and price convergence with trading partners, had been more significant in explaining deflation.

Genberg and Pauwels (2003) using both the VAR and New Keynesian Phillips curve frameworks for the period 1997 to 2003, also showed that the deflation in Hong Kong emanated from declining prices of imported intermediate and final goods. Foreign shocks constituted the basic underlying driver of deflation. This corroborated results by N'Diaye (2003), which indicated that price convergence with trading partners influenced the prices in Hong Kong.

Goretti and Zhan (2015) examined the factors contributing to recent negative inflation in Bulgaria and their relative importance. The study utilised an expectation-augmented Phillips

curve framework using monthly data for 2012–14. The results suggested that inward spillover of low inflationary pressure from the EU to Bulgaria has been the most significant factor. The negative inflation was also exacerbated by the downward review of administered prices such as electricity price cuts. Falling global commodity prices also contributed to negative inflation particularly since late 2014.

Iossifov and Podpiera (2014), applied a New Keynesian Phillips curve for non-euro area European Union countries and showed that falling food and energy prices have been the main driver of negative inflation. Countries with more rigid exchange rate regimes and a higher share of foreign value added in domestic demand have been more affected. Disinflation spillovers from the euro area have been an important factor for exchange-rate targeters with high foreign value added in domestic demand. In this regard, supply side factors have been more important in driving prices down than demand side factors.

Slaný and Sudo (2006) studied the causes of deflation in Japan between 1992 and 2004 and showed that demand side factors were the most prominent drivers of inflation. Low performance of the total factor productivity (TFP) as a result of an aged population resulted in a recession which caused deflation. Concomitantly, consumption and aggregate demand fell, with implications on consumer prices.

The review of both theoretical literature and country experiences show that negative inflation is not always harmful. What is important is to determine the sources as well as the extent and duration of the decline in inflation, that is, whether it originated from shocks to aggregate supply or aggregate demand (Marcin, 2015 & Bordo & Filardo, 2005). As such, a period of negative annual inflation may not in itself necessarily imply deflation in a meaningful economic sense, unless the price declines become generalised and entrenched in inflation expectations. Indeed, sustained negative rates of inflation are of concern if they create negative feedback loops with the real economy. For instance, prolonged negative inflation raises the burden for debt servicing. In addition, the reaction of banks, households and firms potentially creates additional negative feedback loops between the real economy and the price level.

on factors contributing to deflation in Hong kong by Genberg and Pauwels (2003) and Genberg (2005). The VAR model is specified, following Sims (1980) and expressed as follows:

$$Y_t = c + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \mu_t \quad (2)$$

Where, $c = (c_1 \dots c_n)$ is an n - dimensional vector of constants, $A_1 \dots A_p$ is a vector of autoregressive coefficients, Y_t is a vector of endogenous variables with dynamics and μ_t is an n -dimensional Gaussian white noise with covariance matrix. $E(\mu_t^1 \mu_t) = \varphi$.

The impulse response functions are used to track the effect of an exogenous shock or innovation in one of the variables on some or all of the other variables in the system. On the other hand, forecast error variance decompositions, provide an estimate of the contribution of each type of shock to the forecast error variance. In this study, the variance decomposition is used to assess the contribution of each factor that drives inflation to the overall inflation.

Data Sources

The study uses monthly data on CPI, VAT, US\$/rand exchange rate, international food and oil prices for the period January 2009 to December 2015. The CPI data was obtained from the Zimbabwe National Statistical Agency (ZIMSTAT), while data on VAT was obtained from the Ministry of Finance and Economic Development. The use of VAT to proxy aggregate demand may, however, affect the impact of this variable. International food and oil price indices were obtained from the World Development Indicators database. The US\$/rand exchange rate data was obtained from the South African Reserve Bank⁶.

⁶ <http://www.resbank.co.za/>

SECTION VI: RESULTS AND ANALYSIS

Unit Root Tests

As a preliminary analysis, the statistical properties of the data were assessed using unit root tests and Johansen cointegration tests. The unit root test results obtained from Augmented Dickey Fuller tests are shown in Table 2 below.

Table 2: Unit root tests

Variable	Augmented Dickey Fuller test	
	Level	First Difference
Consumer price index	-2.027355 (0.2746)	-5.316744*** (0.000)
South Africa rand/US dollar exchange rate	0.191850 (0.9696)	-9.177234*** (0.000)
World food prices	0.474806 (0.9844)	-5.685601*** (0.000)
Oil prices	0.746658 (0.9922)	-5.029732*** (0.0001)
Value Added Tax	-0.21898 (0.2746)	-5.211258*** (0.0001)

Source: Researcher's own Computations

The unit root test results in Table 2 show that all the variables become stationary after first differencing.

Results of Single Step Error Correction Regression Model

Table 3 below summarizes the regression results from the single step error correction regression model.

Table 3: Results of Single Step Error Correction Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.238031	0.372074	3.32738	0.0018
LOG(CPI(-1))	-0.313361***	0.106364	-2.946129	0.0051
LOG(ZAR(-1))	-0.071408***	0.019407	-3.679511	0.0006
LOG(FOOD(-1))	0.026946	0.017877	1.507286	0.1389
LOG(OIL(-1))	0.018963	0.021286	0.890874	0.3778
LOG(VAT(-1))	0.031478	0.019039	1.653368	0.1054
DLOG(ZAR)	-0.029293	0.025522	-1.147756	0.2573
DLOG(FOOD)	0.020656	0.026539	0.778308	0.4406
DLOG(OIL)	0.032832	0.037899	0.866297	0.391
DLOG(VAT)	0.021285	0.013542	1.57184	0.1232
R-squared	0.921323			

***Significant at 1%.

The results in Table 3, show that US\$/South African rand exchange rate and lagged CPI are significant at 1% level of significance. Other variables such as food, oil and VAT are, however, insignificant. It should, however, be noted that the significance of coefficients is not of great importance in pass through analysis for policy analysis. The size of the coefficient is what is critical.

Long Run Model

The long run is derived from the estimation of a conditional ECM, following Pesaran and Shin (1999) and is specified as follows:

$$LOG(CPI)_t = \beta_1 + \beta_2 LOG(ZAR_t) + \beta_3 LOGFOOD_t + \beta_4 LOG(OIL_t) + \beta_5 LOG(VAT_t)$$

Long run Pass through Effect

The long-run pass through effect to inflation are estimated following Bardsen (1989). The longrun coefficient is found by dividing the coefficient of the lagged independent variable by the lagged coefficient of the consumer price index (CPI) and multiplying by -1. The long-run pass through effects are shown in Table 4.

Table 4: The long-run pass through effects to inflation

Parameter	Variables	Elasticity
β_2	Rand/US\$ Exchange rate	-0.228
β_3	Food prices	0.086
β_4	Oil Prices	0.061
β_5	VAT	0.10

The results suggest that a 1% appreciation of the South African rand against the US\$ would result in a 0.228% increase in domestic prices, while a 1% increase in international food and oil prices would increase domestic prices by 0.086% and 0.061%, respectively. A 1% increase in aggregate demand would result in a 0.1% increase in domestic prices.

Overall, the pass-through analysis suggests a high response of domestic prices to shocks on the South African rand/US\$ exchange, international food prices and domestic demand conditions. The pass-through from international oil prices is low since it had been counteracted by other domestic policy measures, such as the introduction of additional taxes on fuel prices. Given that South Africa is the country's major trading partner, the downward correction of prices due to movements in the US\$/rand exchange rate is inevitable and a welcome development to consumers since it actually increases their personal disposable income. Zimbabwe largely depends on South Africa for most of its consumption goods. About 60% of the country's imports are sourced from South Africa (RBZ, 2015)

The pass through effect of aggregate demand to prices, at 10% is also quite high reflecting the impact of the deceleration of output on inflation. The decline in aggregate demand partly as a result of company closures and retrenchments also contributed to the fall in inflation.

The results of the pass through effects were also corroborated by evidence from the variance decomposition analysis. The variance decomposition indicates the relative importance of each variable in influencing inflation dynamics over the period under consideration. As shown in Table 4, the US\$/South African rand exchange rate, international food and oil prices as well as aggregate demand played a key role in influencing domestic prices. Table 5 shows variance decomposition of inflation results.

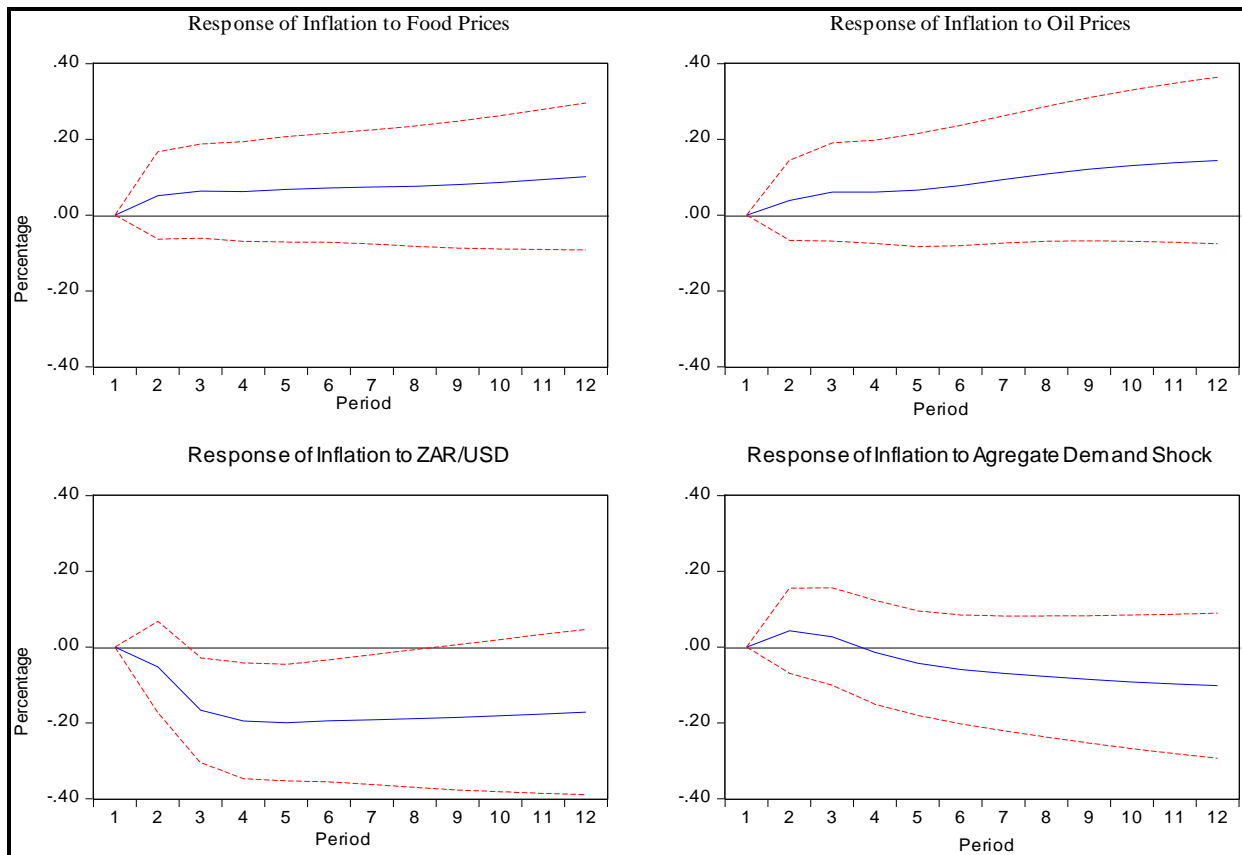
Table 5: Variance Decomposition of Inflation (%)

Period	INF	LOG(FOOD)	LOG(OIL)	LOG(ZAR)	LOG(VAT)
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	95.55575	1.358579	0.769705	1.382123	0.933843
3	82.14095	2.647593	2.076947	12.10267	1.031834
4	70.44352	3.437141	2.917863	22.29097	0.910509
5	61.53374	4.135792	3.628957	29.45046	1.251058
6	55.00097	4.728063	4.508046	33.88635	1.876575
7	49.93018	5.187309	5.656113	36.63881	2.587590
8	45.83623	5.555178	7.013139	38.27415	3.321301
9	42.47022	5.903580	8.459945	39.11079	4.055465
10	39.69576	6.287408	9.891178	39.35242	4.773235
11	37.41006	6.733141	11.24119	39.15971	5.455900
12	35.52408	7.243722	12.47942	38.66454	6.088241

The variance decomposition results in Table 5 suggest that about 38.7 percent of the variation in inflation is due to the movement in the US\$/South African rand exchange rate; international oil price, 12.5 percent; world food price, 7.2 percent; and aggregate demand, 6.1 percent. Inflation persistence explain 35.5 percent of the variation in inflation. External shocks, altogether accounted for 58.4 percent of the variation in domestic prices.

Figure 8 shows the impulse response functions of inflation to different inflation drivers.

Figure 8: Impulse Response functions of Inflation



The impulse response functions in Figure 8, suggest that domestic inflation is most responsive to fluctuations of the US\$/South African rand exchange rate. An appreciation of the US dollar against the South Africa rand results in a negative impact on inflation in Zimbabwe. Shocks in international food and oil prices impact positively on domestic prices albeit with a lesser impact. Moreover, a negative shock on aggregate demand impacts negatively on inflation.

Sensitivity Analysis

The sustained decline in consumer prices, particularly those emanating from a fall in global prices is a welcome development as it increases the purchasing power of consumers. The decline in international oil and food prices eased the food and energy prices in the economy. The inflation risk to the economy from these external factors, however, remains high as a significant depreciation of the US\$ dollar against the South African rand and increase in oil prices would result in increased inflation in the country. Figure 9 shows the potential impact of a 30% shock to key inflation drivers.

Figure 9: A Negative 30% Shock on Key Inflation Drivers

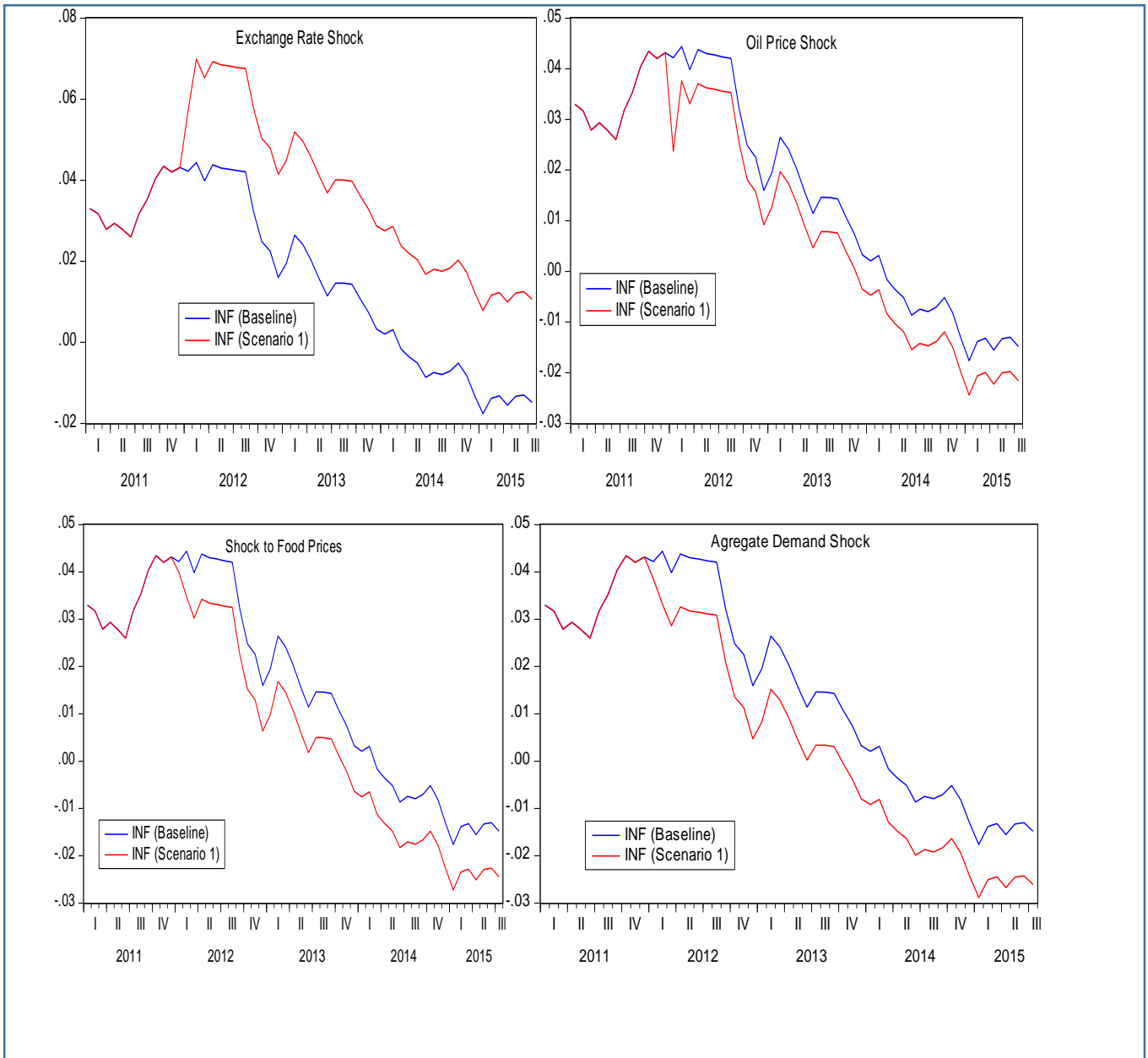


Figure 9 shows that inflation is more sensitive to exchange rate shocks, compared to other drivers of inflation in Zimbabwe. Specifically, the analysis suggests that inflation could have been well in positive territory if the US dollar had appreciated by 40 percent, instead of 70 percent since 2012.

SECTION VII: CONCLUSION AND POLICY RECOMMENDATIONS

The analysis in this paper has shown that the negative inflation experienced in Zimbabwe since November 2014 was mainly due to external factors. Together the external shocks accounted for about 58.4% of the variation in the country's inflation profile. Domestic demand accounted for 6.1% during the period 2011 to December 2015, while the remainder was attributed to inflation persistence. The downward correction in prices owing to external factors is a welcome development and could not be avoided in light of the recent slowdown in the international prices of oil and food and appreciation of the US dollar.

The results also suggest that Zimbabwe could also easily get out of the deflationary phase, even without any policy intervention if the South African rand appreciates against the US\$. Moreover, given the transitory and volatile nature of external shocks, it is unnecessary for the central bank to take any decisive action on negative inflation arising from transitory shocks. It is also important to note that South Africa cannot sustain a depreciated exchange rate forever. Sooner or later, the trend of depreciation of the ZAR/US\$ exchange rate witnessed in the recent past will induce inflationary pressures in the South African economy. An increase in inflation in South Africa, will offset the exchange rate gain, thereby exerting inflationary pressure in Zimbabwe given the high pass through of South African prices to domestic prices.

In Zimbabwe, the domestic industry should also take the opportunity of an appreciated US\$/ZAR exchange rate to retool as it is now cheaper to import plant and machinery from South Africa. Retooling of the industry would enhance productivity of the local industry. In addition, given that the decline in prices is occasioned by the correction of prices from high levels premised on the legacy of hyperinflation margins, the negative inflation rates may be beneficial to consumers under the multicurrency regime

It should be highlighted that while inflation is negative, the prices of non-tradables in Zimbabwe remain high compared to neighbouring and trading partner countries. Stated differently, Zimbabwe is a low inflation but a high cost country. According to ZEPARU (2014), most cost drivers such as electricity, water, transport, trade taxes and lending fees are priced more in Zimbabwe compared to regional countries. Despite the negative inflation, the high price environment, may imply that companies may still be productive at current prices, were it not for other structural rigidities and institutional bottlenecks.

High price levels require that authorities focus on reducing the cost of production, so as to improve and restore competitiveness. Dealing with deflation, however, poses significant challenges for Zimbabwe, given that the major causes are external.

It is recommended that measures must be put in place to restore competitiveness through internal devaluation. This may mean that negative inflation may deepen in the short-term. Once the country's cost structures are re-aligned to regional averages, industry becomes competitive, production increases and prices would begin to respond to economic fundamentals.

Although the negative inflation may have short term consequences, the resultant negative inflation environment may actually boost output and increase real incomes and wealth in the long run if productivity improves. The low price environment may also make exports of goods more competitive. Authorities, however, need to aggressively pursue policies that improve ease of doing business and attract FDI to increase output. Government needs to take proactive steps in managing the risks arising from sustained negative inflation, since it has limited policy options to influence inflation. As a small open economy with no independent monetary policy and limited space on the fiscal front, there seems little room for the Government to directly influence the inflation path. There is also need to re-align nominal wage levels, with increases tied to productivity gains, taking into account the effect of falling prices.

The negative inflationary environment has also affected the competitiveness of the local industry against imported goods, while reducing the prices of exportables. Since the price of tradable goods must be equal among countries (Law of One Price), the only policy option for the country under a dollarized environment is to improve productivity, which reduces the relative cost of production and increases profit margins. A sustained improvement in productivity, particularly in the tradable sector would eventually result in increase in wages in that sector which will also spill over to the non-tradable sector. The pressure to increase wages in the non-tradable sector would, through the Balassa-Samuelson effect⁷ result in increases in prices in the non-tradable sector and will assist the economy to eventually climb out of negative inflation.

⁷ The Balassa Samuelson effect suggests that an increase in wages in the tradable goods sector of an economy will also lead to higher wages in the non-tradable (service) sector of the economy

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