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THE IMPACT OF A BUDGET DEFICIT ON INFLATION IN ZIMBABWE

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Abstract

The Zimbabwean economy is one of the many numbers of countries that has experienced a relatively high fiscal deficit for a prolonged period with the result of a high inflationary environment. This paper examines the deficit-inflation nexus in the Zimbabwean economy and establishes the causal link that runs from the budget deficit to the inflation rate using Johansen (1991, 1995) cointegration technique over the period 1980 – 2005. Due to massive monetization of the budget deficit, significant inflationary effects are found for increases in the budget deficit

1 INTRODUCTION

Whilst the budget deficit – inflation relationship is not always obvious, the fact that Zimbabwe since independence has experienced both high inflation rates and budget deficits, presents an interesting case study for the relationship between the two fundamental indicators. Since 1980 to the present day, the Zimbabwean government has consistently run its economy with a budget deficit. Budget deficit is the amount by which total government expenditures exceed total government revenues in a given particular period of time, usually a year.

Government expenditures are categorized into either current (non-developmental) expenditure or capital (developmental) expenditure. The former comprises material consumption of the state sector, salaries of government employees, and all kinds of transfers to population. The latter includes expenditure on fixed capital (such as road infrastructure) and depreciation. On the other hand, national budget revenues include all kinds of taxes and other levies. Thus, the interaction between the budget and the rest of national economy can be observed through the definition of budgetary deficit.

Generally, the revenue side of the budget is positively and highly dependent upon the overall economic performance at any given time. If the economic activity in the country is on the upswing, the budget revenues will grow without increase of the fiscal burden (with even possibilities of budget surplus, which is the opposite of budget deficit). Although the expenditure side of budget has often been labeled in the economic literature as the instrument of economic policy (exogenous variable), even in stable economies, the budget expenditures appear to be

much more inert (Anusic, undated). Given this positive correlation, it follows that if a country is in the period of economic stagnation, substantive changes occur in the budget sphere. Budget revenues decrease due to erosion of the tax base, while expenditures rise mostly due to increase in transfers to population (unemployment benefits, social welfare etc.).

Economically, the universal belief is that budget deficit is *a priori* harmful for the total functioning of economy. The most frequent arguments are crowding-out effect on gross investments, intertemporal effects of budget deficit and its impact on inflation. According to the second argument, budget deficit today relentlessly implies the necessity of running a surplus in the future budget, what simultaneously means heavier fiscal burden for future generations. It is, however, often forgotten that interest on government bonds will also be the income of future generations. As long as the deficit is financed through internal debt, interest payment is simply financial transfer from one group of population to another. Although these transfers need not be desirable, it cannot be said that they represent a burden for national economy (Anusic, undated). It is important to note that, higher deficit policies may, however, lead to higher inflation even in the absence of monetization by Central banks. Ackay et al (1996) pointed out that there are two other possible channels through which higher deficits lead to higher inflation. Firstly, the government's borrowing requirements normally increase the net credit demands in the economy, driving up the interest rates and crowding out private investment. The resulting reduction in the growth rate of the economy will lead to a decrease in the amount of goods available for a given level of cash balances and hence the increase in the price level. Secondly, deficits can also lead to higher inflation even when Central Banks do not monetize the debt when the private sector monetizes the deficits. This occurs when the high interest rates induce the financial sector to

develop new interest bearing assets that are almost as liquid as money and are risk free. Thus, the government debt not monetized by the Central Bank is monetized by the private sector and the inflationary effects of higher deficit policies prevail. Of these three possible channels, this paper analyses the monetized deficit-inflation relationship.

The Zimbabwean economy is one of the many cases that have experienced an inflation trend which trended from relatively high rates to hyperinflation rates and this was accompanied by high fiscal deficits. This paper aims to examine the deficit-inflation relationship in the Zimbabwean context and establishes the causal link that runs from the budget deficit to the inflation rate using cointegration analysis over the period 1980-2005.

The paper is organized as follows. Section 2 gives an overview of the Zimbabwean situation, while section 3 discusses the budget deficit and inflation from the monetarist perspective. Section 4 estimates the relationship empirically, while section 5 provides conclusion.

2 THE ZIMBABWEAN ECONOMY, THE BUDGET AND INFLATION

2.1 The budget deficit and its financing

Government deficit has been one of the topical issues in the country's historical economic problems. Specifically, government spending especially on recurrent or non developmental is considered to have contributed extensively to the country's high inflation.

Since independence in 1980 to the present day, the government of Zimbabwe has consistently run its economy with a budget deficit. Whilst most applauded the deficits of the early independence years, the deficits in the last decade (1997 – 2007) have been damaging to the overall economy. Soon after independence (two to three years) the government embarked on massive capital expenditure especially in infrastructure developments such as roads, schools and hospitals, to mention just a few. The main motivation was to try and redress the lack or inexistence of these basic facilities to the majority Zimbabwean. The previous government (that is, government before 1980) regime's expenditures on these and other expenditure items were highly skewed towards the small minority race. Thus, these developmental expenditures (in the early 1980s) though they resulted in budget deficits, were however welcomed.

The budget deficits which were incurred especially in the years following 1997 to date were very much anti-developmental and some of them were not to the best interest of the country, but rather to the interest of the few ruling elites. Major government expenditures in this period include the unbudgeted government expenditure of 1997 to pay for the war veterans gratuities. Although, most people are not against payment of these gratuities, the way in which the payments were done was detrimental to the whole economy. These unbudgeted payments have ushered in a hyperinflation trend that has bedeviled the country ever since. In Zimbabwe's inflation history, they talk of the black Friday of 14 November 1997, as the one of the darkest day in the country's financial sector which saw the local currency depreciating more than 15 percent to the US dollar for the month of November (while the cumulative depreciation for the 1997 year was around 76 percent to the US dollar) (Reserve Bank of Zimbabwe – [RBZ] figures).

The other massive government non-developmental expenditures in chronological order includes the publicly condemned and unjustifiable Zimbabwe's intervention in the Democratic Republic of Congo (DRC)'s war in 1998; the expenses of the controversial land reform (begging 2000), the parliamentary (2000/2005) and presidential (2002) elections, introduction of senators in 2005 (at least 66 posts) as part of 'widening the think tank base' and the international payments obligations, especially since 2004.

In all the above expenditures (especially the ones after 1997), the budget deficits incurred were financed mostly by money printing (monetized deficits), with a small percentage (not more than five percent) financed by borrowing from the banking system (sometimes banks were commanded to lend the government). There was no meaningful (if any) foreign finance source during this period (1997 to date). The important link is that the source of finance implies a different effect of a budget deficit on inflation. Thus, overall, budget deficits in Zimbabwe, especially in the last decade were financed through domestic means. Economically, domestic financing is more inflationary than foreign financing in many developing country economies because of the fact that the economies of these developing countries is characterized by inefficient capital markets and high dependence on developed countries for foreign reserves (Solomon and de Wet, 2004). Zimbabwe's economy is not different from many other developing countries.

2.2 Inflation performance in Zimbabwe

Whilst the Chhibber et al's (1989) study reveal that Zimbabwe used to have traditionally relatively moderate inflation, that situation has since changed radically. For the first decade after independence (the period covered by Chhibber et al 1989) until 1990, average annual inflation rates were hovering below 15 per cent. Since 1999, the country has been experiencing hyperinflation, as defined by Cagan (1956). Although data shows that the country's monthly inflation rate reached the 50 per cent mark in February 1999, this monthly rate was above 100 per cent by November 2001 before jumping to rates higher than 200 per cent by January 2003. By the December 2003, the rate was squarely at 600 per cent, though it temporarily declined through 2004 and 2005, reaching the trough of 124 per cent in March 2005. Since April 2006, the monthly rate has been above 1000 percent, with the upward trend reaching the highest ever (as of March 2008) of 164 900,3% per cent in February 2008. Even though the country is still in this hyperinflationary trend (at the time of writing), evidence on the ground shows that no serious policy is yet to be instituted to curb this 'evil' phenomenon which has haunted the majority of the citizen. Although Reserve Bank of Zimbabwe (RBZ)'s monetary policy statements in recent years have suggested policy measures to deal with hyperinflation, incredible actions by the same institution have discouraged the majority in the 'war' against hyperinflation. That is, actions such as money printing (which have been referred to earlier) to finance government expenditures have meant that the public views any hyperinflation stabilization policy from RBZ as more of jokes. Thus to this day, hyperinflation still persists.

3 THEORETICAL LINKS OF THE BUDGET DEFICIT AND INFLATION

According to Akcay et al (1996), the correlation from deficits to inflation is generally a difficult one to establish for a number of reasons. Firstly, empirical studies which try to capture the connection between budget deficits and inflation are bound to produce results that are quite sensitive to the choice of the model being used when one considers the number of possible versions that can be constructed intending to capture a given structure. Secondly, the money-inflation nexus is itself a highly dynamic one for the following reasons: (i) inflation will cause the velocity of circulation to rise and even an intact money supply will generate more inflation; (ii) the rise in inflation will diminish the available inflation tax base for the government and the attempt on the part of the government to collect a given inflation tax revenue will bring forth an increase in the tax (inflation) rate; (iii) inflation might cause budget deficits to rise (revenues to fall) due to the Tanzi effect¹, and the pursuing monetization could lead to even higher rates of inflation (Akcay et al, 1996, p. 2).

Alavirad and Athawale (2005) argue that on the basis of theory and research, the relationship between budget deficit and inflation is extensive and that empirical researches have recently pinpointed different models for the subject matter. In most studies, government budget deficit variables are directly entered into the model and the relationship with inflation has been studied — a few indirectly, and some with proxy variables.

¹ The Olivera-Tanzi effect, occasionally called the Tanzi effect or the O-T effect, is an economic situation involving a period of high inflation in a country which results in a decline in the volume of tax collection and a slow deterioration of real tax proceeds being collected by the government of that country

Despite the possible diverse theories linking budget deficit and inflation, this paper will briefly present the monetarist perspective. The monetarist theory postulates that money supply drives inflation. That is, if monetary policy is accommodative to a budget deficit, money supply will continue to rise for a long time. This deficit financing will in turn cause aggregate demand to increase, causing output to increase above the natural level of output. Growing labour demand increase wages, and this in turn leads to the shift in aggregate supply in a downward direction. After some time the economy returns to the natural level of output. However, this happens at the expense of permanent higher prices (Solomon and de Wet, 2004).

Hamburger and Zwick (1981) argue that, from the monetarist view, budget deficits can lead to inflation, but only to the extent that they are monetized. Thus in the monetarist (and neo-classical) models, changes in the inflation rate is highly correlated to changes in the money supply. Normally, the budget deficit on its own does not cause inflationary pressures, but rather affects the price level through the impact on money aggregates and public expectations, which in turn trigger movements in prices. The money supply link of causality rests on Milton Friedman's famous theory of money, which dictates that inflation is always and everywhere a monetary phenomenon (Solomon and de Wet, 2004). Thus the monetarist view postulates that continuing and persistent growth of prices is necessarily preceded or accompanied by a sustained increase in money supply.

On the empirical side, the relationship between budget deficit and inflation has been researched by many economists, and below are a few of them summarized.

The study by Alavirad and Athawale (2005) measure and investigates the impact of budget deficit on inflation in the Islamic Republic of Iran. To achieve the objective, the research employed univariate cointegration tests: the autoregressive distributed lag model (ARDL) and Phillips-Hansen methods, to study the relationship between the two in the long term. Based on time series annual data from 1963 to 1999, the results show that budget deficits, as well as liquidity, do have a major impact on inflation rates in the Islamic Republic of Iran.

Solomon and de Wet (2004) studied the coexistence of a relatively high inflation rate and high fiscal deficits for a prolonged period for the economy of Tanzania. The research established a causal link that runs from the budget deficit to the inflation rate using cointegration analysis over the period 1967-2001. The study concluded that “due to monetization of the budget deficit, significant inflationary effects are found for increases in the budget deficit”.

The impact of budget deficit on inflation was also investigated on the economy of Ukraine by Piontkivsky (2001). Based on monthly data from 1995 to mid-2000, the study utilized the class non-structural vector auto regression (VAR) models to analyse the dynamics of the Ukraine budget deficit and inflation. The “... major finding in the VAR specification was that the fiscal imbalance, apart from other, purely monetary, factors, did play a role in determining inflation”.

Evidence documenting the relationship between the general level of prices and budget deficit in Turkey was researched by Ackay et al (1996). By employing cointegration tests, the study showed that budget deficit growth had a positive effect on increased price levels in Turkey.

4 EMPIRICAL ANALYSIS OF ZIMBABWE'S INFLATION

The commonly used empirical method to investigate the deficit – inflation nexus is to employ a single equation model for money growth or inflation and treating deficits as exogenous variable among others (Solomon and de Wet, 2004). To this end, this study employs a four variable single equation model with budget deficit, GDP and exchange rate treated as an exogenous variables and inflation (CPI) treated as an endogenous variable.

4.1 The Empirical Model

Adapting the framework presented by Solomon and de Wet (2004: p. 107 – 107), one need to start from the long run government budget constraint to get a better estimate of the influence of a budget deficit on inflation.

$$\frac{B_{t-1}}{P_t} = \sum \frac{1}{r_j} \left(\tau_{t+j} - g_{t+j} + \left(M_{t+j} - \frac{M_{t-1-j}}{P_{t+j}} \right) \right) \quad (1)$$

Where:

- B_{t-1}/P_t = Government debt
- r_j = The discount rate
- τ_{t+j} = Total tax revenue
- g_{t+j} = Total government expenditure
- M_t = Broad money supply

Taking into account a peculiar scenario where the public debt cannot grow implies that the entire budget deficit is ultimately financed through seignorage. Imposing this restriction on the public debt, one obtains the following short run budget constraint:

$$\frac{B_{t-1}(t)}{P_t} = \tau_t - g_t + \left(\frac{M_t - M_{t-1}}{P_t} \right) \quad (2)$$

where $B(t)$ is the public debt with maturity in period t that has to be paid and cannot be rolled-over. Thus by rearranging, this can be rewritten as:

$$\frac{B_{t-1}(t)}{P_t} - \tau_t - g_t = \left(\frac{M_t - M_{t-1}}{P_t} \right) \quad (3)$$

The left hand side represents the budget deficit formed from the fiscal deficit and repayment of public debt with the maturity in period t and the term on the right hand side is seignorage.

Seignorage revenue (S) can be written as a function of the inflation rate and real money supply as follows:

$$S = \frac{f(\Pi)M_t}{P_t} \quad (4)$$

where $f(\Pi_t)$ is a reduced form money demand equation.

Assuming that seignorage is increasing with inflation and combining equation (3) and equation (4), one obtains the similar equation estimated by Catao and Terrones (2001) which explains the inflation rate by the budget deficit and money supply:

$$\Pi_t = \frac{\beta d_t P_t}{M_t} \quad (5)$$

where β = the inverse linear multiplier

d_t = budget deficit which is $d_t = g_t - T_t - B_{t-1}$

M/P = money supply

If one divides by nominal GDP (Y) one obtains a relation between the size of budget deficit (D) in GDP and the level of inflation:

$$\Pi = \frac{D_t / Y_t}{M_t / Y_t} \quad (6)$$

The long run equation developed in this research includes the ratio of the budget deficit to GDP and the exchange rate as exogenous variables and the consumer price index, as the endogenous variable.

The impact of the budget deficit on inflation is positive. The higher the budget deficit, the greater will be the rate of inflation. The budget deficit affects inflation only if it is monetized to increase the monetary base of the economy, thus increasing the money supply thereby causing an increase

in the price level. When the budget deficit is monetized, an extremely high correlation exists between the budget deficit and money supply.

In order to estimate the effect of the budget deficit on inflation, the budget deficit is used as explanatory variable instead of the money supply. The second explanatory variable is the level of GDP, which is negatively related with the level of inflation. The third variable is exchange rate. This third variable has a deterministic effect on the level of prices in most developing countries. It is included as a control variable in this study that can explain inflation. In a developing country like Zimbabwe, an exchange rate depreciation (appreciation) normally increase (decrease) the price of imported commodities. The country's markets are heavily based on imported commodities, which imply the depreciation of the exchange rate could be immediately reflected on an increase on the price of the consumer's basket of commodities. The functional form of the model is:

$$\text{CPI} = f(\text{bdef}, \text{exr}, \text{gdp})$$

where: cpi is the consumer price index

bdef is the consolidated budget deficit

gdp is the level of gross domestic product at constant price

exr is the official exchange rate of Zimbabwe's dollar against U.S dollar

4.2 Data sources and stationarity issues

Annual data for CPI, GDP and official exchange rate (EXR) are obtained from Reserve bank of Zimbabwe (RBZ), while budget deficit data was obtained from the International Fund (IMF). All the data series are for the period 1980 to 2005.

Given the nature of time series variables, the univariate characteristics of the data were also conducted. Stationarity tests are done on all three variables in logarithm, that is, consumer price index (LCPI), GDP (LGDP) and exchange rate (LEXR). Since the values of the budget deficit are negative, stationarity test was done on this variable in level form (that is, BDEF). Two unit root tests are done to investigate the univariate characteristics of the four time series. These tests are the Augmented – Dickey – Fuller (ADF) and Phillips Peron (PP). In both the ADF and PP, the null hypothesis of a unit root could not be rejected for the variables expressed in level form. Thus, all the time series variables, except BDEF, are non-stationary and exhibit stochastic trends that can be removed by differencing once or more than once (See Appendix A, Table A1). Table A2 of Appendix shows the graphs of all the four series.

Thus, since majority of the variables were non-stationary, the Johansen test for cointegration between CPI, GDP, EXR and BDEF was employed to test for cointegration between these variables. For a VAR(2), the Johansen likelihood ratio test for the number of cointegrating relationships, based on both the maximum eigenvalues and the trace of the stochastic matrix suggests one cointegration relationship at a 5 percent level of significance between the variables in the long run cointegration relationship. These results are presented in Table 1.

Table 1: The Johansen test for the number of cointegrating relationships: Consumer prices

Cointegration LR test based on the maximum eigenvalue of the stochastic matrix				
Null	Alternative	Statistic	95% Critical	Prob
r=0	r=1	111.6	54.07	0.000
r<=2)	r=2	60.92	75.19	0.323
Cointegration LR test based on trace of the stochastic matrix				
Null	Alternative	Statistic	95% Critical	Prob
r=0	r>=1	50.68	28.58	0.000
r<=2)	r>=2	34.08	42.30	0.323

The results of the estimated long run relationship are presented in Table 2. As shown in the Table 2, the coefficient on budget deficit is positive and significant at one percent level of significance. Thus, for the case of Zimbabwe, budget deficit impact positively on the country's rate of inflation.

Table 2: Estimation of long run cointegration equation

Variable	Coefficient	Standard Error	t-statistic	Probability
C	8.341926	3.949157	2.112331	0.0462
DEF	3.45E-07	1.13E-07	3.044072	0.0060
LEXR	1.079171	0.042661	25.29650	0.0000
LRGDP	-0.818553	0.404380	-2.024218	0.0553
R ²	0.807	F-statistic	34.61	
Adjusted – R ²	0.761	Prob(F-statistic)	0.0000	

The results from the parsimonious error correction model (ECM) are presented in Table 3. All variables in the ECM are entered in first difference form. In this equation, (ECM_{t-1}) is the lagged error correction factor, given by the residuals from the static cointegration long run equation. In other words, (ECM_{t-1}) is the long run information set, represented by what economic theory

posits as the equilibrium hyperinflation behaviour. It is a stationary linear combination of the variables postulated in theory. It is a cointegrating vector. The coefficient of (ECM_{t-1}) shows the speed of adjustment to long run solution that enters to influence short run movements in hyperinflation. The results show that the coefficient of the error term (ECM_{t-1}) has a negative sign, which is significant at five percent level of significance. This is in line with theory, which expects it to be between -1 and 0 (or negative and less than unity in absolute terms), since we do not expect a 100 per cent or instantaneous adjustment. Thus this significant negative sign on the ECM ensures that all the explanatory variables in ECM work together for inflation to get to equilibrium in the short run.

Table 3: Estimation of ECM equation

Variable	Coefficient	Standard Error	t-statistic	Probability
$ECM_{(t-1)}$	-0.78663	0.270685	-2.90608	0.01301
D(LRGDP)	-1.98618	0.983775	-2.01894	0.03909
D(LEXR)	0.755509	0.116737	6.47189	0.0000
D(DEF)	5.68E-07	1.34E-07	4.238806	0.02677
R^2	0.753	Adjusted – R^2	0.717	

5 CONCLUSION

The public sector deficits and inflation relationship remains one of the most important and controversial issues in the academic literature as well as in economic policy field. Using annual data for the Zimbabwean economy for the period 1980 to 2005, the existence of a stable long run relationship between the budget deficit, exchange rate, GDP and inflation is tested in this study and the result has been confirmatory. Using the cointegrating vector found in the research, a significant positive impact of the budget deficit on inflation in Zimbabwe cannot be refuted.

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APPENDIX

Table A1: ADF and PP tests for non-stationarity

Series	Model	ADF		PP		Conclusion
		τ	τ_{μ} τ_{τ}	ϕ_3 ϕ_1	τ τ_{μ} τ_{τ}	
LCPI	τ_{τ}	6.053	56.69***	5.58	Non – Stationary	
	τ_{μ}	9.89	97.97***	7.49		
	τ	2.47	-----	10.81		
D(LCPI)	τ_{τ}	-1.288	1.85	1.23	Non – Stationary	
	τ_{μ}	0.116	0.013	0.237		
	τ	0.958	-----	1.43		
D ² (LCPI)	τ_{τ}	-5.36***	14.395***	-5.97**	Stationary	
	τ_{μ}	-4.971***	24.72***	-4.97**		
	τ	-4.698***	-----	-4.70***		
LEXR	τ_{τ}	1.127	6.87*	3.11	Non – Stationary	
	τ_{μ}	1.278	8.03***	4.014		
	τ	1.652	-----	5.83		
D(LEXR)	τ_{τ}	0.68	5.05	-2.65	Non – Stationary	
	τ_{μ}	2.17	5.81**	-1.82		
	τ	2.549	-----	-1.178		
D ² (LEXR)	τ_{τ}	-6.268***	19.51***	-10.01***	Stationary	
	τ_{μ}	-1.16	16.53***	-6.72***		
	τ	-0.81		-6.43***		
LRGDP	τ_{τ}	1.44	17.72***	1.032	Non – Stationary	
	τ_{μ}	-0.94	1407***	-2.427*		
	τ	-0.625	-----	-0.714		
D(LRGD)	τ_{τ}	-2.73	3.73	-2.849	Non – Stationary	
	τ_{μ}	-1.70	2.88	-1.68		
	τ	-2.04**	----	-2.09**		
D ² (LRGD)	τ_{τ}	-4.79***	11.92***	-6.313***	Stationary	
	τ_{μ}	-4.69***	21.95***	-5.54***		
	τ	-4.57***	----	-4.72***		
DEF ⁺	τ_{τ}	-3.74*	5870.6***	6.357	Stationary	
	τ_{μ}	-7.947***	7356.6***	7.385		
	τ	-10.09***	-----	7.890		

Note: *(**)[***] Statistically significant at a 10(5)[1] percent level

⁺ For this variable, ADF test is assumed enough. For differencing one or twice to accommodate PP test, the variable becomes non-stationary both when ADF and PP tests are applied. Nevertheless, in level form, four of the five ADF tests reject the null of non-stationarity.

The Augmented Dickey - Fuller and Phillips Peron results tests for non-stationarity shows that all the variables, except budget deficit, appear to be integrated of order two, that is stationary, they become after second differencing.

Table A2: Graphs of the series used in the model

