

Determinants of Household Debt in Botswana: 1994-2012

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Abstract

The paper identifies the factors that are influential in determining the growth of household debt in Botswana. Understanding the relationship between household debt and other economic indicators is an important step towards formulating focused and effective policies that control the effects of household debt on the whole economy. Using quarterly data from the first quarter of 1994 to the second quarter of 2012, the paper employs the Vector Error Correction Model (VECM) to analyse the influence of Gross Domestic Product (GDP) per capita, interest rates, inflation, household consumption and money supply on household debt. The findings indicate that GDP per capita, interest rates and money supply determine changes in household debt in the long-run. Further analysis shows that lagged household debt, interest rates and money supply influence changes in household debt in the short-run.

Keywords

household debt, vector error correction model, long run

1. Introduction

Household debt is an important component of most growing economies, on the condition that it is used prudently and in moderation. Without credit, the poor stay poor, but with the ability to borrow, individuals can spend even without current income (Cecchetti, Mohanty, & Zampolli, 2011). Household borrowing can be just as sensible as saving, especially borrowing to finance a more desirable consumption pattern, assuming that the agent has the capacity to service the debt (Bertola, Disney, & Grant, 2006). However, borrowing increases their vulnerability to the adverse effects of economic shocks. Rapid growth in household debt in a weak macroeconomic environment is problematic and is worsened by systemic vulnerabilities including poor risk management and ineffective legal and institutional infrastructure (IMF, 2006).

The amount of bank credit issued to households in Botswana has increased from P637.9 million in the first quarter of 1994 to P16,595.3 million in the second quarter of 2012 (Bank of Botswana, 2012). In the first quarter of 1994, household debt as a percentage of GDP was 24 percent but in the second quarter of 2012 it had risen to 57 percent, after reaching a peak of 66.9 percent in the first quarter of 2009 (Bank of Botswana, 1994, 2009, 2012). Furthermore, households' demand for unsecured personal loans grew at a faster rate than the demand for long-term secured vehicle and mortgage loans. In the

first quarter of 2004, unsecured debt accounted for 51.4 percent of total household credit but this figure rose to 71.3 percent by the second quarter of 2012 (Bank of Botswana, 2004-2012). This shows that households in Botswana hold increasingly large amounts of debt and hence increasing levels of arrears. Clearly, as the levels of arrears in this period grew from 5 percent of total credit to 12.2 percent, households experience escalating financial distress which reduces their ability to service their debts. This scenario leaves Botswana's financial sector exposed to major risk of losing huge amounts of money to defaulting borrowers.

Households' use of unsecured credit is not monitored by the lenders hence its use includes building small structures and purchase of second hand vehicles which normally could not be financed through secured credit (Radipotsane, 2007). Competition in the growing financial sector has increased the supply of credit to households, introduced less stringent credit application requirements and higher credit limits. As a result, households can borrow larger amounts of unsecured credit which significantly increase the risk to the financial sector. This is because lenders cannot control the risks incurred by borrowers with unsecured loans, thus increasing the likelihood that borrowers will default.

The growing trend of households' failure to repay the principal and interest amount borrowed from the financial sector is another threat to the wellbeing of the economy. The funds issued to households as credit do not belong to the banking sector, but are the savings deposited by other households and institutions. Failure by households to repay will have a magnified effect on commercial banks, other institutions in the financial sector and the rest of the economy. The problem is that if banks fail to recover the funds lent to households, they would in turn fail to honour their obligations to their debtors and creditors. The banking sector is increasingly vulnerable and fragile since over 60 percent of its total credit is extended to households, of which 71.3 percent is unsecured (Bank of Botswana, 2012). The sense of insecurity whether banks will honour their obligations will trigger panic and loss of confidence in the banking sector by savers and investors. On the other hand, risk reduces the banks' willingness and capacity to lend and increases their risk premiums on credit. The crisis will spread to the rest of the economy as losses in savings reduce capital available for investment, reduce total production and adversely affect economic growth.

Therefore, the persistent increase in the growth of household debt and the associated growth in the default rate, poses a threat that can spread to the entire economy. Furthermore, the official data on household debt in Botswana does not account for the entirety of the amount of debt accrued by households since it does not account for the money borrowed from the informal sector, employers and credit acquired in shops (Okurut & Botlhole, 2008). Currently, there is no way for authorities to trace and record the level of transactions that are undertaken between households and the informal financial sector. This situation proves that the more households accumulate debt the less they are able to repay the debt given the unknown extent of their borrowing from both sectors. Therefore, the financial sector's ability to recover loans and absorb the losses comes into question, especially when households' total debt burden and their ability to sustain it is unknown.

Understanding the factors that determine the increase in household debt is a critical step towards minimizing the negative effects of high debt levels on the economy. Previous studies have suggested that income, consumption, the housing price index, interest rates, inflation rates, economic growth, unemployment rates and money supply are some of the factors that determine the growth of household debt (Tudela & Young, 2005; Nieto, 2009; Kim, 2011; Meniago, Mukuddem-Petersen, Petersen, & Mongale, 2013). The lack of definitive studies on the causes of the growth of household debt in Botswana imply that it is debatable which factors actually have significant effect on the level of debt among households in Botswana. Evidently, there is need to study and identify factors that influence this persistent growth in household debt in Botswana. Therefore, the paper seeks to investigate the determinants of household debt in Botswana. The paper specifically aims to determine the effects of GDP per capita, nominal interest rate, inflation, household consumption and money supply on household debt in Botswana.

1.1 Growth Trends of Selected Economic Variables

In the period between 1994 and 2012, Botswana has experienced rapid credit expansion to the private sector with households borrowing the larger portion. Household debt as a percentage of GDP went from as low as 18.3 percent and to a high of 66.8 percent (Figure 1). Since 2004, the growth of the household debt—GDP ratio was faster but with more pronounced peaks and valleys. Volatility of this variable can be explained by changes in interest rates as the central bank worked to stabilise credit supply and inflation rates. The data depict a growing trend in the ratio of household debt to GDP.

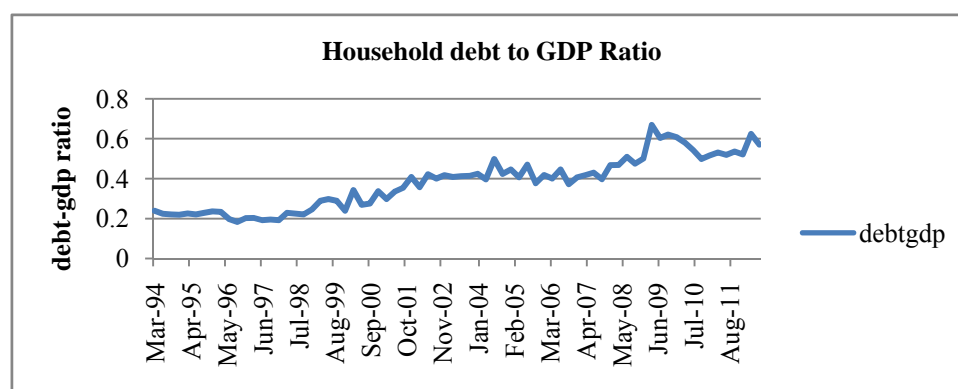


Figure 1. Household Debt to GDP Ratio

Source: Bank of Botswana Financial Statistics (1994-2012).

Figure 2 shows a definite positive growth trend in GDP per capita. The economic shocks in the past five years made their mark but the economy was seen to recover from every plunge in its earnings. By lowering the bank rate, the central bank managed to encourage credit expansion and stimulate spending by the private sector to compensate for slower government spending since 2008. Even though the data shows a significant growth in GDP per capita, it is not a definitive that all sectors of the economy are experiencing a proportionate increase in income.

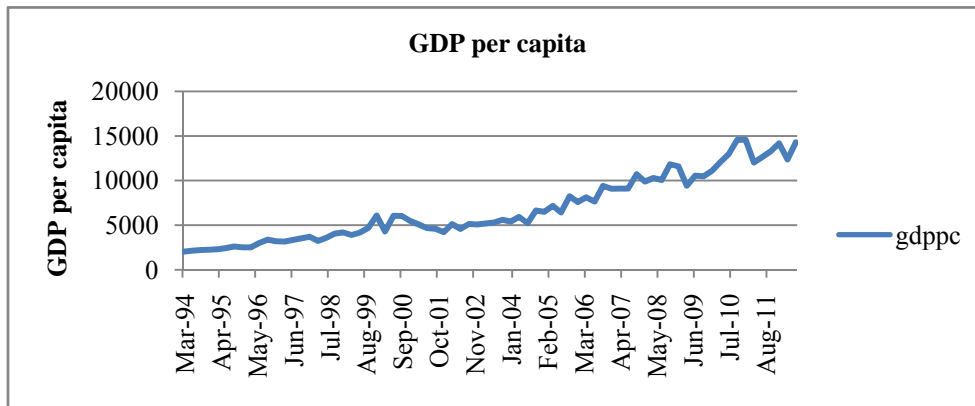


Figure 2. GDP per Capita

Source: Bank of Botswana Financial Statistics (1994-2012).

Figure 3 shows growth in household consumption in relation to GDP. Over the period of study, consumption-GDP ratio varied between 27.7% of GDP and 57.4% of GDP. Stronger growth in GDP per capita clearly does not translate to similar growth in consumption and saving. This can indicate that households spend more and more of their income on debt and interest payments. However, if household debt is increasing and consumption is increasing by a less than proportionate rate that can also indicate that households use most of their credit to import foreign products that do not contribute to aggregate domestic consumption.

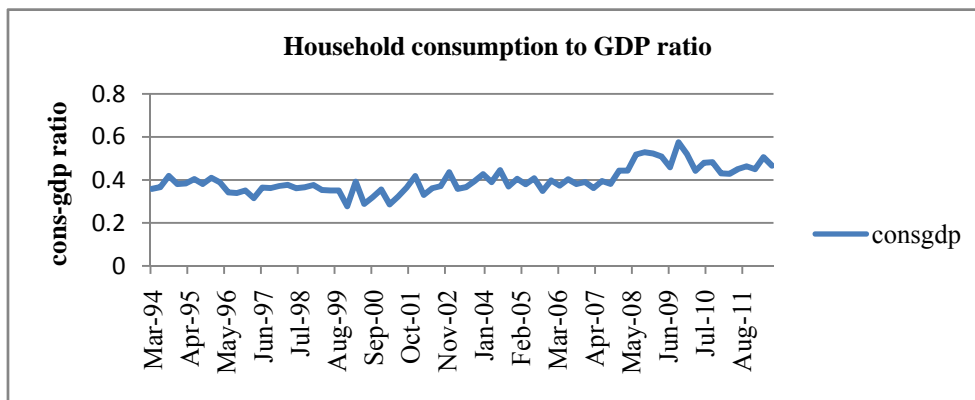


Figure 3. Household Consumption to GDP Ratio

Source: Bank of Botswana Financial Statistics (1994-2012).

Inflationary pressure on domestic prices has a direct effect on households' real earnings. When prices increase at a higher rate than households' earnings, it means that their real income is declining (Figure 4). A general increase in the price level also means that households spend a greater share of their disposable income on consumption than savings. Figure 4 shows significant and steady growth of the

price level. This inflationary pressure can be attributed to global and domestic factors like increase in the world prices of oil and food items and accelerated credit expansion in the domestic financial markets.

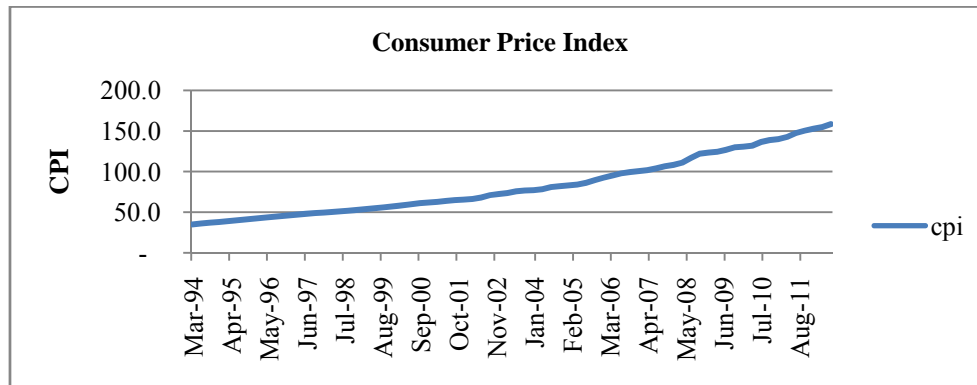


Figure 4. Consumer Price Index

Source: Bank of Botswana Financial Statistics (1994-2012).

Figure 5 shows a steady increase in the growth of money supply in Botswana's economy over the period of study. The supply of money to the economy is strictly regulated by the central bank of Botswana under any circumstance. An increase in the supply of money into the economy has the effect of reducing interest rates and this in turn encourages households to borrow more money. A reduction in money supply leads to an increase in interest rates which effectively discourage households from borrowing.

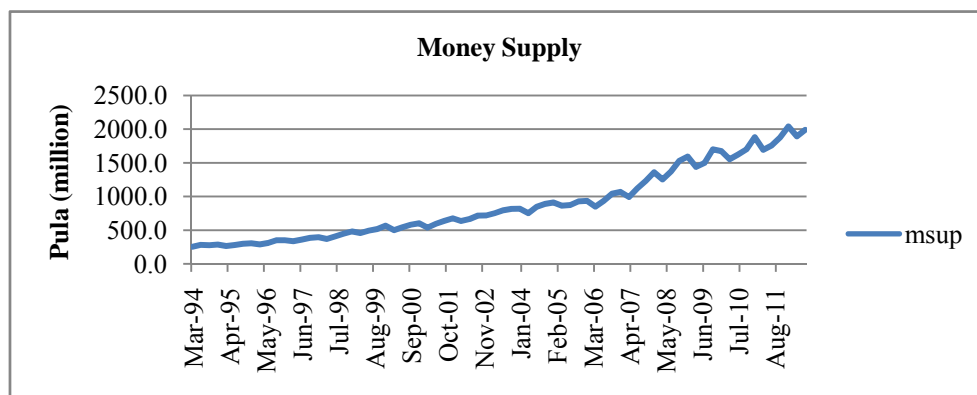


Figure 5. Money Supply

Source: Bank of Botswana Financial Statistics (1994-2012).

Interest rates are one of the main policy instruments through which the central bank has been managing the Botswana economy. In the past, high interest rates were used to control growing inflation, expanding credit to households and money supply. The decline in interest rate was necessitated by the

2008 economic crises since Botswana has been facing low export earnings and slow government spending. Availability of cheaper credit is essential to motivate spending in the private sector and sustain national earnings.

2. Literature Review

2.1 Review of Previous Studies

The first study that sheds light on the factors that determine household debt in developing countries similar to Botswana is by (Meniago, Mukuddem-Petersen, Petersen, & Mongale, 2013). The study explores the determinants of household debt in the Republic of South Africa which is one of Botswana's major trading partners. Using a Vector Error Correction Model (VECM) based on quarterly data from 1985 Q1 to 2012 Q1, the study confirmed the existence of a long-run relationship between household debt and other macroeconomic variables. Specifically, the study found that the increase in household debt is significantly influenced by increases in the Consumer Price Index (CPI), GDP and household consumption. The price of houses and the level of savings were also found to have positive influence on household debt. However, these relationships did not have significant influence. Furthermore, it was found that a decrease in income led to a significant increase in the amount of household debt incurred by South Africans and prime interest rates had a negative but insignificant influence on household debt as well. The growth in household debt was also attributed to a poor saving culture and poor financial literacy, both factors which also apply to Botswana (Radipotsane, 2007).

Radipotsane (2007) studied the determinants of household saving and borrowing in Botswana with the expectation that savings should be positively related to real income. Households were found to be net borrowers with respect to the banking sector and net savers with respect to contractual saving with the rest of the financial sector. Based on empirical evidence, the short-run relationship between income and savings in Botswana was found to be negative. That is when income rises savings fall because households expect this adjustment to be permanent. This implies that employed households increase consumption more than the increase in their real income implying an increase in household debt and a decline in savings. Expansion of the banking sector and diversification of its products were also found to contribute to the growth of household debt.

Credit expansion is responsible for relating changes in monetary policy to changes in aggregate demand and the general level of economic activity (Van Der Walt & Prinsloo, 1995). In their study on the importance of household debt in South Africa, Van Der Walt and Prinsloo (1995) found prices of real assets (especially housing), spending on durable goods and consumer prices to be positively related with household debt. Increase in credit commitment was found to be negatively related to savings unless if contradicted by an equal or more increase in household assets. An increase in the price of assets leads to an increase in wealth and thus borrowing capacity. This implies that households will consume more due to their increased borrowing capacity, hence boosting aggregate demand. Cyclical movement in expenditure on durable goods and real estate were found to coincide with the general

course of the business cycle. Growth in consumer credit was found to be positively influenced by disposable income and negatively influenced by the cost of credit.

A study of household debt in Ethiopia revealed one major characteristic of most developing countries which is the existence of highly segmented formal and informal financial institutions (Kedir, 2002). This implies that both the formal and informal sectors act as sources of credit for households depending on how constrained the households are or depending on what the loan will be used for. The findings also show that the chances of being credit constrained are significantly influenced by current household resources, education of head of household, outstanding debt, number of dependents and location.

The reviewed literature suggested that changes in household debt are brought about by prevailing economic conditions. The variables that tend to affect household debt depend on these conditions. This substantiates the reason for undertaking a study of the nature of the relationship between household debt and other economic variables in Botswana. These linkages are important in determining the extent of the effect that economic variables will have on household debt. Therefore, the nature of the relationship between household debt and economic indicators will depend on the interaction of the variables in Botswana over the period of study.

Most of these studies are based on a component of household debt such as consumer debt or mortgage debt. This allows us to study one side of the problem and completely ignore the other. Furthermore, this review has revealed that the study to be undertaken based on Botswana, might have the weakness based on the type of available data. The review has revealed that the same set of variables behave differently for advanced, emerging and poor economies. In the study for Botswana, these variables are expected to mimic those for other emerging economies such as South Africa and be less like the poorer developing countries. This bias is based on how much the domestic economy is influenced by and interacts with the advanced economies.

3. Methodology

3.1 Key Determinants of Household Debt

Theoretically, household debt represents the transfer of a portion of households' income to financial institutions as revenue and profits. Surplus cash balances are mobilised and transformed into loanable funds through financial intermediaries (Dos Santos, 2009). The credit system is responsible for channelling the surplus cash back into circulation as credit to private businesses and the household sector. Unlike lending to business enterprises, the process of lending to households does not give them an opportunity to employ the funds productively and earn profits. Therefore households rely on wage income to repay the principal and interest of the borrowed amount.

The key determinants of household debt used across literature are categorised as institutional, economic and social. Institutional factors that determine the demand for household credit include court efficiency in prosecuting defaulters, information sharing, creditor right protection and bank regulations (Japelli, Pagano, & Maggio, 2008; Barba & Pivetti, 2009). Amongst the economic factors house prices, housing

stock, or housing price index were some of the most dominant factors to be considered. Investing in housing requires large sums of money and thus affects households' demand for credit in developed economies where banks are not reluctant to offer mortgage loans. Interest rates, inflation rate, wealth, income, consumption, level of arrears and future expectations are some of the other economic variables that were found to influence changes in the level of household debt.

3.2 Model Specification

A Vector Autoregressive (VAR) model is a non-structural approach to modelling the behavioural relationship between two or more variables. This model assumes that the variable sequences are stationary and that the error terms are uncorrelated white noise disturbances with constant variance (Pindyck & Rubinfeld, 1998). A cointegrated VAR otherwise called a Vector Error Correction Model (VECM) is used to investigate the dynamic long run relationship of the variables. The short run relationship is established through the estimation of the impulse response function.

The VAR model is adapted from Enders (2004). In matrix form the model is as follows:

$$x_t = A_0 + A_1x_{t-1} + \dots + A_px_{t-p} + e_t \quad (1)$$

Where: x_t is a vector containing all the variables contained in the VAR (debtgdp, consgdp, gdppc, cpi, msup and npir), A_0 is a vector of intercepts, A_i are the $n \times n$ coefficient matrices, e_t is the matrix of unobserved errors and p is the number of lags. The estimates from these equations are then used to estimate the impulse response functions to determine the effect a shock to the explanatory variables will have on household debt. As a result, we will find if an increase in the economic indicators will trigger a decline or improvement in household debt.

Since the Johansen test confirmed the presence of cointegrating vectors, the VECM is the appropriate model to use. The VECM assumes that the economy converges to its long-run relationships whilst at the same time allowing for short-run adjustments. Extending the VAR model in equation (1), the VECM is represented as follows:

$$\Delta x_t = \pi_0 + \pi x_{t-1} + \pi_1 \Delta x_{t-1} + \dots + \pi_p \Delta x_{t-p} + e_t \quad (2)$$

Where π_0 is vector of intercepts π_{i0} , π_i are the coefficient matrices, π is a matrix of elements π_{jk} with at least one of them not being equal to zero and e_t is a vector of error terms. The VECM indicates that for a cointegrating rank $r > 0$ the vector of first differences of the variables Δy_t does not have a finite order VAR representation (Lutkepohl, 2004).

In the context of the chosen variables for the study of the determinants of household debt in Botswana, equation (2) is transformed as follows:

$$\begin{bmatrix} \Delta debtgdp \\ \Delta consgdp \\ \Delta gdppc \\ \Delta cpi \\ \Delta msup \\ \Delta npir \end{bmatrix} = \pi_0 + \pi (debtgdp_{t-1} + consgdp_{t-1} + gdppc_{t-1} + cpi_{t-1} + msup_{t-1} + npir_{t-1}) +$$

$$\pi_i \begin{bmatrix} \Delta debtgdp_{t-p} \\ \Delta consgdp_{t-p} \\ \Delta gdppc_{t-p} \\ \Delta cpi_{t-p} \\ \Delta msup_{t-p} \\ \Delta npir_{t-p} \end{bmatrix} + \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ u_{3,t} \\ u_{4,t} \\ u_{5,t} \\ u_{6,t} \end{bmatrix} \quad (3)$$

3.3 Selecting the Lag Length

The Schwartz Information Criterion (SIC) is used to determine the optimal lag length to be used in the model. It has to be taken into consideration that the Akaike Information Criterion (AIC) asymptotically over estimates the lag order with positive probability whilst the SIC is more general (Enders, 2004).

3.4 Estimating the VECM

The VECM represented in equations (2) and (3) is estimated. Specification of this model depends on the number of lags selected, the presence of cointegrating relationships and stationarity tests performed on the available data. The advantage of this model is that it allows for the study of the long-run and short-run dynamics of household debt in relation to other variables.

$$\Delta x_t = \alpha_0 + \alpha_{i1}(y_t + \theta_1 x_t + \theta_2 z_t) + \beta_{i1} \Delta y_{t-1} + \beta_{i2} \Delta x_{t-1} + \beta_{i3} \Delta z_{t-1} + \varepsilon_{it} \quad (4)$$

Similarly, equation (4) indicates that the long-run relationship between the variables x , y and z is shown by the cointegrating equation $(y_t + \theta_1 x_t + \theta_2 z_t)$. α_{i1} is the vector of adjustment coefficients that indicate the speed of adjustment to a state of long-run equilibrium. The differenced and lagged variables represents the short-run adjustment process whilst their coefficients (β_{ij}) quantify the amount by which the variables adjust in the long-run.

3.5 Data Type and Sources

The data comprises of time series quarterly data on all variables starting from the first quarter of 1994 to the second quarter of 2012.

4. Empirical Results

4.1 Unit Root Test for Stationarity

Table 1 shows that the selected variables are not stationary at levels based on both the ADF and KPSS tests. After differencing once the ADF test shows that all the variables are integrated of order 1 at 5 percent level of significance. The KPSS test confirmed the results except for GDP Per Capita (GDPPC) which was stationary at 1 percent level of significance. The disadvantage of the Augmented Dickey Fuller (ADF) test is that it has low power against variables that are near unit roots and that the presence of deterministic trend also reduces its power (Ng & Perron, 2001). Based on this argument, the results from the KPSS test are considered to be more robust.

Table 1. Unit Root Test (with Constant and Trend)

	ADF	KPSS
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Variable	Level	1 st Difference	Level	1 st difference
CONSGDP	-2.822	-14.596 ^{***}	0.164	0.133 ^{**}
CPI	0.807	-4.980 ^{***}	0.296	0.106 ^{***}
DEBTGDP	-2.873	-14.583 ^{***}	0.059	0.129 ^{**}
GDPPC	-2.424	-12.648 ^{***}	0.246	0.179 [*]
MSUP	1.332	-3.404 ^{**}	0.274	0.0732 ^{***}
NPIR	-1.467	-4.991 ^{***}	0.226	0.063 ^{**}

Note: ^{***} 10% levels of significance, ^{**} 5% level of significance, ^{*} 1% level of significance.

Serial correlation and multicollinearity are problematic if the values off the diagonal values of the correlation matrix are greater than 0.7 (Enders, 2004). The results on table 2 suggest that the variables in this study do not pose a serial correlation or multicollinearity problem since none of them have a coefficient of correlation greater than 0.7. This is an important consideration that is designed to ensure that the model yields an accurate estimation of the chosen variables.

Table 2. Correlation Matrix

	DCONSGDP	DCPI	DMSUP	DNPIR	DGDPPC
DCONSGDP	1.000000	0.214805	0.182355	0.127442	-0.503950
DCPI	0.214805	1.000000	0.373100	0.032017	0.223459
DMSUP	0.182355	0.373100	1.000000	0.047254	0.453408
DNPIR	0.127442	0.032017	0.047254	1.000000	0.037044
DGDPPC	-0.503950	0.223459	0.453408	0.037044	1.000000

4.2 Cointegration Test

Testing for cointegration based on the unrestricted VAR framework with 1-4 lags confirms the presence of cointegrated variables. The data is assumed to have a linear trend but the cointegrating vector is assumed to have the constant term only without trend. The trace statistic indicates the existence of two cointegrating relationships at the 5 percent level of significance whilst the maximum Eigen statistic shows only one cointegrating equation (Table 3). Therefore, making a conclusion based on the trace test we conclude on the rank $r = 2$, implying that there are two independent long-term equations. However, estimating the model with one cointegrating relationship is more representative of the underlying theory. The cointegration equation will show household debt as the dependent variable and normalize it to 1. This will also simplify the estimation and interpretation of the results.

Table 3. Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE (s)	Eigen value	Statistic	Critical Value	Prob.**
$r = 0^*$	0.576610	129.7772	95.75366	0.0000
$r \leq 1^*$	0.342647	70.47440	69.81889	0.0443
$r \leq 2$	0.257731	41.52650	47.85613	0.1724
$r \leq 3$	0.184507	20.96153	29.79707	0.3600
$r \leq 4$	0.082656	6.888097	15.49471	0.5907
$r \leq 5$	0.013464	0.935294	3.841466	0.3335

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized		Max-Eigen	0.05	
No. of CE (s)	Eigen value	Statistic	Critical Value	Prob.**
$r = 0^*$	0.576610	59.30284	40.07757	0.0001
$r \leq 1$	0.342647	28.94790	33.87687	0.1731
$r \leq 2$	0.257731	20.56496	27.58434	0.3034
$r \leq 3$	0.184507	14.07344	21.13162	0.3590
$r \leq 4$	0.082656	5.952803	14.26460	0.6193
$r \leq 5$	0.013464	0.935294	3.841466	0.3335

Note: * denotes rejection of the hypothesis at the 0.05 level.

4.3 Model Estimation

4.3.1 Vector Error Correction Model—Model 1

For simplicity the following VECM assumes one cointegrating vector. In the cointegrating vector, the coefficient for DEBTGDP coefficient is normalised to 1 since in this equation DEBTGDP is the only dependent variable of interest (Table 4).

Table 4. Model 1—Unrestricted VECM Long-Run Coefficients

Cointegrating Eqn	Coefficient	S.E.	t-value
DEBTGDP	1.000		
CONSGDP	-0.315099*	0.12004	-2.62487
CPI	0.001291	0.00106	1.21995
GDPPC	0.0000153*	0.0000055	2.77661
MSUP (-1)	-0.000565*	0.000069	-8.21176
NPIR (-1)	-0.031616*	0.00208	-15.2220
C	0.500559		

Note: * indicates significant coefficients.

The VECM essentially treats all variables as endogenous implying that to interpret the relationship between household debt and the other variables, household debt has to be expressed as a function of its explanatory variables. As shown in equation (5), transposing the explanatory variables to the right hand side of the equation necessitates reversal of their signs.

$$\text{household debt} = f(\text{consgdp}, \text{cpi}, \text{gdppc}, \text{msup}, \text{npir}) \quad (5)$$

The signs of the coefficients of the explanatory variables in cointegrating vector (β) are reversed to determine the effect of the explanatory variables on the dependent variable and the t-values are used to determine the significance of the coefficients. Consumption, money supply and interest rates have a positive and significant effect on household debt. GDP per capita shows a significant negative relationship with household debt whilst inflation, as measured by CPI, indicates an insignificant negative relationship to household debt. Therefore, inflation does not have a long-run relationship with household debt. The model representing the long and short-run relationships is represented as follows:

$$\begin{aligned} \text{HOUSEHOLD DEBTGDP} = \\ -0.500559 + 0.315099\text{CONSGDP} - 0.0000153\text{GDPPC} + 0.000565\text{MSUP} + 0.031616\text{NPIR} - \\ 1.125\text{ECT} \end{aligned}$$

Where

$$\begin{aligned} \text{ECT} = 0.145 + 0.562\text{debtgdp}_{t-4} - 0.00088\text{msup}_{t-1} - 0.0006\text{msup}_{t-2} - \\ 0.0004\text{msup}_{t-3} - 0.0005\text{msup}_{t-4} + 0.054\text{npir}_{t-3} \end{aligned} \quad (6)$$

Table 5 presents the short-run adjustment parameters for model 1 which show the load of each cointegrating relation entering the equation. These adjustment coefficients measure the feedback effects of disequilibrium on the variables in the VECM. If the adjustment parameters do not adjust significantly to short-run deviations from equilibrium, then it is an indication of weak exogeneity of the explanatory variables for the dependent variable (Kim, 2011). In essence, weak exogeneity independent variable for the dependent variable implies that the marginal distribution of the independent variable contains no useful information for conducting inference on the dependent variable.

The error correction term restricted the long-run behaviour of the endogenous variables to their cointegrating relations whilst allowing for short-run adjustment dynamics. The speed of adjustment of the short-run to the long-run is negative, implying that household debt is reverting to its long-run equilibrium and significant. However, the speed of adjustment coefficient shows a problem in the regression since its absolute value should lie between 0 and 1. Speed of adjustment coefficient -1.125 indicating that more than 100% of the error in the short-run will be corrected each quarter which still does not restore equilibrium. The results of the short run dynamics show that DEBTGDP coefficient is significant in the fourth quarter. CONSGDP, CPI and GDPPC coefficients are insignificant implying that they do not adjust significantly to short-run deviations from equilibrium and are weakly exogenous. All MSUP adjustment coefficients are significant implying that it adjusts significantly to short-run

deviations from equilibrium. NPIR short-run adjustment coefficients are significant in the third lag only.

Table 5. Unrestricted VECM Short Run Coefficients

Error Correction	Coefficient	S.E.	t-value
Cointegrating Eqn	1.125*	0.26721	-4.21068
D (DEBTGDP(-1))	-0.049046	0.26548	-0.18474
D (DEBTGDP(-2))	0.546802	0.27817	1.96569
D (DEBTGDP(-3))	0.036638	0.22983	0.15941
D (DEBTGDP(-4))	0.562805*	0.24028	2.34225
D (CONSGDP(-1))	-0.242155	0.19923	-1.21547
D (CONSGDP(-2))	-0.240931	0.20341	-1.18446
D (CONSGDP(-3))	0.072583	0.17997	0.40330
D (CONSGDP(-4))	0.074068	0.16073	0.46082
D (CPI(-1))	-0.011529	0.00726	-1.58712
D (CPI(-2))	-0.011862	0.01051	-1.12822
D (CPI(-3))	-0.012511	0.00897	-1.39404
D (CPI(-4))	-0.016284	0.00842	-1.93344
D (GDPPC(-1))	0.0000077	0.000013	0.58512
D (GDPPC(-2))	0.0000127	0.000012	1.03950
D (GDPPC(-3))	-0.0000179	0.000012	-1.48536
D (GDPPC(-4))	0.0000107	0.000013	0.81653
D (MSUP(-1))	-0.000880*	0.00024	-3.63973
D (MSUP(-2))	-0.000614*	0.00022	-2.81796
D (MSUP(-3))	-0.000435*	0.00020	-2.18014
D (MSUP(-4))	-0.000552*	0.00017	-3.19158
D (NPIR(-1))	-0.000433	0.01507	-0.02870
D (NPIR(-2))	-0.001318	0.01442	-0.09135
D (NPIR(-3))	0.054297*	0.01440	3.77190
D (NPIR(-4))	-0.014610	0.01511	-0.96664
C	0.145210*	0.03493	4.15696
R-squared = 0.73	Adj R-squared = 0.57	SE eqn = 0.030127	F statistic = 4.652
AIC = 19.443	Schwartz = 24.688		

4.3.2 Restricted VECM (without CPI)—Model 2

All the variables except CONSGDP in the long run cointegrating vector were found to be statistically

significant ($>$ critical $t_{(69, 0.05)} = 2.000$), hence they have a significant long run relationship with household debt. CONSGDP changed from being significant in the unrestricted long-run equation to being insignificant after the removal of CPI.

Table 6. Model 2—Restricted VECM (Excluding CPI) Long-Run Coefficients

Cointegrating Eqn	Coefficient	S.E.	t-value
DEBTGDP	1.000		
CONSGDP	0.061925	0.14316	0.43257
GDPPC	0.0000283*	0.0000073	3.89728
MSUP(-1)	-0.000528*	0.000056	-9.35873
NPIR(-1)	-0.027237*	0.00263	-10.3504
C	0.269751		

Note: * Indicates significant variables.

The restricted model without CPI is presented as follows:

HOUSEHOLD DEBTGDP =

$$-0.269751 - 0.0000283GDPPC + 0.000528MSUP + 0.027237NPIR - 0.70ECT$$

Where $ECT = 0.032 + 0.541debtgdp_{t-4} - 0.0005msup_{t-1} - 0.0004msup_{t-4} + 0.040npir_{t-3}$ (7)

For the short-run adjustment parameters (Table 7), the error correction term remained negative and significant. Adjustment coefficients revealed that lagged CONSGDP and GDPPC do not react significantly to short-run deviations from equilibrium. Lagged DEBTGDP, MSUP and NPIR have at least one significant short-run adjustment coefficient. Model 2 exhibits an improvement in the speed of adjustment of -0.7 which is within the expected range. The presence of insignificant variables imply that further restrictions can be imposed on the model with a view to improve it. Diagnostic tests lead to the same conclusions as in the unrestricted model.

Table 7. Model 2 Restricted VECM (Excluding CPI) Short-Run Coefficients

Error Correction	coefficient	S.E.	t-value
Cointegrating Eqn	-0.705906	0.22286	-3.16745
D (DEBTGDP(-1))	-0.192209	0.25937	-0.74106
D (DEBTGDP(-2))	0.342576	0.28129	1.21787
D (DEBTGDP(-3))	0.006147	0.24784	0.02480
D (DEBTGDP(-4))	0.541696*	0.24312	2.22807
D (CONSGDP(-1))	0.012114	0.17875	0.06777
D (CONSGDP(-2))	-0.047419	0.19632	-0.24153
D (CONSGDP(-3))	0.113680	0.18489	0.61487

D (CONSGDP(-4))	0.060251	0.16428	0.36676
D (GDPPC(-1))	0.0000173	0.000013	1.35935
D (GDPPC(-2))	0.0000145	0.000013	1.10901
D (GDPPC(-3))	-0.0000129	0.000013	-1.03089
D (GDPPC(-4))	0.0000142	0.000012	1.13933
D (MSUP(-1))	-0.000539*	0.00020	-2.73108
D (MSUP(-2))	-0.000310	0.00020	-1.58226
D (MSUP(-3))	-0.000223	0.00017	-1.33208
D (MSUP(-4))	-0.000419*	0.00015	-2.84499
D (NPIR(-1))	-0.007251	0.01304	-0.55617
D (NPIR(-2))	-0.009792	0.01458	-0.67175
D (NPIR(-3))	0.040376*	0.01449	2.78620
D (NPIR(-4))	-0.010296	0.01515	-0.67947
C	0.032180*	0.01193	2.69855
R-squared = 0.675	Adj R-squared = 0.529	SE eqn = 0.031618	R-squared = 0.675
AIC = 18.080	Schwartz = 21.804	F statistic = 4.648	AIC = 18.080

Note: * indicates significant variables.

Likelihood Ratio (LR) tests conducted on the coefficient of the cointegrating equation for model 2 confirmed that restricting CONSGDP to zero would not significantly affect the results of the model. This test follows the same process conducted for model 1 in Table 4. In addition, the theoretical relationship between inflation and consumption supported the exclusion of CONSGDP from the long-run cointegrating vector. These results prove that CONSGDP relies on the presence of CPI for it to have significant long-run effect on household debt.

4.3.3 Restricted VECM (without CPI and CONSGDP)—Model 3

When the model was further restricted to exclude CPI and CONSGDP, all the remaining variables in the long-run cointegrating equation displayed significant influence on household debt (Table 8).

Table 8. Model 3—Restricted VECM (Excluding CPI and CONSGDP)

Cointegrating Eqn	Coefficient	S.E.	t-value
DEBTGDP	1.000		
GDPPC	0.0000249*	0.0000066	3.77523
MSUP (-1)	-0.000503*	0.000046	-10.9427
NPIR (-1)	-0.026510*	0.00255	-10.4048
C	0.285409		

Note: * indicates significant variables.

The model with two restrictions is represented as follows:

$$\text{HOUSEHOLD DEBTGDP} = -0.285409 - 0.0000249\text{GDPPC} + 0.000503\text{MSUP} + 0.026510\text{NPIR} - 0.65\text{ECT}$$

Where

$$\text{ECT} = 0.031191 + 0.512\text{debtgdp}_{t-4} - 0.0005\text{msup}_{t-1} - 0.000382\text{msup}_{t-4} + 0.046\text{npir}_{t-3} \quad (8)$$

The short-run adjustment parameters (Table 9), shows that of the short-run coefficients, lagged differenced DEBTGDP, MSUP and NPIR have at least one significant short-run adjustment coefficient implying that they do have a feedback mechanism with the parameter of interest. Lagged GDPPC has consistently remained weakly exogenous to the parameter of interest. Overall, the model has less weakly exogenous variables than the unrestricted model and the error correction term has maintained its negative significant coefficient. The speed of adjustment parameter shows a relatively swift response of household debt to the previous period's deviation from long-run equilibrium. When the speed of adjustment parameter is 1, the response of the dependent variable to departure from equilibrium is also instantaneous. Model 3 reveals that as the insignificant variables were excluded from the model, the speed of adjustment term has improved by becoming more realistic. This model shows that 65% of the deviation from the long-run equilibrium will be corrected each quarter.

Table 9. Model 3 Restricted VECM (Excluding CPI and CONSGDP) Short-Run Coefficients

Error Correction	coefficient	S.E.	t-value
Cointegrating Eqn	-0.650891	0.19056	-3.41565
D (DEBTGDP(-1))	-0.249811	0.22076	-1.13158
D (DEBTGDP(-2))	0.342943	0.24289	1.41193
D (DEBTGDP(-3))	0.043712	0.21307	0.20516
D (DEBTGDP(-4))	0.512648*	0.21531	2.38102
D (GDPPC(-1))	0.0000137	0.000012	1.17569
D (GDPPC(-2))	0.0000163	0.000012	1.35551
D (GDPPC(-3))	-0.0000162	0.000011	-1.48338
D (GDPPC(-4))	0.0000101	0.000011	0.89112
D (MSUP(-1))	-0.000513*	0.00018	-2.83801
D (MSUP(-2))	-0.000294	0.00018	-1.62643
D (MSUP(-3))	-0.000168	0.00015	-1.10939
D (MSUP(-4))	-0.000382*	0.00014	-2.82496
D (NPIR(-1))	-0.007135	0.01169	-0.61034
D (NPIR(-2))	-0.008290	0.01363	-0.60799

D (NPIR(-3))	0.046079*	0.01311	3.51514
D (NPIR(-4))	-0.011244	0.01386	-0.81123
C	0.031191*	0.01148	2.71806
R-squared = 0.666	Adj R-squared = 0.555	SE eqn = 0.030766	
AIC = 22.126	Schwartz = 24.587	F statistic = 5.985	

Note: * indicates significant variables.

5. Discussion

Inflation as measured by CPI does not have a long-run relationship with household debt. In the short-run inflation is weakly exogenous implying that CPI does not have a short-run relationship with household debt. An increase in the rate of inflation reduces the future value debt hence increases the demand for credit. At the same time, it reduces the supply of credit due to the loss it transfers to savers and lenders. By adding the inflation premium to real interest rates, the tendency of inflation to stimulate demand for credit is cancelled out by the increase in the nominal interest rates (Note 1) hence the net effect of inflation is not significant.

It was established in model 1 that in the long-run, an increase in household consumption leads to an increase in household debt. This finding is consistent with conventional theory. Furthermore, consumption was found to have no effect on household debt in the short-run since households are slow to adjust their consumption to the short term shocks, but can adjust in the long-run. Stagnant civil service wages suggest declining real wages hence household tend to borrow more in order to maintain their consumption levels especially with global inflationary pressure on food, oil and electricity (Bank of Botswana, 2011).

Model 2 shows that without CPI, consumption-GDP ratio is insignificant both in the long and short-run and thus is dropped from the system. Households' consumption and borrowing decisions are influenced by the relationship between inflation and interest rates. If the inflation rate is greater than interest rates households lose the value of their savings but gain on the money borrowed. As a result, their consumption in relation to GDP increases and thus is related positively to household debt as shown by model 1. However, the redistribution of present and future value of money by the inflation rate implies that consumption does not operate in isolation without CPI. Therefore, the results of model 2 are consistent by showing that in the absence of CPI, CONSGDP has insignificant influence in the model.

An increase in GDP per capita leads to a decrease in household debt. This outcome is consistent with existing literature. The increase in income means that households reach their optimal consumption levels without the need to borrow. This variable being a proxy for household income, also reveals that in the short-run GDP per capita does not have any influence on household debt. It explains that households do not adjust their debt holding on the basis of temporary change in income but rather it is the long-run earnings that determine the amount of debt households' demand.

Money supply influences household debt significantly both in the long and short-run. An increase in

money supply leads to an increase in household debt. This finding is consistent with theory since the increase in money supply implies an increase in bank credit and reduction in interest rates both of which positively influence the growth of household debt. In a competitive environment where banks seek to maximise profits, excess money supply and a more relaxed attitude towards risk contribute to the growth of household debt.

Interest rates have a rather controversial effect on household debt in this instance. In the long-run, an increase in nominal prime interest leads to an increase in the amount of household debt. In the short run, interest rates maintain their positive influence on household debt. The sign of this variable suggests that as the cost of borrowing increases households tend to borrow more. Nominal interest rates are equal to real interest rate plus an inflation premium that is based on the expected increase in the inflation rate (Mankiw, 2009). This implies that nominal interest rates are related to the anticipated increase in the inflation rate. An increase in the inflation rate leads to a decrease in households' real income, given stagnant wages. Therefore, as the gap between households' income and expenditure widens, they increasingly become unresponsive to the increasing cost of borrowing. The implication is that households in Botswana are financially distressed to the point of borrowing at any cost both in the long and short-run.

In this case, the decrease in households' real income is greater than the increase the cost of borrowing in the long-run. Therefore, in the long-run households increase their borrowing regardless of the increasing interest rates. This can be explained by the high cost of long-term debt financed investments such as housing and purchase of vehicles. Such debt is based on flexible interest rates hence increasing interest rates increase households' long term debt burden. Distressed households will therefore borrow more to augment their income in light of an increase in their expenditure on monthly debt service payments.

Finally, the coefficients of lagged household debt show a positive relationship between pre-existing household debt and the increase in the current level of household debt. This implies that the presence of previously existing debt increases the demand for household debt by households in the short-run. Increasing debt burden and declining real income have a negative impact on households' disposable income. Therefore, households have to borrow more money and pay off older debts in order to avoid loss of property and foreclosures. Households in this situation are effectively trapped by spiralling debt. The model exhibited a relatively fast speed of adjustment where 65 percent of all short-run error was adjusted within the first quarter to the long-run equilibrium. Significant short-run adjustment coefficients of household debt-GDP ratio, money supply and nominal prime interest rates indicate the existence of a bilateral causal relationship with household debt. Weak exogeneity of CPI and Consumption-GDP ratio imply that disequilibrium in the cointegrating relationship does not feedback to these variables hence there is no adjustment to the long-run equilibrium. These results are corroborated by the intuition provided by the impulse response functions.

5.1 Impulse Response Functions

Impulse Response Functions (IRF) are essential to the model because they trace the time path of the response of household debt-GDP ratio to shocks from the explanatory variables (Kirchgassner & Wolters, 2007). IRFs measure the effect of a shock with the size of one standard deviation of the error term of each explanatory variable at time t_0 on household debt-GDP ratio in the later periods. The use of Cholesky's decomposition is used to constrain the system of equations so that the contemporaneous effect of the explanatory variables would not have effect on household debt-GDP ratio.

Figure 6 shows how household debt-GDP ratio responds to shocks in GDPPC, money supply and interest rates over a period of 15 quarters. The response of household debt-GDP ratio to its own shocks is a sharp decline in the first two quarters then fluctuates over the next four quarters and gradually declines. Household debt-GDP ratio converges to zero more than 15 quarters in response to its own shocks. Household debt-GDP ratio responds positively and moderately to one standard deviation innovation to GDPPC, and shows no sign of convergence. In response to innovations in money supply, household debt-GDP ratio initially shows a positive response but tend to converge to zero after only 5 quarters. Household-debt-GDP ratio increases sharply and displays a significant positive response to innovations in interest rates in the first 10 quarters. Thereafter, it declines and tend to converge to zero in the long-run.

Overall the response of household debt-GDP ratio to shocks in money supply, nominal prime interest rates and itself is volatile over the initial 10 periods and tends to converge to zero thereafter. Therefore, these shocks have a temporary effect on household debt-GDP ratio in the short-run but thereafter they converge to their long-run equilibrium. However, the shocks to GDPPC only cause a weak positive influence on the household debt-GDP ratio that does not show any tendency to converge to zero over time. This implies that an increase in per capita GDP results in a permanent effect on the household debt-GDP ratio. This finding is supported by theory since higher income increases households' capacity to borrow and sustain larger amounts of money. The finding of these IRFs reveal that the explanatory variable have influence on the dependent variable in the short-run. The fact that most of these shocks converge to zero indicates that this system is stable and does not produce an explosive time path.

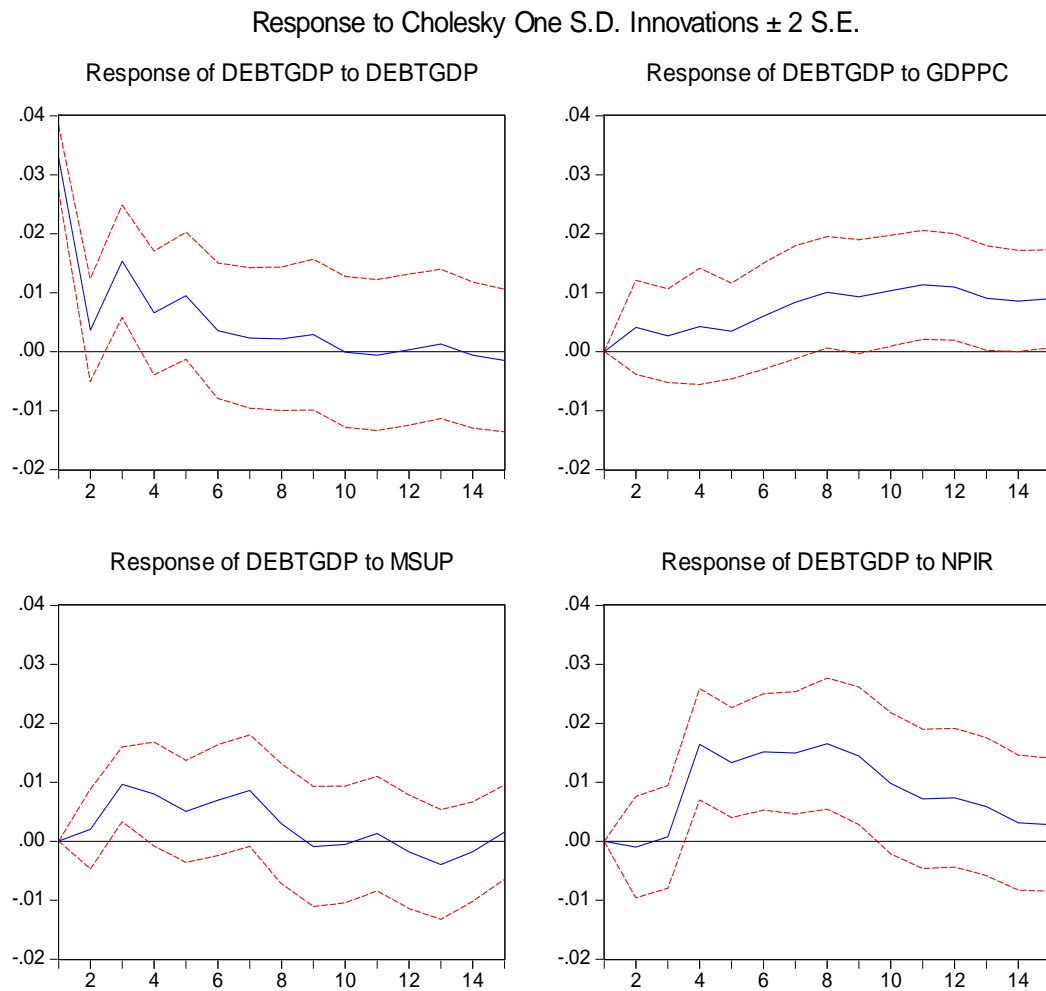


Figure 6. Impulse Response Function for Model 3 (15 Quarters)

6. Conclusions and Policy Implications

The study established that consumption-GDP ratio, GDP per capita, money supply and interest rates have significant influence on household debt in the long run. However, CPI does not have any influence on household debt in the long-run.

The Botswana financial sector has always proved to be sound and resilient. However, the 2012 IMF country report emphasized that this economy has one major weakness, which is its excessive exposure to the household sector. The household sector's debt to commercial banks decreased from 61% to 53% between 2011 and 2012 because households began to extend their borrowing to non-bank financial institutions and the informal sector (IMF, 2012).

The findings of this study indicate an important relationship that an increase in GDP per capita leads to a decrease in household debt. More importantly, this finding implies that it is possible to reduce the level of household debt in Botswana by creating more jobs. Job creation in the public and private

sectors increases productivity in the entire economy and hence increases per capita income to households. The 2012 IMF country report on Botswana suggested reduction of the size of the public sector in Botswana. Such an action would be expected to impact negatively on the level of household debt unless the creation of jobs in the private sector compensates for those lost in the public sector.

Furthermore, the study reveals that an increase in household consumption leads to an increase in household debt. Encouraging financial literacy amongst individuals would help households make informed decisions as they allocate their income between their consumption and saving. By reducing their consumption expenditure, households will be able to reduce the amount of money they borrow. However, household consumption is influenced by the cost of basic commodities, hence households may not always be able to control their consumption in relation to their income. Public policy may be aimed at reducing household indebtedness by subsidising the cost of basic commodities such as fuel, electricity and basic food items.

Interest rates were found to lead to an increase in household debt. Unfortunately, this finding implies that households are financially distressed to the point that even high interest rates cannot deter their demand for credit. Limiting households' credit in relation to their income would reduce the snowballing effect of their debt. It is unsustainable levels of household debt that make households insensitive to the cost of accruing more debt. Limiting households' credit reduces their debt levels and interest payments to manageable levels. This policy would restore interest rates' power to control debt levels since households will borrow for convenience and not due to financial distress.

Money supply was found to positively influence household debt implying that excess money supply contributes to the growth of household debt. In order to contain the growth of the risk posed by the growth of household debt, the Central Bank controls the supply of loanable funds to commercial banks by controlling their liquidity ratios. The Bank of Botswana uses the Bank of Botswana Certificates (BoBCs) to absorb excess liquidity while reverse repurchase agreements are used to mop up liquidity between auctions of BoBCs. The effectiveness of these policy instruments in mopping up excess money supply will result in reduction in credit and debt in the household sector.

In conclusion, these results conform to theoretical and empirical background established in the literature. However, the finding on the positive relationship between household debt and nominal prime interest rates is uncommon. The impulse response functions have shown that a shock in GDP per capita results in a permanent change in household debt, whilst pre-existing debt, household consumption and money supply result in temporary change in household debt. These findings are important when formulating policy and deriving the implications of the behavior of these variables in Botswana's economy.

References

- Bank of Botswana. (1994-2012). *Botswana Financial Statistics*.
Bank of Botswana. (2001). *Annual report*.

- Bank of Botswana. (2008). *Annual report*.
- Bank of Botswana. (2009). *Annual report*.
- Bank of Botswana. (2010). *Annual report*.
- Bank of Botswana. (2011). *Annual report*.
- Bank of Botswana. (2012). *Annual report*.
- Barba, A., & Pivetti, M. (2009). Rising Household Debt: Its Causes and Macroeconomic Implications—A Long Period Analysis. *Cambridge Journal of Economics*, 33, 113-137. <http://dx.doi.org/10.1093/cje/ben030>
- Bekhet, H. A., & Yusop, N. Y. M. (2009). Assessing the Relationship Between Oil Prices, Energy Consumption and Macroeconomic Performance in Malaysia: Co-integration Vector Error Correction Model (VECM) Approach. *International Business Research*, 2, 125-152.
- Bertola, G., Disney, R., & Grant, C. (2006). The Economics of Consumer Credit Demand and Supply. In G. Bertola, R. Disney, & C. Grant (Eds.), *The Economics of Consumer Credit* (pp. 1-26). Cambridge, Massachusetts: MIT Press.
- Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). The Real Effects of Debt. In *Bank for International Settlements*. Working Paper No. 352.
- Dos Santos, P. L. (2009). At the Heart of the Matter: Household Debt in Contemporary Banking and the International Crisis. *Ekonomiaz*, 72(3).
- Enders. (2004). *Applied econometric time series* (2nd ed.). NY, USA. John Wiley and Son Publishing.
- Hoxha, A. (2010). Causality between Prices and Wages: VECM Analysis for EU-27. *The Romanian Economic Journal*, 37, 3-36.
- International Monetary Fund (IMF). (2006). Household Credit Growth in Emerging Market Countries (Chapter 2). In *Global Financial Stability Report: Market Development and Issues*. Washington: International Monetary Fund.
- International Monetary Fund (IMF). (2012). *World economic outlook: Botswana country report*.
- Japelli, T., Pagano, M., & Maggio, M. (2008). *Household Indebtedness and Financial Fragility*. Presented at the 9th Jacques Polak Research Conference.
- Kedir, A. (2002). Determinants of Access to Credit and Loan Amount: Household-level Evidence from Urban Ethiopia. *JEL*.
- Kim, Y. K. (2011). *Macroeconomic Implications of Household Debt: An Empirical Analysis* (Unpublished paper).
- Kirchgassner, G., & Wolters, J. (2007). *Introduction to Modern Time Series Analysis*. Berlin: Springer Publishing.
- Lutkepohl, H. (2004). Vector Autoregressive and Vector Error Correction. In H. Lutkepohl, & M. Kratzig (Eds.), *Applied time series econometrics*. Cambridge, UK: Cambridge University Press.
- Mankiw, N. G. (2009). *The principles of microeconomics* (4th ed.). New York: Worth Publishing.
- Meng, S., Hoang, N. T., & Siriwardana, M. (2011). The Determinants of Australian Household Debt: A

- Macro-Level Study. In *Business, Economics and Public Policy*. Working Papers, No. 2011-2014.
- Meniago, C., Mukuddem-Petersen, J., Petersen, M. A., & Mongale, I. P. (2013). What Causes Household Debt to Increase in South Africa. *Economic Modelling*, 33, 482-492.
- Ng, S., & Perron, P. (2001). Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power. *Econometrica*, 69, 1519-1554.
- Nieto, F. (2009). The Determinants of Household Debt in Spain. In *Bank of Spain*. Working Paper, No. 0716.
- Okurut, F. N., & Botlhole, T. (2008). Informal Financial Market in Botswana: A Case Study of Gaborone City, Botswana. *Development South Africa*, 26(2), 255-270.
- Pindyck, R. S., & Rubinfeld, D. L. (1998). *Econometric models and economic forecast* (4th ed.). Singapore. McGraw-Hill international.
- Radipotsane, M. O. (2007). The Determinants of Household Saving and Borrowing in Botswana. In *Proceedings of the IFC conference on Measuring the Financial Position of the Household Sector* (pp. 284-296). From Bank of International Settlements.
- Schmitt, E. D. (2000). Does Rising Consumer Debt Signal Future Recessions? Testing the Causal Relationship between Consumer Debt and the Economy. *Atlantic Economic Journal*, 28, 333-345.
- Tudela, M., & G. Young, (2005). *The Determinants of Household Debt and Balance Sheets in the United Kingdom*. Working Paper, No. 266. Bank of England.
- Van der Walt, B. E., & Prinsloo, J. W. (1995). *The Compilation and Importance of Household Debt in South Africa*. Reserve Bank of RSA. Occasional paper, No. 8.

Note

Note 1. Since nominal interest rates equals real interest rates plus the inflation premium.