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# Asymmetric Effects of Monetary Policy: Empirical Evidence from Jamaica Using the Consumption-Wealth Channel

Rochelle Samuels[1]
Research Services Department
Research and Economic Programming Division
Bank of Jamaica

## Abstract

This paper tests the existence of the consumption-wealth channel in Jamaica by investigating how monetary policy affects consumption through its impact on financial wealth. In addition, the research explores whether there is asymmetric effects of monetary policy via the consumption-wealth channel.Using quarterly macroeconomic data from 1990 to 2011 and employing a two-stage OLS and VECM framework, the results indicate the presence and importance of the consumption-wealth channel in explaining the asymmetric effects of changes in monetary policy, proxied by interest rates and the Samuels-Serju index. The results show that whiletight monetary policy help to reduce wealth and consumption in the Island, looser monetary policy does not symmetrically affect consumption. Therefore, wealth reduction due to monetary tightening is expected to have a greater impact on consumption than increases in wealth.

*JEL Classifications*: E21, E52
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## 1.0 Introduction

An important aspect of monetary policy involves a thorough appreciation of the dynamics of the transmission mechanism. Several studies have investigated the workings of the transmission process in Jamaica, namely, Shaw(1992), Ghartey (1995), Robinson (1997) and more recently Bryson (2009). However, no attempt has been made to empirically assess the pass-through of monetary policy changes on consumption expenditure through movements in asset prices and household wealth. That analysis requires an assessment of the responsiveness of consumption to rates of returns. Weber (1970), Gylfason (1981) as well as Reinhart and Vegh (1995) find evidence of a significant relationship between consumption and interest rates. In that regard, interest ratechanges might play a key role in influencing consumption decisions of households in Jamaica. Given that the Bank of Jamaica's monetary policy actions play an important role in influencing movements in interest rates in Jamaica, monetary policy can play a critical role in shaping consumption patterns in the Jamaican society. Against this background, this paper attempts to investigate how monetary policy affects consumption through the consumption-wealth channel.

The consumption-wealth channel looks at how adjustments in interest rates affect consumption through its impact on wealth, measured by changes in the market value of assets. The stock of wealth in any period is determined by changes in either financial assets (stocks and bonds) or non-financial asset (typically housing). Movements in interest rates are expected to influence financial assets and housing. There are three ways in which variations in interest rate can affect consumption through the wealth channel. Firstly, reductions in interest rates translate into increases in the market value of financial assets as the present value of the income stream from these assets will improve due to the lower discount factor. Secondly, lower interest rates will cause an appreciation in the value of housing stocks as increased demand for housing causes house prices to rise given the availability of more affordable loans. Theappreciation in housing wealth motivates property ownersto borrow against the increasedequityon their property (through mortgage equity withdrawal)and to use such borrowings to finance consumption of durable and non-durable goods. In this context, as wealth increases, consumption is expected to adjust accordingly.Thirdly, housing collateral improves as interest rates fall. This increases property owners' ability to borrow due to an appreciation in the value of their asset that can stand as security for future loan disbursements. Financial institutions will be more willing to lend to borrowers as their collateral improves.

Researchers have found asymmetries in the consumption-wealth channel of monetary policy. According to Morgan (1993) the roots of asymmetries in monetary policy dates as far back as the Great Depression, when it was widely believed that tightening monetary policy was more effective than easing monetary policy, since reductions in interest rates did little to stimulate growth in that period. As a result, there was conflict among monetarists surrounding the presence of asymmetry in the 1940's and 1950's, which loss credibility in the 1960's and 1970's.

In the twenty-first century, developments in asset markets have renewed the interest of academics, central bankers and governments on the role that monetary policy can play to prevent or minimize the negative effects of financial instability in economies across the world. As a result, recenttheoretical studies have provided evidence in support of asymmetries in monetary policy using different channels such as the credit, interest rate, wealth andexchange rate channels. These studies includeMullineux et al (2011), Apergis and Miller (2004) and Disney et al (2002). This paper contributes to the literature as it explores the possibility of the existence of asymmetries in the consumption-wealth channel of monetary policy transmission in Jamaica. In other words, it aims to find out whether easy monetary policy, which indicates a reduction in interest rates, has a proportional impact on theconsumption patterns of Jamaicans through its impact on financial wealth when compared to tight monetary policy.The absence of empirical studies on this topic in Jamaica makes this paper's contribution very significant in a country that is still trying to recover from the financial crisis that affected world economies in 2008. This paper presents the case of Jamaica using the methodology employed by Mullineux et al (2011) and Morgan (1993) and finds the existence of a significant consumption-wealth channel in Jamaica and the presence of asymmetries in the monetary policy transmission mechanism.

The paper proceeds as follows: Section 2 provides a review of literature. Section 3 discusses the data and econometric model used, while Section 4 discusses the empirical results. Section 5 concludes and highlights policy implications.

## 2.0 Literature Review

Empirical research on the consumption-wealth channel of the transmission mechanism has been analyzedpredominantly using two-stage ordinary least square (OLS) and structural vector-autoregressive (VAR) methods using various measuresof wealth. The dominant finding is that the consumption-wealth channel plays an important role in explaining the asymmetric effects of monetary policy changes, especially in the United States (US) and the United Kingdom (UK). This section presents a summary of the various methods used in analyzing the pass-through of monetary policy changes on consumption expenditure through movement in asset prices and household wealth.

Mullineux et al (2011) use quarterly data from 1990 to 2006 to examine the role of the consumption-wealth channel in explaining the asymmetric effects of monetary policy changes in the UK.Using a two-stage OLS procedurewith time-series data collected from the Office of National Statistics on Gross Domestic Product (GDP), consumption, financial and non-financial wealth, inflation and the Bank of England’s base interest rate, the authors find that consumption decisions are inversely related to interest rates.The authors assert that wealth and both aggregated and disaggregated components of consumption responded asymmetrically to movements in interest rates.

Using VAR methodology, Laopodis (2010) explores the linkages between interest rates and stock market prices in the US using quarterly data from 1970 to 2004. The findings of his paper suggest the presence of asymmetric effects of monetary policy actions on the stock market which were more significant during low periods of economic activity. This meant that tight monetary policy were more effective than easy monetary policy in influencing stock market developments during that period.

Sousa (2010) empirically examines the relationship between monetary policy and asset markets using quarterly data for the Euro area from 1980 to 2007. The author focuses on the effects of monetary policy on a specific set of macroeconomic aggregates which includes GDP, unemployment, aggregate prices such as the GDP deflator and the price of raw materials as well as monetary aggregates, in particular, broad money, $M_3$ and $M_1$. The aggregates are obtained by combining the relevant macroeconomic time series across member economies that were a part of the Economic and Monetary Union of the European Union.The results from the structural VAR highlight that a contractionary monetary policy leads to a substantial fall in both financial and housing wealth. The findings of his paper also suggest that while the adjustment in financial wealth to an interest rate shock is relatively fast, housing wealth changes very slow. The author also examines the effects of monetary policy shocks on regional asset prices such as housing and stock prices at the country level. The results reveal sufficient evidence to suggest that the effects of monetary policy contractions on stock prices are particularly important in France, Germany, Italy, Netherlands and Spain. In addition, he finds that in France, Ireland, Italy and Netherlands an increase in the interest rate lead to a negative and very persistent impact on housing prices.

Koop et al (2005) use quarterly data from 1951 to 2003 on consumption, assets and labour income to examine the consumption-wealth channel relationship in the US. Modeling uncertainty using a variety of different approaches to Bayesian Model Averaging[2], results uncover that when there was a large degree of uncertainty in the US economy, permanent shocks had only a small role in driving the price of assets while transitory shock had little effect on consumption.

Siokis (2005) uses a structural vector auto-regressive model to investigate the effects of monetary policy on consumption through the wealth channel using data on consumption, income, wealth, interest rate and inflation. The author found that endogenous changes in wealth, due to an increase in short-term interest rate, had little impact on consumption in the Euro area using quarterly data from 1977 to 2002.

Bertaut (2002) empirically tests the size and significance of changes in wealth on consumption in selected industrialized countries of UK, US, Canada and Japan. The author investigates the strength of wealth effects across these countries using different estimation techniques, namely calibration estimates, reduced form equation,cointegration tests and the Vector Error Correction model (VECM) using quarterly and annual data. The paper uses data on real consumption, real income and real wealth between 1960 and 2000. The results reveal evidence of significant wealth effects in the UK and Canada of a size comparable to that in the US, as well as a significant wealth effect in Japan. In Canada and the United Kingdom, the response of consumption to a

[2] Bayesian Model Averaging (BMA) is a technique that provides a coherent mechanism for accounting for model uncertainty. By averaging over many competing models, BMA improves out of sample predictive performance as it incorporates model uncertainty into conclusions about parameters and predictions. BMA has been applied successfully to many statistical models including linear regressions and generalized models.

given change in wealth was a little larger than that for the US.The paper only focuses on the presence and importance of the consumption-wealth channel the industrialized countries. It does not examine the role of the consumption-wealth channel in explaining asymmetric effects of monetary policy changes.

Using the VAR methodology, Ludvigson et al (2002) examine the monetary policy transmission to consumption in the US for the pre-Volcker period and afterwards.[3] The pre-Volcker sample period consists of data on non-stock and stock market wealth from the first quarter of 1966 to the first quarter in 1979. The other sample period extends from the second quarter in 1979 to the third quarter in 2000and the variables used in the empirical analysis include aggregate consumption, the federal funds rate, inflation and labour income. Results from the VAR indicate that the wealth channel plays only a weak role in transmitting the Federal Reserve's monetary policy changes to consumption spending. In addition, the authors find that the wealth channel of monetary transmission to consumption was stronger in the pre-Volker period.

Cover (1992) uses quarterly data from 1947 to 1986 to examine whether positive and negative money-supply shocks have symmetric effects on output in the United States using a two-stage OLS procedure. Using the 90-day Treasury bill rate and real GNP as a proxy for output as well as the quantity of M1 to represent the money supply, he estimates a money supply equation. The residuals from themoney supply equation, considered as money supply shocks were separated into positive and negative shocks and used in an output equation in a second stage regression. The output equation models current output as a function of lagged output levels, past values of interest rates and positive and negative monetary shocks.The paper finds that only negative money-supply shocks have an impact on output.

Morgan (1993) also uses the two-stage OLS procedure using quarterly data from two sample periods,to examine whether monetary policy has asymmetric effects in the US. Using the federal funds rate from 1963 to1992, he estimates an interest rate equation. In his first stage regression, current interest rate is a function of its own lagged values, current and lagged values of output growth and inflation as well as a constant and a time trend. The residuals from the interest rate

[3] Paul Adolph Volcker was an American Economist and was the Chairman of the Federal Reserve from August 1979 to August 1987. He is widely credited with ending the high levels of inflation in the US in the 1970s and early 1980's. However, the federal funds rate increased from 11.2 per cent in 1979 to 21.5 per cent in 1981.

equation were used to construct positive and negative interest rate shocks that were used in the second stage regression to estimate an output equation. In this equation,the growth rate of output is regressed on a constant and a trend variable, past values of output growth and lagged values of the positive and negative residuals from the first stage regression. In addition, Morgan (1993) uses the Boschen- Mill index which was constructed from the policy records of the Federal Open Market Committee (FOCM) on the stance of monetary policy action published from 1953 to 1991. Morgan (1993) results using the federal funds rate and the Boschen-Mill index both reveal that in the two different sample periods, tight monetary policy substantially and significantly reduces output, while easy monetary policy had an insignificant effect on output.

## 3.0 Data and Methodology

This section provides a summary description of the data employed in the empirical analysis. The empirical analysis is conducted using quarterly data from 1990 to 2011 which allows for a reasonable sample size to study the response of consumption to changes inmonetary policy and to examine any asymmetries that may exist in the relationship.The variables includereal consumption, inflation as measured by the change in the log of the consumer price index (CPI) and the 180-day Treasury bill rate which are obtained from the BOJ.[4] Real Gross Domestic Product (GDP)and real income are collected from the Statistical Institute of Jamaica while the Jamaica Stock Exchange Index, the measure of wealth is obtained from the Jamaica Stock Exchange.[5]A detailed description of the variables and the descriptive statistics are in *Tables 1*& 2 in Appendix A. All variables except the 180-day Treasury bill rate are logged and deseasonalized.Time plots of the variables are shown in Figure 1, Appendix B. This was done to identify structural breaks that could affect the final results or regression output. They reveal that all variables are trending over the time period of interest, which mean that the variables are non-stationary and cannot be used in regression analyses if used without correcting for non-stationarity.

[4]Consumption is derived as outlined by Serju (2004).
[5]Real wages are used as a proxy for real disposable income.

### *3.1 Preliminary observations*

From the time plots in Figures 2.0 and 3.0 in Appendix B, it appearsthat up to2005, when interest rates fluctuate greatly,reductions in rates were accompanied most times by a rise in the wealth variable. For three distinct periods, movements in the wealth variable coincided with the changes in interest rates during the aforementioned period. During that period the response of consumption is somewhat ambiguous moving against and along with variations in interest rates equally.Between 2005 and 2008, when changes to interest rates remain relatively stable, the wealth variable increases with corresponding growth in consumption. Although the wealth variable increases between 2008 and 2010 in response to relatively sharp reductions in interest rates, consumption falls. Again at the end of the sample period that is from 2010 to 2011 interest rates movements remain relative stable while the wealth variable improves with similar improvements in consumption. These observations suggest that consumption patterns in Jamaica are influenced somewhat by changes in interest rates; however, the response is a bit ambiguous.[6]

### *3.2 Stability Properties of the Variables (Unit root testing)*

Before any estimation is carried out, the order of integration of the five variables is determined by using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for unit roots.[7]The results show that all the variables are integrated of order one, I(1) at both the five percent and one percent significance levels. The results of the tests are in *Table 4.1* and *Table 4.2* in Appendix A.The variables are cointegratedwith one cointegrated vector as indicated bythe Johansen test in*Table 7.1*.[8]This means that the variables share a long run relationship.

### *3.3 Methodology 1: The Two-Stage OLS*

The methodology employed in this paper follows that of Mullineux et al (2011), whichusesa two stage OLS procedure to estimate an interest rate and an output equation. The methodology is

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[6]Reference can be made to Figures 2, 3 and 4 in Appendix B.

[7] The PP test can be viewed as the Dickey-Fuller statistic that has been made robust to serial correlation by the Newey-West (1987) heteroscedasticity and autocorrelation- consistent covariance matrix estimator.

[8] The Johansen test is a procedure for testing cointegration of several I(1) time series. This test permits more than one cointegrating relationship so is more generally applicable than the Engel-Granger test. The Johansen test is based on maximum likelihood estimation and two statistics: maximum eigenvalues and the trace statistics.

similar to that used by Cover (1992).[9]The first stage regression that is, the interest rate equation is as follows:

$$\boldsymbol{r_t = \alpha_0 + \sum_{i=1}^{N} \alpha_i^r r_{t-i} + \sum_{i=1}^{M} \alpha_i^y y_{t-i} + \sum_{i=1}^{R} \alpha_i^\pi \pi_{t-i} + u_t} \qquad \textbf{(1)}$$

where$\boldsymbol{r_t}$ represents the180-day Treasury bill rate,$\boldsymbol{y_t}$ is real GDP,$\boldsymbol{\pi_t}$ is the inflation rate and $\boldsymbol{u_t}$is the residual thatdenotes the interest rate shocks not explained by the explanatory variables.[10] The residuals from this first stage regression are collected and used to constructtwo distinct series of interest rate shock that is positive and negative shocks. The positive monetary shocks (that is a reduction in interest rates) are represented by $u_t^+$= min ($u_t$, 0)while the negative monetary shocks (that is an increase in interest rates) are represented by $u_t^-$= max ($u_t$, 0).The second stage regression is of the form:

$$\boldsymbol{w_t = \beta_0 + \sum_{i=1}^{P} \beta_i^y w_{t-i} + \sum_{i=1}^{S} (\gamma_i^+ u_{t-i}^+ + \gamma_i^- u_{t-i}^-) + v_t} \textbf{(2.0)}$$

$$\boldsymbol{c_t = \beta_0 + \sum_{i=1}^{P} \beta_i^y c_{t-i} + \sum_{i=1}^{S} (\gamma_i^+ u_{t-i}^+ + \gamma_i^- u_{t-i}^-) + v_t} \textbf{(2.1)}$$

where$\boldsymbol{w_t}$is wealth and $\boldsymbol{c_t}$consumption.The estimated coefficients on the positive($\boldsymbol{\gamma_i^+}$) and negative ($\boldsymbol{\gamma_i^-}$) monetary shocks are used to determine the presence of asymmetry in monetary policy. The stock market index is used as a measure of wealth in equation 2.0.The asymmetric impact of interest rate shock on wealth changes is first estimated then consumption.

[9]Mullineux et al (2011) improves the methodology of Cover (1992) by replacing the money equation with the interest rate equation used in Morgan (1993). Morgan uses the interest rate equation as he believes that the money equation did not truly reflect changes in monetary policy.
[10] The explanatory variables would be the growth rates of the Treasury bill rate, the CPI and the GDP.

### *3.3.1 Samuels-Serju Index of Monetary Policy*

Following Morgan (1993), the paper construct an index of monetary policy,similar to Boschen-Mill index of monetary policy, from changes made to the Bank of Jamaica policy rate between1990 to 2011.[11]Boschen andMills (1993)reviewed statements from policymakers at the Federal Open Market Committee and constructed an index based on their opinion on the stance of policy indicated by the statements. The index ranged from negative two to positive two.A value of two (2) was taken if the policy is very tight, one (1) if the policy is considered to be tight, zero (0) if the policy is neutral, negative one (-1) if the policy is easy and negative two (-2) if they thought the policy is very easy. The index in this paper is constructed accordingly using quarterly data and is plotted in Figure 4.1 in Appendix B.This paper uses positive and negative percentage changes in the BOJ's policy rate to represent tight and easy monetary policy action, respectively. Changes in the BOJ's policy rate are graphed in figure 4.2 in Appendix B. TheSamuel-Serju index is assigned a value of 2 if the movement in the 30-day CD rate is greater than or equal to 20 per cent andassumes a value of 1 if the changes are greater than zero per cent but less than 20 percent.The index is assigned a value of 0 if the 30-day CD rate remainsunchanged. On the other hand, the index is assigned a value of -2 if changes in the 30-day CD rateis less than or equal to -20 per cent and assumes a value of -1 if the movement is less than zero per cent but greater than -20 per cent. The two-stage OLS in this paper is repeated using the Samuels-Serju index instead of the 180-day Treasury bill rate to uncover its impact on consumption and wealth over the same sample period.[12]

### *3.4 Wealth Variable- Jamaica Stock Exchange Index: Stylized Facts*

Figure 1.0 in Appendix B plots the Jamaica Stock Exchange Index (JSE-Index). At the start of the sample period in 1990 there was a slight reduction in the JSE-Index, followed by a significant increase in the third quarter of that same year. This improvement only lasted for four quarters before declining significantly in the third quarter in 1991. Thereafter, it fell below zero and increased substantially in the third quarter in 1992 before declining again to negative values (approximately -0.3 points). The developments during this period could be attributed to the

[11] The Bank of Jamaica 30-day certificate of deposit (CD) is used as the monetary policy instrument from 1994 to 2011. However, prior to 1994 only a few 30-days CD was issued as such the 90-day CD was used from 1990 to 1994.

[12] The index was stationary in levels, i.e. (I(0)) as indicated by the ADF and PP tests in Table 4.1.

liberalization of the financial system in Jamaica which was accompanied by the removal of a fixed exchange rate regime to a floating exchange rate regime. From this point onwards the index oscillates in an orderly fashion around the number line. However, two distinct periods of sharp movements were observed after 1992. The first development occurred in the first quarter of 2004, where the index increased significantly by 0.3 points. This could be attributed to the 2.1 per cent expansion in real GDP in 2003 which was emanated from the services industry. The second noticeable development occurred in the third quarter of 2008, where the index declined sharply by 0.09 points. The recession that affected world economies at the start of 2008 and the subsequentfall in GDPcould account for this decline in the index.

### *3.3.2 Vector Error Correction Model (VECM)*

Based on the Johansen test for cointegration, a cointegrating relationship exists among the variables, i.e. they share a long-run equilibrium relationship. In that context, the paper uses a vector error correction model to evaluate the importance of the role of the consumption-wealth channel in explaining asymmetric effects of monetary policy. The optimal number of lags(4) usedfor each variable in the VECM is determined by the Hannan-Quinn information criterion.[13]According to Zestos and Tao (2002), inclusion of the optimal number of lagged differences ensures that the error becomes approximately white noise.The vector error correction model is of the form:

$$\Delta \boldsymbol{Y_t} = \prod \boldsymbol{Y_{t-4}} + \sum_{i=1}^{k-1} \boldsymbol{\varphi_i Y_{t-4}} + \boldsymbol{v_t}$$

where**Y** is a vector which contains all the stationary variables namely inflation, household net labour income, consumption, interest rates and wealth as measured by commercial banks' deposits and the JSE index.[14]The cointegratingrank of **Π** is estimated by the Johansen full maximum likelihood procedure. Impulse responses and the variance decomposition from the VECM are analyzed to uncover the dynamic interactions among the variables to interest rate and

[13] The Hannan-Quinn information criterion (HQ) is a criterion for model selection. It is an alternative to the Akaike information criterion (AIC) and the Schwarz information criterion (SC). The HQ works well with quarterly data. The lag structure is presented in *Table 7.0*.

[14] Income represents household's net labour income, which is proxy by real wages.

wealth shocks. The impulse response functions trace the effects of a shock to one endogenous variable on the other variables in the VECM while the variance decomposition separates the variation in an endogenous variable by providing information about the relative importance of each innovation.To ensure that the innovations within the system are properly identified, the paper uses a Cholesky decomposition whereby the variables at the right contemporaneously affect the variables at the left and not the reverse. In this regard, the variables are ordered as follows:

*Inflation→Household Net Labour Income→ Consumption→ Wealth→ Interest Rate*

By this ordering, interest rate does not contemporaneously respond to changes in wealth and consumption is contemporaneously affected by wealth but not the reverse.

## 4.0 Empirical Results

### *4.1 Two Stage OLS: Interest Rates*

The results from equation (1) in the first stage regression are presented in *Table 5.0*in Appendix A. The residuals from this regression are collected and two distinct series of positive (easy) and negative (tight) monetary policy shocks are constructed as explained earlier. With the easy and tight monetary shocks as regressors and the growth in wealth (JSE index) as the dependent variable, equation (2.0) is estimated. The results from equation (2.0) using the JSE Index as a proxy for wealth is shown in *Table 5.1*in Appendix A. The coefficient on the easy interest rate shock variable is positive and significant while that on the tight interest rate shock variable is negative and significant, which highlights the fact that as interest rate falls, the stock of wealth increases. On the other hand, an increase in interest rates is accompanied by a fall in wealth. To be more specific, a one percentage point increase in interest rate is associated with a 1.6 percentage point reduction in wealth. However, a one percentage point reduction in interest rates is associated with a 1.4percentage point increase in wealth.

*Table 5.2*in Appendix A gives the results of the consumption growth equation which indicate that interest rate increases have a negative and significant impact on consumption in Jamaica while interest rate reductionshave a positive and significant impact on consumption. A one percentage point reduction (increase) in interest rate is associated with a 0.4 (-0.6) percentage point increase (decrease) in consumption. The Wald test is used to assess the equality of the two coefficients on the monetary shocks in the consumption equation. The results are presented in *Table 5.3* in Appendix A. The result indicates that the two coefficients arestatistically different from each other, which suggest the presence of asymmetry in monetary policy.The results show that a monetary tightening has a greater impact than monetary easing on economic activity. This finding is similar to Morgan (1993). Therefore, monetary tightening could reign in consumption growth over the desired level.

### *4.2 Two Stage OLS: Samuels-Serju Index of Monetary Policy*

The results of the two-stage OLS using the Samuels-Serju index are fairly similar to the results of the two-stage OLS procedure using the interest rate as the monetary policy tool. The results of the two-stage OLS using the Samuels-Serju index are presented in *Tables 6.0* to *6.2*in Appendix A. Similar to the findings in section 4.1, increases in the index have a negative and significant impact on wealth as measured by the JSE Index, however, reductions in the index, while positive,the impact was not significant.

Table 6.2 gives the result of the asymmetry in the consumption growth estimation. The results are the same as that obtained from the interest rate estimation, whereby interest rate increases (decreases) have a negative (positive) and significant impact on consumption in Jamaica. The test for equality of the two coefficients on the tight and easy policy variables in the consumption function using the index,also revealthat the two effects are statistically different from each otherand suggests the presence of asymmetry. See *Table 6.3* in Appendix A.

The robustness of the results presented above were ascertained by a series of diagnostic tests which include the Durbin-Watson test that checks for autocorrelation[15], the Jarque-Bera test that checks for normality[16] and the ARCH LM test and the Breush- Pagan test that checks for

[15] In the presence of autocorrelation the coefficient estimates derived from using OLS are still unbiased but inefficient. That is, they are not BLUE even in large sample sizes.

[16] Normality is not necessary for the existence of OLS estimators. However, it is needed to test hypothesis.

heteroscedasticity[17]. These tests were carried out to ensure that each equation satisfied the Classical Linear Regression Model (CLRM) assumptions.[18]All equations passed these diagnostic tests.

### *4.3 Impulse- Response Analyses from the VECM*

Using the JSE Index as a proxy for wealth, the impulse responses of the variables to interest rate and wealth shocks using one standard error confidence intervals are presented in Figures 5.0 and 6.0, respectively in Appendix B. As the impulse responsesindicate, inflation responds positively to the interest rate shock at the start of the sample period and then by the third quarter declines thereafter then peters out by the 17th quarter at a lower level. This observation at the start of the period is not in line with expectations and was also observed by Mullineux et al (2011) and Siokis (2005). Real disposable income responds positively to interest rate shocks at the start of the sample horizon and then decreases by the second quarter before increasing by the 5th quarter and peters out by the 14th quarter at a higher level. Consumption on the other hand responds negatively to interest rate shocks throughout the entire sample horizon and peters out by the 14th quarter. The JSE Index responds positively for the most part to interest rate shocks.

Focusing on the response to wealth shocks (using the JSE Index) the graphs show that consumption responds positively to wealth shocks throughout the entire sample period. The impact tapers off by the 15th quarter. This result provides evidence of the strength of the consumption wealth channel.

#### *4.3.1 Variance Decomposition*

Using JSE index as the measure of wealth, the results of the variance decomposition of the consumption series in *Table 8.0*in Appendix A highlights that the variation in consumption is driven predominantly by wealth over the full sample and secondly by real disposable income up to the 3rd quarter, thereafter by changes in interest rate.   By the 5th quarter, 73.3, 11.6 and 7.3 per

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[17]If heteroscedasticity exist in the model, OLS estimation gives unbiased coefficient estimates but they are no longer BLUE. This implies that if OLS is used in the presence of heteroscedasticity, the standard errors could be inappropriate and hence any inference made could be misleading.

[18] Since all assumptions hold then the estimates from the regression equations are BLUE (Best Linear Unbiased Estimator).If any of these assumptions were violated, the coefficient estimates would be wrong, the associated standard errors would be wrong and the distribution assumed for the test statistics would be inappropriate.

cent of the variation in consumption is explained by wealth, interest rate and real disposable income, respectively.

## 5.0 Conclusions and Policy Implications

This paper attempts to examine the role of the consumption-wealth channel as a possible factor in explaining asymmetric effects of monetary policy changes in Jamaica. Two measures of policy are used: (1) the 180-day Treasury bill rate and (2) the Samuels-Serju index of monetary policy actions. The two-stage procedure was used as outlined by Mullineux et al (2011) and Morgan (1993). The results indicate that in Jamaica, easy monetary policy which indicates a reduction in interest rates does not have a proportional impact on the consumption patterns of Jamaicans as do tight monetary policy. Thus, it is credible to infer that consumption responds asymmetrically to variations in interest rates through wealth changes.

It is therefore recommended that the Bank of Jamaica in implementing monetary policy be cognizant of the asymmetry in the consumption-wealth channel, which is found to be statistically significant in the monetary policy transmission process. The paper provides evidence to suggest that while interest rate increases help to reduce wealth and consumption in the Island, looser monetary policy does not appear to symmetrically affect consumption.Further, monetary tightening will reign in consumption growth over the desired level.

This paper shed some light on the importance of the consumption-wealth channel in explaining asymmetric effects of monetary policy changes in Jamaica, future studies can consider using different measures of wealth such as total household net worth and non-financial wealth for example housing.

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## Appendix A

**Table 1.0**: Description of Variables[19]

| Acronym | Variable Names | Description |
|---|---|---|
| LCPISA | Log of the Consumer Price Index | A measure that examines the weighted average of prices of a basket of consumer goods and services in Jamaica such as transportation, food and medical care. The base year used is December 2006. |
| LGDPSA | Log of Real GDP | An inflation-adjusted measure that reflects the value of all goods and services produced in Jamaica in a given year. |
| LCONSA | Log of Real Consumption | The value of all goods and services demanded in the economy. |
| LJSESA | Log of the Jamaica Stock Exchange Index | A statistical average of the value of companies listed on the Jamaica Stock Exchange |
| T-BILL | 180-Day Treasury Bill Rate | The returns to investors who purchase Treasury Bills issued by the Bank of Jamaica on behalf of the Government of Jamaica, which matures within 180 days of purchase |
| LWAGESA | Real Income | Household income after taking into consideration the effects of inflation on purchasing power. |

[19] All variables except the 180-day Treasury bill rate was logged and deseasonalized.The US Census Bureau X-12-ARIMA Seasonal Adjustment technique was used to seasonally adjust the variables.

**Table 2.0:** Summary statistics of the growth rates of the variables

| | DLCONSA | DRATE | DLWAGESA | DLGDPSA | DLCPISA |
|---|---|---|---|---|---|
| Mean | 0.0040 | -0.0026 | 0.0062 | 0.0008 | 0.0399 |
| Median | -0.0031 | -0.0017 | 0.0046 | 0.0016 | 0.0251 |
| Maximum | 0.1744 | 0.1718 | 0.2378 | 0.0634 | 0.2174 |
| Minimum | -0.1346 | -0.2036 | -0.1360 | -0.0657 | -0.0022 |
| Std. Dev. | 0.0567 | 0.0518 | 0.0399 | 0.0150 | 0.0400 |
| Skewness | 0.2875 | 0.1713 | 2.0342 | -0.1941 | 2.4802 |
| Kurtosis | 3.9421 | 7.0684 | 16.7029 | 9.0711 | 9.9222 |
| Jarque-Bera | 4.4160 | 60.4264 | 740.6657 | 134.1564 | 262.8890 |
| Probability | 0.1099 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**Note**: The variables take the same meaning as in *Table 1* except that these variables are stationary. Std. Dev. is the standard deviation.

**Table 3.0:** Correlation matrix of the variables in first difference

| | DLCONSA | DLGDPSA | DLCPISA | LDEPSA | DRATE | DJSESA |
|---|---|---|---|---|---|---|
| DLCONSA | 1 | 0.4653 | 0.0375 | 0.0064 | 0.0145 | -0.0160 |
| DLGDPSA | 0.4653 | 1 | 0.0048 | -0.0108 | 0.0512 | 0.0813 |
| DLCPISA | 0.0375 | 0.0048 | 1 | -0.6060 | 0.2521 | 0.1786 |
| DRATE | 0.0145 | 0.0512 | 0.2521 | -0.0539 | 1 | -0.3219 |
| DJSESA | -0.0160 | 0.0813 | 0.1786 | -0.2955 | -0.3219 | 1 |

**Note**: All variables have been differenced only once to make them stationary. DRATE is the stationary variable of the 180-day Treasury bill rate.

**Table 4.0:** Unit root tests at levels

| | Consumption | | Real Wages | | Treasury Bill Rate | |
|---|---|---|---|---|---|---|
| | ***Without trend*** | ***With Trend*** | ***Without trend*** | ***With Trend*** | ***Without Trend*** | ***With Trend*** |
| ADF test Statistic | -1.1644 | -4.2105 | -9.3822 | 10.5849 | -1.2631 | -3.5897 |
| Number of lags | 2 | 0 | 0 | 0 | 3 | 3 |
| P-value | 0.6865 | 0.0065 | 0.0000 | 0.0000 | 0.6433 | 0.0367 |
| Critical value (5%) | -2.8959 | -3.4623 | -2.8955 | -3.4629 | -2.8963 | -3.4642 |
| PP test statistic | -1.6264 | -4.1343 | -9.432 | -10.6025 | -1.8734 | -3.3989 |
| Bandwidth | 1 | 4 | 4 | 2 | 10 | 9 |
| P-value | 0.4649 | 0.0082 | 0.0000 | 0.9600 | 0.3433 | 0.0582 |
| Critical Value (5%) | -2.8951 | -3.4623 | -2.8955 | -3.4623 | -2.8951 | -3.4623 |

| | CPI | | JSE Index | | Real GDP | |
|---|---|---|---|---|---|---|
| | ***Without trend*** | ***With Trend*** | ***Without Trend*** | ***With Trend*** | ***Without Trend*** | ***With Trend*** |
| ADF test Statistic | -1.6359 | -1.5966 | -2.5214 | -3.1599 | -1.6422 | -2.0319 |
| Number of lags | 0 | 0 | 1 | 1 | 0 | 0 |
| P-value | 0.4601 | 0.7865 | 0.114 | 0.0996 | 0.4569 | 0.5756 |
| Critical value (5%) | -2.8951 | -3.4623 | -2.8955 | -3.4929 | -2.8951 | -3.4623 |
| PP test statistic | -1.636 | -1.6101 | -2.8325 | -2.7575 | 1.6422 | 2.096 |
| Bandwidth | 0 | 1 | 3 | 2 | 0 | 1 |
| P-value | 0.4601 | 0.7812 | 0.0579 | 0.2170 | 0.4569 | 0.5405 |
| Critical Value (5%) | -2.8951 | -3.4623 | -2.8951 | -3.4623 | -2.8951 | -3.4623 |

| | Samuels-Serju Index | |
|---|---|---|
| | ***Without Trend*** | ***With Trend*** |
| ADF test Statistic | -6.1278 | -6.5049 |
| Number of lags | 2 | 2 |
| P-value | 0.0000 | 0.0000 |
| Critical value (5%) | -2.8959 | -3.4635 |
| PP test statistic | -5.8516 | -5.9305 |
| Bandwidth | 7 | 8 |
| P-value | 0.0000 | 0.0000 |
| Critical value (5%) | -2.8951 | -3.4623 |

**Note:** The null hypothesis for the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests state that the series has a unit root. When the hypothesis tests indicated that a series had a unit root, the series was transformed and only the stationary form of the series used in the regression analysis.

**Table 4.1:** Unit root tests at first difference

| | Consumption | | Real Wages | | Treasury Bill rate | |
|---|---|---|---|---|---|---|
| | *Without trend* | *With Trend* | *Without trend* | *With Trend* | *Without Trend* | *With Trend* |
| ADF test Statistic | -10.2823 | -10.2223 | -9.3822 | -10.5849 | -9.3299 | -9.2945 |
| Number of lags | 1 | 1 | 0 | 0 | 2 | 2 |
| P-value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Critical value (5%) | -2.8959 | -3.4635 | -2.8955 | -3.4629 | -2.8963 | -3.4642 |
| PP test statistic | -15.1762 | -15.0839 | -9.4320 | -10.6025 | -10.1931 | -10.0143 |
| Bandwidth | 9 | 9 | 4 | 2 | 26 | 26 |
| P-value | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Critical Value (5%) | -2.8955 | -3.4629 | -2.8955 | -3.4629 | -2.8955 | -3.4629 |

| | CPI | | JSE Index | | Real GDP | |
|---|---|---|---|---|---|---|
| | *Without trend* | *With Trend* | *Without Trend* | *With Trend* | *Without Trend* | *With Trend* |
| ADF test Statistic | -9.2736 | -9.2938 | -6.0461 | -6.2291 | -8.5231 | -8.4705 |
| Number of lags | 0 | 0 | 0 | 0 | 1 | 1 |
| P-value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Critical value (5%) | -2.8955 | -3.4629 | -2.8955 | -3.4629 | -2.8959 | -3.4635 |
| PP test statistic | -9.2736 | -9.2938 | -5.8591 | -5.9593 | -8.9624 | -8.9042 |
| Bandwidth | 1 | 1 | 7 | 8 | 3 | 3 |
| P-value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Critical value (5%) | -2.8955 | -3.4629 | -2.8955 | -3.4629 | -2.8955 | -3.4929 |

**Note:** The null hypothesis for the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests state that the series has a unit root.

**Table 5.0:** Equation (1): OLS Regression: Using Interest Rate

| Interest Rate Equation | |
|---|---|
| Variables | Coefficients |
| Intercept | -0.0133** |
| | (0.0184) |
| Interest rate growth(-1) | 0.0791 |
| | (0.4277) |
| Interest rate growth(-2) | 0.1452 |
| | (0.1775) |
| Interest rate growth(-3) | -0.5321*** |
| | (0.0000) |
| Interest rate growth(-4) | -0.1330 |
| | (0.1105) |
| GDP Growth(-2) | 0.1501 |
| | (0.5052) |
| GDP Growth(-3) | 0.2955 |
| | (0.3722) |
| GDP Growth(-4) | 0.5234* |
| | (0.0821) |
| Inflation(-1) | 0.3754*** |
| | (0.0056) |
| Inflation(-2) | 0.4073** |
| | (0.0411) |
| Inflation(-3) | -0.8356*** |
| | (0.0000) |
| Inflation(-4) | 0.2717 |
| | (0.1248) |
| R-squared | 0.6512 |
| Adjusted R-squared | 0.5972 |
| Log likelihood | 170.4021 |
| F-statistic | 12.0524 |
| Prob(F-statistic) | 0.0000 |
| Durbin-Watson Statistic | 1.8442 |
| Akaike info criterion | -3.8170 |
| Schwarz criterion | -3.4672 |

Note: P-values are in parentheses.

*Significant at the 10% level

**Significant at the 5% level

*** Significant at the 1% level

**Table 5.1:** Equation (2): Using JSE Index as Wealth Variable

| Wealth Equation | |
|---|---|
| Variables | Coefficients |
| Intercept | 0.0460*** |
| | (0.0038) |
| Growth rate of the JSE Index(-1) | 0.4218*** |
| | (0.0023) |
| Growth rate of the JSE Index(-4) | -0.1579 |
| | (0.1882) |
| Growth rate of the JSE Index(-5) | 0.2525 |
| | (0.1035) |
| Growth rate of the JSE Index(-6) | 0.1066 |
| | (0.3547) |
| Growth rate of the JSE Index(-7) | -0.0653 |
| | (0.6403) |
| Easy policy(-1) | 1.4155* |
| | (0.0919) |
| Tight policy(-1) | -1.6078** |
| | (0.0235) |
| R-squared | 0.3154 |
| Adjusted R-squared | 0.2488 |
| Log likelihood | 62.5733 |
| F-statistic | 4.7388 |
| Prob(F-statistic) | 0.0002 |
| Durbin-Watson Statistic | 1.904 |
| Akaike info criterion | -1.3643 |
| Schwarz criterion | -1.1261 |

Note: P-values are in parentheses.

*Significant at the 10% level

**Significant at the 5% level

*** Significant at the 1% level

**Table 5.2**: Equation (2.1): Asymmetry in Consumption Growth

| Consumption Equation | |
|---|---|
| Variables | Coefficients |
| Intercept | 0.0205** |
| | (0.0146) |
| Consumption Growth(-1) | -0.4511*** |
| | (0.0001) |
| Consumption Growth(-2) | -0.4061*** |
| | (0.0019) |
| Consumption Growth(-3) | -0.1275 |
| | (0.3694) |
| Consumption Growth(-4) | -0.2071 |
| | (0.1001) |
| Easy policy(-1) | 0.3934** |
| | (0.0385) |
| Tight policy(-1) | -0.6041** |
| | (0.0445) |
| R-squared | 0.2864 |
| Adjusted R-squared | 0.2300 |
| Log likelihood | 133.3491 |
| F-statistic | 5.0832 |
| Prob(F-statistic) | 0.0002 |
| Durbin-Watson Statistic | 1.9497 |
| Akaike info criterion | -3.0446 |
| Schwarz criterion | -2.8406 |

Note: P-values are in parentheses.

*Significant at the 10% level

**Significant at the 5% level

*** Significant at the 1% level

**Table 5.3:** Wald Test Results: 180-day Treasury bill rate

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| F-statistic | 3.271893 | (2, 76) | 0.0433 |
| Chi-square | 6.543786 | 2 | 0.0379 |

**Table 6.0:**Equation (1): OLS Regression: Using Samuels-Serju Index of Monetary Policy

| Boschen-Mill Equation | |
|---|---|
| Variables | Coefficients |
| Intercept | -0.4891*** |
| | (0.0000) |
| Boschen-Mill Index (-1) | 0.4624*** |
| | (0.0000) |
| Boschen-Mill Index (-2) | -0.3183*** |
| | (0.0008) |
| GDP Growth(-2) | 10.7422 |
| | (0.1381) |
| Inflation(-1) | 10.9947*** |
| | (0.0000) |
| Inflation(-3) | -17.4511*** |
| | (0.0000) |
| Inflation(-4) | 13.0156*** |
| | (0.0000) |
| R-squared | 0.4991 |
| Adjusted R-squared | 0.4596 |
| Log likelihood | -95.191 |
| F-statistic | 12.622 |
| Prob(F-statistic) | 0.0000 |
| Durbin-Watson Statistic | 1.8766 |
| Akaike info criterion | 2.4624 |
| Schwarz criterion | 2.6664 |

Note: P-values are in parentheses.

*Significant at the 10% level
**Significant at the 5% level
*** Significant at the 1% level

**Table 6.1 :**Equation (2): Using JSE Index as Wealth Variable

| Wealth Equation(JSE Index) | |
|---|---|
| Variables | Coefficients |
| Intercept | 0.0684*** |
| | (0.0007) |
| Growth rate of the JSE Index(-1) | 0.3731*** |
| | (0.0006) |
| Growth rate of the JSE Index(-4) | -0.1524 |
| | (0.1407) |
| Growth rate of the JSE Index(-5) | 0.2345 |
| | (0.1002) |
| Growth rate of the JSE Index(-6) | 0.0583 |
| | (0.4377) |
| Easy policy(-1) | 0.0513 |
| | (0.1632) |
| Tight policy(-1) | -0.1260*** |
| | (0.0032) |
| R-squared | 0.391 |
| Adjusted R-squared | 0.3416 |
| Log likelihood | 68.1344 |
| F-statistic | 7.9182 |
| Prob(F-statistic) | 0.0000 |
| Durbin-Watson Statistic | 1.8407 |
| Akaike info criterion | -1.5095 |
| Schwarz criterion | -1.3026 |

Note: P-values are in parentheses.

*Significant at the 10% level

**Significant at the 5% level

*** Significant at the 1% level

**Table 6.2:**Equation (2.1): Asymmetry in Consumption Growth

| Consumption Equation | |
|---|---|
| Variables | Coefficients |
| Intercept | 0.0247*** |
| | (0.0024) |
| Consumption Growth(-1) | -0.4054*** |
| | (0.0003) |
| Consumption Growth(-2) | -0.3887*** |
| | (0.0002) |
| Consumption Growth(-4) | -0.2288** |
| | (0.0497) |
| Easy policy(-1) | 0.0279*** |
| | (0.0073) |
| Tight policy(-1) | -0.0260** |
| | (0.0716) |
| R-squared | 0.2825 |
| Adjusted R-squared | 0.2359 |
| Log likelihood | 133.1251 |
| F-statistic | 6.0640 |
| Prob(F-statistic) | 0.0001 |
| Durbin-Watson Statistic | 2.0343 |
| Akaike info criterion | -3.0623 |
| Schwarz criterion | -2.8884 |

Note: P-values are in parentheses.
*Significant at the 10% level
**Significant at the 5% level
*** Significant at the 1% level

**Table 6.3:**Wald test results using the Boschen- Mill index

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| F-statistic | 3.817405 | (2, 77) | 0.0263 |
| Chi-square | 7.634810 | 2 | 0.0220 |

**Table 7.0**: VAR Lag order selection Criteria

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 262.7609 | NA | 1.09e-09 | -6.444022 | -6.295145 | -6.384333 |
| 1 | 808.9380 | 1010.428 | 2.40e-15 | -19.47345 | -18.58019* | -19.11532 |
| 2 | 856.7560 | 82.48609 | 1.37e-15 | -20.04390 | -18.40626 | -19.38732 |
| 3 | 885.9596 | 46.72574 | 1.26e-15 | -20.14899 | -17.76696 | -19.19397 |
| 4 | 934.1997 | 71.15420* | 7.28e-16* | -20.72999* | -17.60358 | -19.47653* |
| 5 | 956.6766 | 30.34373 | 8.23e-16 | -20.66691 | -16.79612 | -19.11500 |
| 6 | 982.3793 | 31.48581 | 8.86e-16 | -20.68448 | -16.06931 | -18.83413 |
| 7 | 1004.280 | 24.09101 | 1.09e-15 | -20.60701 | -15.24745 | -18.45820 |
| 8 | 1031.019 | 26.07060 | 1.26e-15 | -20.65048 | -14.54654 | -18.20324 |

**Note**: * indicates lag order selected by the criterion.
AIC denotes theAkaike information criterion
SCis the Schwarz information criterion
HQ is the acronym for theHannan-Quinn information criterion

**Table 7.1:** Trace test for cointegration

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.701261 | 151.4353 | 69.81889 | 0.0000 |
| At most 1 * | 0.282654 | 51.15603 | 47.85613 | 0.0237 |
| At most 2 | 0.186390 | 23.58367 | 29.79707 | 0.2186 |
| At most 3 | 0.073182 | 6.462944 | 15.49471 | 0.6408 |
| At most 4 | 0.001867 | 0.155102 | 3.841466 | 0.6937 |

**Note:** P-values are based on MacKinnon-Haug-Michelis (1999).

**Eigen Value test for cointegration**

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.701261 | 100.2793 | 33.87687 | 0.0000 |
| At most 1 | 0.282654 | 27.57236 | 27.58434 | 0.0502 |
| At most 2 | 0.186390 | 17.12073 | 21.13162 | 0.1664 |
| At most 3 | 0.073182 | 6.307842 | 14.26460 | 0.5740 |
| At most 4 | 0.001867 | 0.155102 | 3.841466 | 0.6937 |

**Note:** P-values are based on MacKinnon-Haug-Michelis (1999).

**Table 8.0:** Forecast error variance decomposition of consumption using the JSE Index to represent wealth

| Period | S.E. | DLCPISA | DLWAGESA | DLCONSA | DJSESA | DRATE |
|---|---|---|---|---|---|---|
| 1 | 0.026529 | 1.278558 | 5.998814 | 0.877997 | 91.84463 | 0.000000 |
| 2 | 0.031426 | 6.426410 | 5.648341 | 2.483988 | 83.48901 | 1.952247 |
| 3 | 0.041321 | 5.440572 | 8.094270 | 2.508799 | 78.30715 | 5.649212 |
| 4 | 0.046767 | 4.541744 | 8.421575 | 3.396936 | 73.87676 | 9.762988 |
| 5 | 0.052122 | 4.540258 | 7.281475 | 3.207955 | 73.32729 | 11.64302 |
| 6 | 0.054927 | 4.519502 | 6.485382 | 2.867737 | 74.78141 | 11.34596 |
| 7 | 0.057821 | 4.146315 | 5.788071 | 2.519756 | 77.46474 | 10.08112 |
| 8 | 0.060496 | 3.702252 | 5.547091 | 2.321731 | 79.10236 | 9.326563 |
| 9 | 0.063658 | 3.379788 | 5.830153 | 2.185140 | 79.68666 | 8.918260 |
| 10 | 0.067245 | 3.132636 | 6.001413 | 2.441509 | 79.18377 | 9.240668 |
| 11 | 0.070498 | 2.920344 | 6.079628 | 2.458307 | 78.64852 | 9.893202 |
| 12 | 0.073672 | 2.811266 | 5.939081 | 2.364728 | 78.52009 | 10.36483 |

## Appendix B

**Figure 1.0:**Time plots of the growth rates of the variables

**Figure 2.0:**Growth rate of Treasury bill rate and JSE index

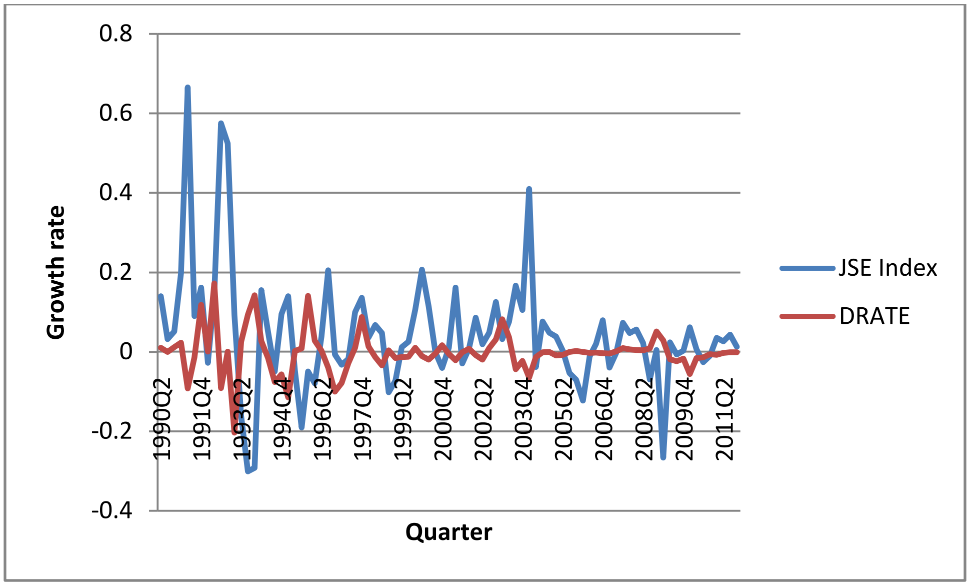


**Figure 3.0:** Growth rate of theTreasury bill rate and consumption growth.

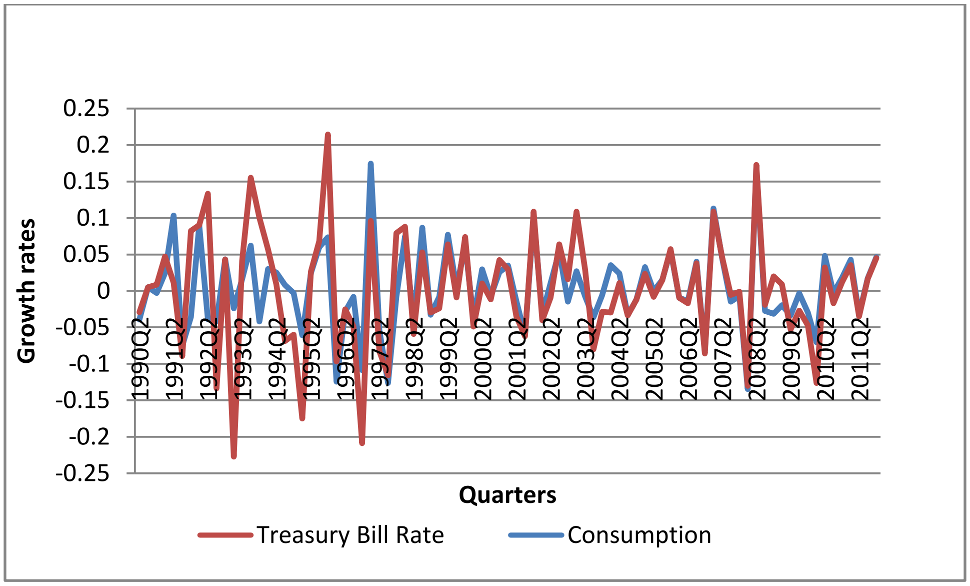

**Figure 4.1:** Samuels-Serju Index of Monetary Policy

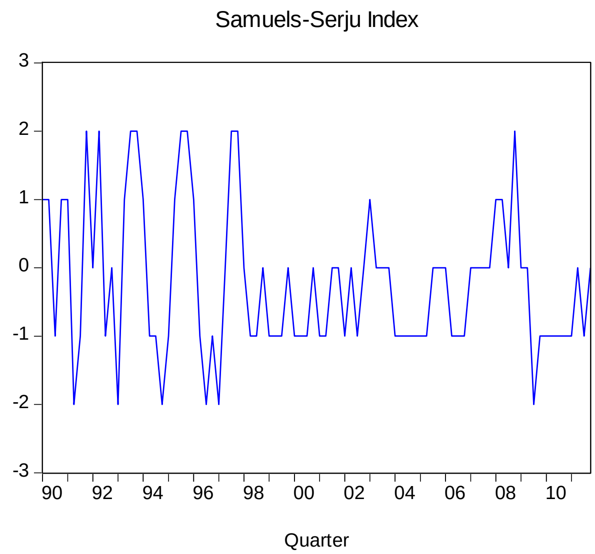


**Figure 4.2:** Graph of the 30-day Certificate of Deposits Rates

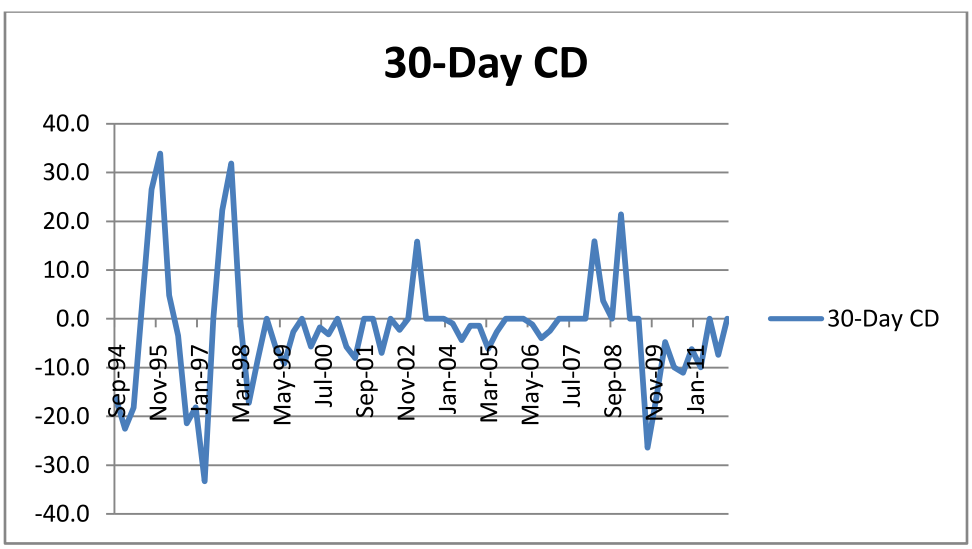

**Figure 5.0:** Impulse responses from the VECM. Responses of the variables to interest rate shocksusing the JSE Index to measure wealth.

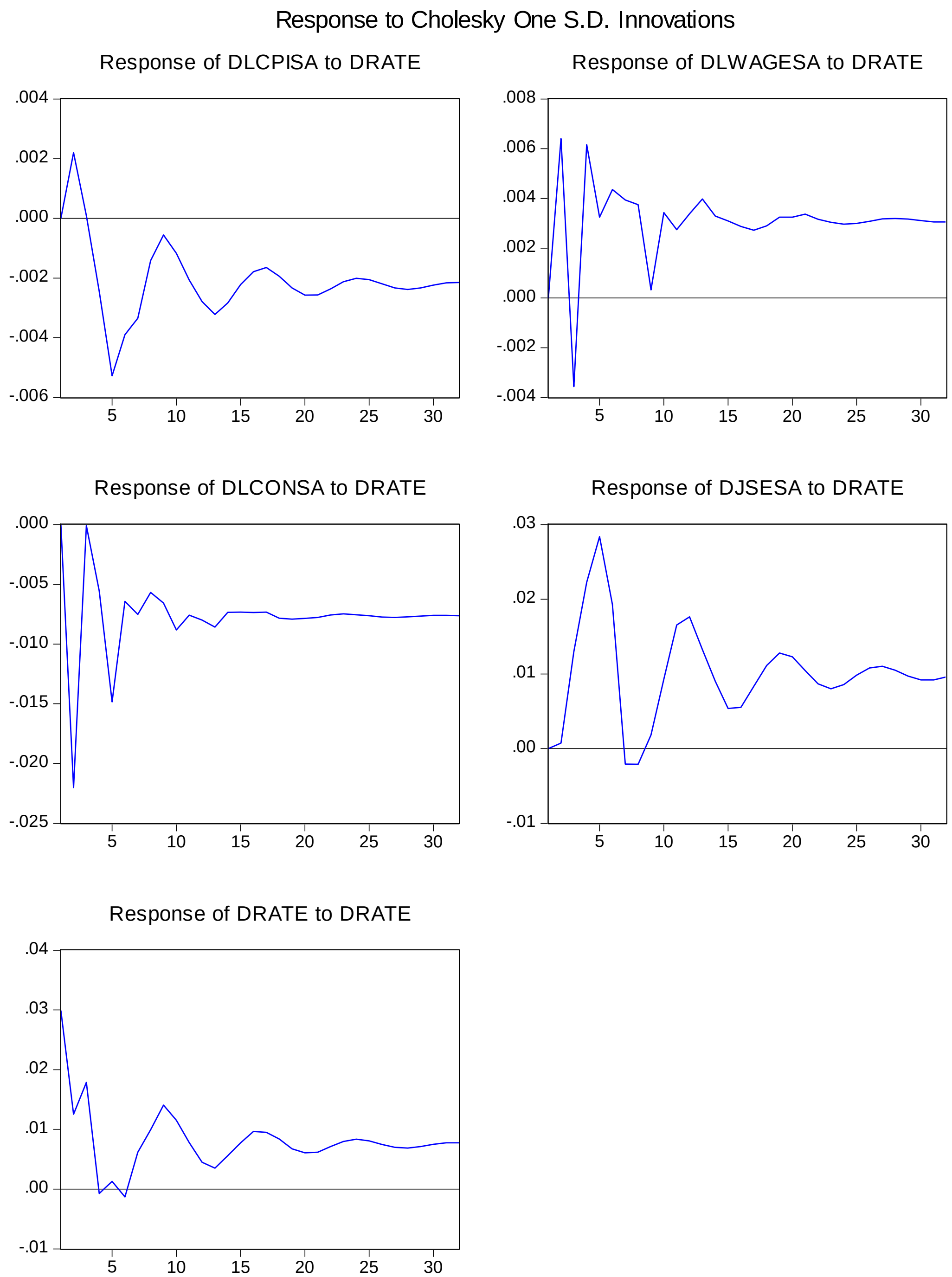

**Figure 6.0:**Impulse responses from the VECM. Responses of the variables to wealth shocks usingthe JSE Index to measure wealth