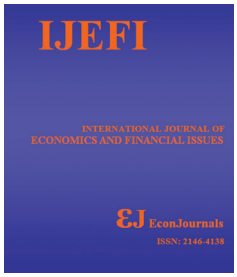

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Effectiveness of the Asset Price Channel as a Monetary Policy Transmission Mechanism in Malawi: Evidence from Time Series Data

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ABSTRACT

This paper first, investigates the responsiveness of stock prices to changes in interest rates in Malawi, a low-income country in sub-Saharan Africa. Secondly, determines whether Gross Domestic Product of such economies respond significantly to changes in stock prices. Time series data from January 2001 to December 2019 are utilised. Unit root tests indicate that each variable is integrated of order one and the Johansen test for cointegration reveal that the variables are cointegrated, with one cointegrating equation. Therefore, a vector error correction model has been adopted to investigate the short and long-run dynamic relationship among the variables. Results of Granger causality tests and impulse response analysis indicate that stock prices do respond to changes in interest rates. Moreover, Gross Domestic Product also responds to changes in stock prices. Thus, contrary to previous studies, this paper finds that an asset price channel operating through stock prices exists in Malawi. More specifically, this study finds that variations in interest rates cause significant changes in stock prices which in turn cause changes in Gross Domestic Product. Among others, the study recommends that the monetary authorities should raise public awareness on investment opportunities available in stock markets.

Keywords: Econometric Modelling, Informal Economies, Monetary Policy, Time Series Models
JEL Classifications: C32, C50, E26, E52

1. INTRODUCTION

Monetary policy is formulated to influence the trajectory of economies towards a more desirable state. For example, when economic output is declining or when unemployment is rising, authorities may lower interest rates or expand the money supply with an aim of encouraging consumption and investment (Blanchard, 2017). Although scholars have long been studying transmission mechanisms of monetary policy (Bernanke and Gertler, 1995; Ireland, 2010), the interest continues to grow even in recent times (Cesa-Bianchi et al., 2020) especially given the influence it has in changing the structure of the economy (European Central Bank, 2010).

This study assesses the effectiveness of the financial asset prices as a channel of monetary policy transmission in low-income countries. It uses data on stock prices, interest rates and Gross Domestic Product (GDP) per capita from Malawi, a low-income country in sub-Saharan Africa (SSA) with a GNI per capita of about US$360 (World Bank, 2018).

An understanding of monetary policy transmission mechanisms enables authorities to determine both the required level and the proper timing of policy interventions (European Central Bank, 2010). In itself, the determination of which channels operate within an economy can be a black box (Bernanke and Gertler,

1995). Low-income countries face additional challenges in their determination of channels of monetary policy transmission due to their underdeveloped institutional frameworks. As observed by Mishra et al. (2012), this results in weak or non-existent interest rate and asset price-based channels.

Studies have either explicitly dismissed the idea of an asset price channel, while others have not incorporated asset prices such as stock prices when investigating transmission mechanisms of monetary policy. For example, citing a study by Phiri (2002) who proposed that stock prices may act as a possible conduit of monetary policy transmission in Malawi, Ngalawa and Viegi (2011) observed that the stock exchange was immature to operate as a possible channel of monetary policy and therefore did not empirically test it using stock price data. A similar approach was echoed by Mwabutwa et al. (2013) whose study on the evolution of monetary policy transmission mechanisms in Malawi did not include stock prices.

It is easy to dismiss entirely the potential role that can be played by stock prices in the transmission of monetary policy in low-income countries on the basis of the immaturity of their stock markets. The motivation to take a closer look at stock prices in Malawi is due, in part, to the fact that there has been a dramatic rise in the volume of trade conducted at the Malawi Stock Exchange since its inception at the end of the 20th century. For example, during the first quarter of 2003, the market recorded a total of 22,307,347 shares (Malawi Stock Exchange, 2003). By the third quarter of 2019, the number of traded shares had risen to 209,366,267 (Malawi Stock Exchange, 2019) representing an average steady increase of 15% per annum. With such an increase in the popularity of trade at the Malawi Stock Exchange, it is imperative to know whether stock prices can now act as a viable channel of monetary policy transmission. This study is adding on to the existing literature on monetary policy transmission mechanisms of low-income economies.

This study therefore aimed to assess the responsiveness of stocks to changes in interest rates or money supply and to determine whether GDP responds to changes in stock prices in Malawi. The rest of the paper is organized as follows. Section 2 is literature review followed by methodology in section 3Results and conclusions of the study are presented in Section 4 and 5 respectively.

2. LITERATURE REVIEW

2.1. Theoretical and Conceptual Framework

The theoretical basis of the asset price channel operating through stock prices was laid down in *Tobin's Q Theory* proposed by Kaldor (1966) as a ratio of the market value of a firm to the cost of replacement of its assets.

$$q = \frac{Market\,Value\,of\,Firm}{Replacement\,Cost\,of\,its\,Assets} \quad (1)$$

Essentially, this states that lowering interest rates (an act of expansionary monetary policy) make investors prefer stocks (equity) relative to bonds whose relative yields decline. As a result, stock prices rise. When stock prices rise, q increases because the market value of a firm is the product of average share price and the number of issued shares. Firms can therefore raise more funds by issuing a small number of additional shares. When faced with the need to decide whether to make new investment spending or use existing equipment by taking over existing firms, companies find it cheaper to issue stock and get a high price relative to the cost of the facilities and equipment they are buying. This means investment spending will rise as firms will be able to buy new equipment with an issue of a few stocks. This leads to an increase in national income.

On the other hand, if share prices decline, the cost of buying replacement assets is high relative to the market value of firms. When faced with a need for additional assets, companies find it cheaper to just buy another firm and obtain its assets instead of purchasing new assets. As a result, no new assets are purchased by firms and investment falls.

In addition to *Tobin's Q Theory*, the *Wealth Effect* provides a theoretical explanation of the asset price channel of monetary policy transmission. It is based on the Life Cycle Hypothesis (Ando and Modigliani, 1963) which states that consumption spending is a function of the lifetime resources owned by individuals and not just their current income. Therefore, consumers are more likely to increase their consumption if their wealth increases, and reduce their consumption spending if their wealth declines.

Thus, during expansionary monetary policy, stock prices increase. Individual investors will now value their wealth as being higher than before. According to Modigliani's *Life Cycle Hypothesis*, the perceived increase in wealth leads to an increase in consumption. Ultimately, this leads to an increase in national income.

In essence, this study utilises data collected from Malawi to check the applicability of *Tobin's Q Theory* and the *Wealth Effect* in the context of a low-income economy.

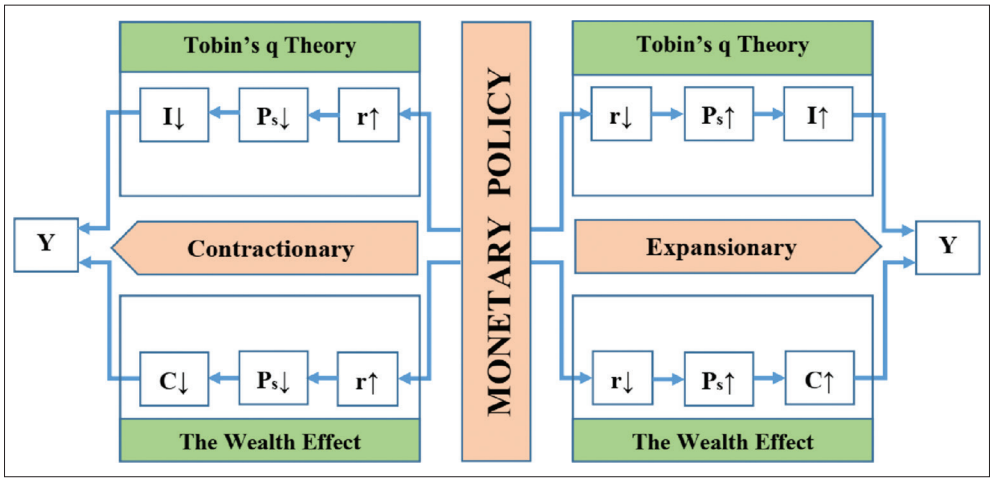
Figure 1 highlights the relationship between stock prices and a monetary policy variable (interest rates) on one hand, and that of stock prices and real macroeconomic variable (y) on the other hand.

2.2. Empirical Studies on Monetary Policy Transmission

The investigation of monetary policy transmission mechanisms using the Vector Autoregressive model (VAR) or Vector Error Correction Model (VECM) techniques has intensified since the publication of the pioneering work by Sims (1980). Researchers throughout the world have attempted to analyse monetary policy transmission mechanisms by applying this method.

Although Mishkin (2017) identified the traditional transmission mechanisms of monetary policy such as the interest rate and exchange rate channels, novel transmission mechanisms continue to be explored (see for example the deposits channel by Drechsler et al. (2017) as well as the risk-taking channel by Delis et al. (2017)). Moreover, due to the importance attached to the

Figure 1: Theoretical relationship between interest rates, stock prices and income



understanding of monetary policy transmission mechanisms by central bankers (European Central Bank, 2010), several studies have investigated transmission mechanisms of monetary policy in different low-income economies such as Sierra Leone (Lavally and Nyambe, 2019) and Tanzania (Alexianu, 2020), as well as in medium-income economies such as Vietnam (Nguyen et al., 2019) and Ethiopia (Nuru, 2019). In Malawi, the study by Ngalawa and Viegi (2011) and Mwabutwa et al. (2013) are among the major works on transmission mechanisms of monetary policy.

Ngalawa and Viegi (2011) investigated how monetary policy decisions affect economic activity in Malawi. Using a Structural Vector Autoregression (S-VAR) approach, the study illustrates that bank lending, exchange rates and aggregate money supply are important transmission processes of monetary policy shocks in Malawi. However, Ngalawa and Viegi (2011) highlighted that the Malawi Stock Exchange which was opened in 1996 (Malawi Stock Exchange, 2020) was still immature to act as a viable channel of monetary policy transmission. Consequently, despite their use of 7 macroeconomic variables, Ngalawa and Viegi (2011) did not include the stock price index in their S-VAR model. In this aspect, this study is unique in that it utilises the Malawi All Share Index (MASI) in the analysis of the transmission mechanism of monetary policy.

Mwabutwa et al. (2013) investigateed how the monetary transmission mechanism in Malawi evolved between 1981 and 2010 through the use of a Time Varying Parameter Vector Autoregressive (TVP-VAR) model. The study concludes that inflation, real output and exchange rate responses to monetary policy shocks varied significantly over the reviewed period. Although it adopts the TVP-VAR approach in order to avert the limitations of the traditional VAR model such as price puzzles and omitted variable bias, the study did not specifically incorporate the stock price index among the 5 variables it utilized.

Lungu et al. (2012) attempted to derive a money demand function and explored its implications for monetary policy conduct in Malawi from 1985 to 2010. Through cointegration tests in a VECM approach, the study finds a long-run relationship between real money balances, prices, income and exchange rates. It however did not find evidence of the asset price channel but instead suggest the existence of an exchange rate channel.

The fact that many studies of transmission mechanisms of monetary policy do not specifically test for the existence of the asset price channel can be explained by the widely held view that low-income countries have a weak financial institutional framework (Bolnick, 1991; Mishra et al., 2012). Thus in Kenani et al. (2012), the immaturity of the Malawi Stock Exchange has been cited as an indication that the financial sector in Malawi is still underdeveloped. The study is aimed at investigating any short-run and long-run relationships between stock prices and exchange rates in Malawi for the period from 1999 to 2010. One conclusion from the study is that both internal and external macroeconomic shocks do not have immediate effect on the stock and foreign exchange markets. This implies that stock prices do not show a significant responsiveness to changes in monetary policy variables such as interest rates and money supply.

However, in a study that analyses secondary data sets of thirteen local companies listed on the Malawi Stock Exchange for the period 2008 to 2014, Majanga (2015) employs correlation analysis and finds a strong positive relationship between a firm's dividends and its stock price on the stock market despite the underdeveloped financial sector and immaturity of the stock markets in low-income countries suggested by Kenani et al. (2012) and Mishra et al. (2012).

With such a mixed array of findings, and the increase in the volume of trade at the Malawi Stock Exchange as well as the clear absence of a study that specifically tests for the asset price channel in Malawi, this study examines the transmission process of monetary policy in Malawi. Next section presents the methodology.

3. RESEARCH METHODOLOGY

3.1.Research Design

This study adopts a positivist philosophy (Saunders et al., 2019) in which transmission mechanisms of monetary policy in Malawi are regarded as an objective reality capable of being measured independent of the researcher. In contrast to this, interpretivism is a perspective adopted by researchers who acknowledge that

their subjective experiences cannot be separated from the study but aim at gaining an in-depth meaning and understanding of a social phenomenon (Cresswell, 2018).

The research approach adopted is deductive, as an attempt to use data to prove the applicability of the asset price channel (Mishkin, 2017) in Malawi is made. Therefore, the methodology adopted in this study is quantitative, being an econometric investigation of the dynamic relationship between selected macroeconomic variables in Malawi within the study period using secondary data.

3.2. Variable Selection and Data Sources

In this study, the primary focus is the determination of the effectiveness of the asset channel as a monetary policy transmission mechanism thereby establishing an empirical link between interest rate and Gross Domestic Product (GDP) through stock prices.

In their study of the dynamic effects of monetary policy in Malawi, Ngalawa and Viegi (2011) use seven variables in their S-VAR model. These variables were output, consumer price level, commercial bank loans, exchange rates, aggregate money supply, bank rate and reserve money. Although they admit that the number of variables in their study is higher than those in comparable studies, it is interesting to note that conspicuously missing from their long list is stock prices. Given that the authors had already overruled the possibility of the asset channel as a monetary policy transmission mechanism in Malawi, it is unsurprising to find that movement of stock prices is not captured in their study. It will therefore be inappropriate to adopt their choice of variables in this study.

However, in a study of monetary policy transmission mechanisms in Vietnam, Canh and Vo (2014) use a rotating variable approach by combining three endogenous variables with one proxy variable for each transmission mechanism they investigated. The three endogenous variables were the Industrial Production Index, the Consumer Price Index (CPI) and the Vietnamese Interbank Offer Rate. Unlike that of Ngalawa and Viegi (2011), the study by Cahn and Vo (2014) investigated the effectiveness of the asset channel using the Vietnam Stock Market Index as the proxy variable for stock prices.

This study therefore adopts the approach taken by Canh and Vo (2014) as it is the one which investigated the asset channel. However, this study does not incorporate the CPI because it only focusses on the asset price channel as outlined in *Tobin's Q theory* (Mishkin, 2017). Instead, this study uses the following variables: Interest rates (INTR), the natural logarithm of the Malawi All Share Index (LOGMASI), and the natural logarithm of real Gross Domestic Product (LOGGDP) per capita for Malawi. The use of INTR is justified on the basis of the observation by Ngalawa and Viegi (2011) that it is a more effective operating target variable of monetary policy than reserve money. Moreover, LOGMASI represents the channel variable of interest while LOGGDP is a macroeconomic policy goal variable.

3.3. Econometric Modelling and Data Analysis

As a starting point in the modelling process, it must be emphasised that this study seeks to establish whether there is any relationship between changes in interest rates (INTR) and stock prices (LOGMASI), and if changes in stock prices affect per capita output (LOGGDP) in Malawi. Ideally, this can be investigated by estimating a linear regression model in which LOGGDP is the dependent variable while LOGMASI and INTR are independent variables as in equation 2:

$$LOGGDP_t = \beta_0 + \beta_1 INTR_t + \beta_2 LOGMASI_t + \varepsilon_t \qquad (2)$$

Apriori, the sign of β_1 is expected to be negative since any reduction in interest rates is an instance of expansionary monetary policy which is expected to lead to higher output. However, β_2 is expected to be positive since from *Tobin's Q Theory*, increases in stock prices lead to increases in GDP.

It is standard practice in time-series analysis to begin by checking whether the series are stationary in levels or if they are integrated. A time-series variable is said to be stationary if it has a time invariant mean and variance, and if the correlation between any two observations only depend on the time between observations, not on the actual time that the observations are made (Hill et al., 2018). This is important since there is a possibility that the series may be non-stationary and cointegrated, in which case estimation of Equation 2 using *Ordinary Least Squares* (OLS) method would lead to *spurious regression*. This is undesirable, as regression results may indicate that the variables have significant relationships when in actual fact, they are unrelated (Gujarati, 2013).

Thus, the study adopts a quantitative methodology following the Structural Vector Auto Regression (SVAR) approach developed by Sims (1980) which has been widely applied, even in contemporary studies such as the one for the Democratic Republic of Congo (Yemba et al., 2020), Vietnam (Nguyen et al., 2019) as well as the study for Pakistan (Anis et al., 2019). Thus, let Y_t be an $(n \times 1)$ matrix representing a vector of autoregressive endogenous variables which can be expressed as a function of their own lags. Taking natural logarithms of the variables in Table 1 except for interest rates, we have:

$$\vec{Y}_t = \begin{bmatrix} LOGGDP_t \\ LOGMASI_t \\ INTR_t \end{bmatrix} \qquad (3)$$

In a VAR model, the variables are expressed as a function of their own previous lags, and the lags of all other variables (Asteriou and Hall, 2016). Thus, in order to test for the existence of the asset price channel through *Tobin's Q Theory*, one must establish the link

Table 1: Variables and data sources

VARIABLE	DESCRIPTION	SOURCE
INTR	Interest rate	Reserve bank of malawi (RBM) https://www.rbm.mw/Statistics/FinancialData/
MASI	Malawi all share index	Malawi stock exchange (MSE) https://mse.co.mw/index.php?route=market/market/report
GDPC	GDP per capita	Federal reserve economic data (FRED) https://fred.stlouisfed.org/series/NYGDPPCAPKDMWI

between interest rates and stock prices on one hand, and between stock prices and GDP on the other hand. Hence the following system of equations is estimated as a VAR, assuming for the time being that there is only one lag (the actual number of lags are obtained from lag length criteria test undertaken in the study, Table 2):

$$LOGGDP_t = \alpha_0 + \alpha_1 LOGGDP_{t-1} + \alpha_2 LOGMASI_{t-1} + \alpha_3 INTR_{t-1} + \varepsilon_t \quad (4)$$

$$LOGMASI_t = \beta_0 + \beta_1 LOGGDP_{t-1} + \beta_2 LOGMASI_{t-1} + \beta_3 INTR_{t-1} + \mu_t \quad (5)$$

$$INTR_t = \gamma_0 + \gamma_1 LOGGDP_{t-1} + \gamma_2 LOGMASI_{t-1} + \gamma_3 INTR_{t-1} + v_t \quad (6)$$

If the series are cointegrated, a vector error correction (VEC) model is estimated which enable the determination of both the short run and long run relationship of the variables (Engle and Granger, 1987).

Stated in general for the 3 variable case as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{p-1} \gamma_j \Delta X_{t-j} + \sum_{k=1}^{p-1} \lambda_j \Delta Z_{t-k} + \phi ECT_{t-1} + \varepsilon_t \quad (7)$$

Where *ECT* is the error correction term which represent the long-run relationship, *p* is the optimum lag length and φ is the speed of adjustment. Apriori, this is expected to be negative and represents the proportion of the error in the current period that is corrected towards the long-run relationship. The variables *Y, X* and *Z* are the endogenous variables (in this case they represent LOGGDP, LOGMASI and INTR) and Δ is the difference operator.

In the analysis, the first stage tested for unit roots on each of the series using the widely adopted *Augmented Dickey-Fuller* (ADF) test (Cheung and Lai, 1995) and to ensure robustness of the results, the *Phillips-Perron* (PP) test is also used (Phillips and Perron, 1988). This is followed by the basic VAR which is used to carry out lag-length selection tests. The *Johansen Test* for cointegration (Johansen, 1991) is next and, depending on the results, either VAR in levels or a vector error correction model (VECM) will be estimated. Section 4 presents the results.

4. RESULTS AND DISCUSSION

4.1. Summary Statistics

This section presents the results of the study on the asset price channel of monetary policy transmission in Malawi. Figure 2 indicate that overall, interest rates declined during the study period whereas both stock prices and per capita income showed a positive trend.

It can be seen from Table 3 that the average value of interest rates in Malawi was 21.1% with a standard deviation of 11.7% indicating that there was great interest rate volatility during the study period. Moreover, the average value of the stock price index was 8433 while that of per capita GDP was about US$38 per month. Note that this amounts to an average per capita income of $1.27 per day.

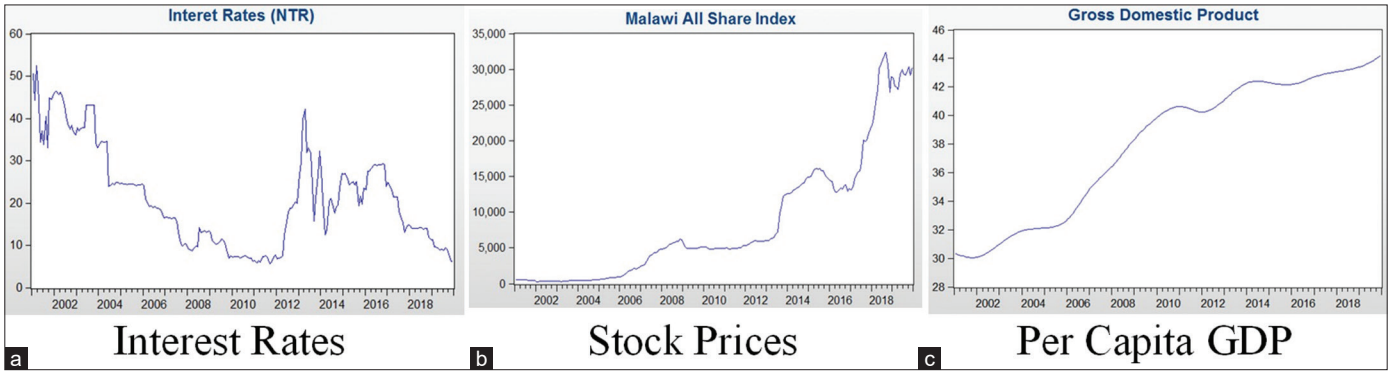
4.2. Results of Unit Root, Lag Order Selection and Cointegration Tests

The ADF tests and PP tests confirm that all series are integrated of order 1. For the basic VAR involving INTR, LOGMASI and LOGGDP, results of lag selection test (Table 2) show that the optimum lag length is either 6 or 5, being the lag lengths selected by the widely adopted *Akaike Information Criteria* (AIC) (Akaike,

Table 2: Lag length selection test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–734.2695	NA	0.163461	6.702450	6.748726	6.721137
1	905.5555	3220.020	5.95e-08	–8.123232	–7.938125	–8.048481
2	1304.759	773.0029	1.71e-09	–11.67054	–11.34660	–11.53972
3	1317.493	24.30979	1.66e-09	–11.70448	–11.24171	–11.51760
4	1395.162	146.1602	8.88e-10	–12.32875	–11.72715	–12.08581
5	1436.147	76.00858	6.64e-10	–12.61952	–11.87909*	–12.32052*
6	1450.864	26.89125	6.31e-10*	–12.67149*	–11.79223	–12.31642
7	1454.552	6.638872	6.63e-10	–12.62320	–11.60511	–12.21207
8	1465.136	18.76248*	6.54e-10	–12.63760	–11.48068	–12.17041

Figure 2: (a-c) Graphs of variables in the study



1974), and the *Bayesian Information Criterion* (BIC) also known as the *Schwarz Criterion* (SC) (Schwarz et al., 1978) respectively.

Results of the cointegration test (Johansen, 1991) with 6 lags show both the trace test and the max-eigenvalue test indicate 1 cointegrating equation at the 0.05 significance level. The Johansen test for cointegration is adopted in this study, as opposed to the Engel Granger approach because the Johansen test can be utilized for more than one cointegrating relationships and is more reliable in large samples (Hill et al., 2018).

4.3. The Vector Error Correction Model (VECM)

Having found our variables to be cointegrated with one cointegrating equation, we now estimate a vector error correction model (VECM). This is a restricted VAR estimated in first differences. It therefore has one lag less than the corresponding VAR, hence our VEC model has 5 lags. From the results of the Johansen test for cointegration, the cointegration equation in our VEC model (normalised on LOGGDP) is as follows:

$$ECT_{t-1} = LOGGDP_{t-1} - 0.065089LOGMASI_{t-1} + 0.002758INTR_{t-1} - 3.1499 \quad (8)$$

We interpret this as follows. In the long run, stock prices (LOGMASI) in Malawi have a positive impact on per capita income (LOGGDP), *ceteris paribus*. This is consistent with the existence of the asset price channel through stock prices since *Tobin's Q Theory* (see Section 2.1) indicates that when stock prices rise ($P_s\uparrow$), there should be an increase in the value of q represented as $q \uparrow$ which should ultimately lead to an increase in income ($Y \uparrow$) as illustrated in Equation 2. Moreover, the value of coefficient φ of the error correction term (*ECM*) in Equation 7 is found (from the estimated VECM) to be -0.001854. This is negative as expected, confirming that the short run movements of the variables in the system do converge as expected to the long run relationship expressed in the *ECT*. This can be interpreted as follows. A unit short run change in the endogeneous variables in the current period is corrected by a factor of 0.19% towards the long run equilibrium.

Similarly, our error correction term shown in Equation 8 indicate that there is negative relationship between interest rates (INT) and per capita income (LOGGDP). Again, this is consistent with the existence of the asset price channel since decreases in interest rates represent expansionary monetary policy and is expected to lead to increases in stock prices (according to *Tobin's Q Theory* outlined in Section 2.1) which should lead to increases in wealth of equity investors (according to the *Wealth Effect* presented in Section 2.1 and illustrated in Equation 3).

Therefore, our estimated VECM from data on stock prices obtained from the Malawi Stock Exchange and other variables reveal the existence of the asset price channel, contrary to earlier findings by Ngalawa and Viegi (2011) as well as Mwabutwa et al. (2013).

Table 3: Summary statistics

	INTR %	MASI (2010 = 100)	GDPC 2010 USD
Mean	21.1	8433.0	38.0
Median	19.4	5068.5	40.25
Maximum	52.4	32373	44.2
Minimum	5.7	279	30.0
Std. Dev.	11.7	8792.6	4.76
Skewness	0.64	1.23	–0.445
Kurtosis	2.5	3.6	1.599
Jarque-Bera	18.0	61.1	26.2
Probability	0.000126	0	0.000002
Sum	4822	1922713	8665.875
Sum Sq. Dev.	30925.03	17500000000	5147.591
Observations	228	228	228

4.4. Granger Causality Tests

Granger causality tests reveal that changes in interest rates (INTR) cause significant changes in stock prices (LOGMASI) (Table 4).

This confirms the first link in *Tobin's Q Theory* and hence the existence of the asset price channel in Malawi. The null hypothesis that INTR does not Granger cause LOGMASI is rejected, even at the 0.01 significance level as the p-value of the test statistic is 0.0009, being much smaller than the standard 0.05 significance level. This means changes in interest rates do significantly cause changes in stock prices.

Moreover, Granger causality test results between LOGMASI and LOGGDP also indicate that changes in stock prices (LOGMASI) do have a significant effect on LOGGDP. This is illustrated in Table 5 where the null hypothesis that LOGMASI does not Granger cause LOGGDP is rejected at the 0.05 significance level. Thus, both tests confirm the existence of the asset price channel operating through stock prices, contrary to earlier findings by Ngalawa and Viegi (2011) and Mwabutwa et al. (2013).

4.5. Impulse Response Analysis

The impulse response function (IRF) is a useful tool in the analysis of VAR results. It allows researchers to trace the impact on present and future values of an endogenous variable of one standard deviation shock of one of the innovations in the system (Lutkepohl, 2005). We present the IRF graphs of the three variables in our study in Figure 3. Our interest is the response of

LOGMASI to Cholesky one standard deviation (SD) of innovations of INTR. This shows that initially, following a positive

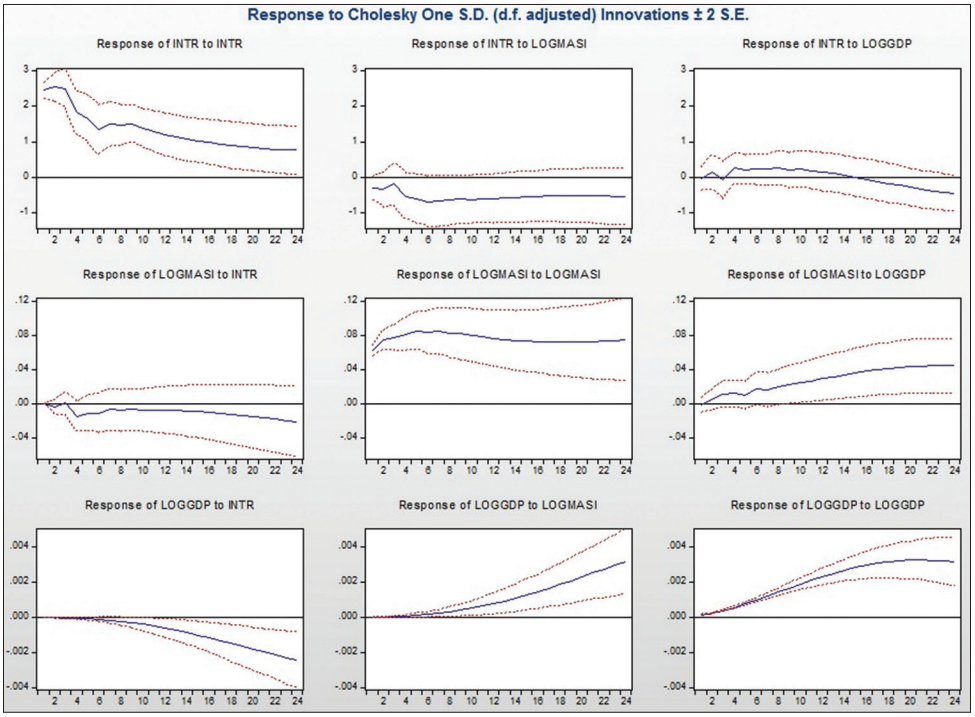
Table 4: Granger causality test results between INTR and LOGMASI using 6 Lags

Null hypothesis	Obs	F-Statistic	P-value
LOGMASI does not granger cause INTR	222	1.73976	0.1132
INTR does not granger cause LOGMASI		3.98353	0.0009

Table 5: Granger causality test between LOGMASI and LOGGDP using 6 lags

Null hypothesis	Obs	F-Statistic	P-value
LOGGDP does not granger cause LOGMASI	222	2.23134	0.0415
LOGMASI does not granger cause LOGGDP		2.34076	0.0329

Figure 3: Impulse response function



change in the interest rates innovations by one standard deviation, stock prices (LOGMASI) decline, as expected in the presence of an asset price channel. This is because a unit increase in interest rates (INTR) is an act of contractionary monetary policy that is expected to lead to a decline in stock prices consistent with *Tobin's Q Theory*. Moreover, the change of LOGGDP to Cholesky one standard deviation (SD) of innovations of LOGMASI also indicate an initial positive response. Again, this is consistent with economic theory and points towards the existence of the asset price channel because a positive standard deviation change in stock prices is expected to lead to an increase in income (LOGGDP) according to *Tobin's Q Theory* and the *Wealth Effect* as explained in Section 2.1

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This study examines the relationships between short term interest rates in Malawi with the stock price from the Malawi Stock Exchange. In addition, the study assesses the responsiveness of income (GDP) to changes in stock prices. Results of Granger causality tests and impulse response functions developed in the study confirm that interest rates significantly affect stock prices in Malawi for the period under study. Moreover, these results also indicate that stock prices do significantly affect GDP in Malawi. Thus, contrary to the findings in Ngalawa and Viegi (2011) as well as in Mwabutwa et al. (2013), the study finds statistical evidence based on the estimated VECM of the asset price channel operating through stock prices.

5.2. Recommendations

Folowing our finding of a viable asset price channel of monetary policy transmission in Malawi, we make the following recommendations. These recommendations are directed towards a wide range of audience, including the Reserve Bank of Malawi (RBM), the Malawi Stock Exchange (MSE), institutional and private investors.

i. The RBM should intensify its financial literacy and educational activities to the wider public. Among other topics, the RBM should aim at encouraging members of the general public to develop a culture of saving and investment. This should result in a well-informed public about investing opportunities available in the country including those at the MSE
ii. The MSE should initiate an intensive promotional campaign aimed at engaging both corporate and individual investors to discuss their concerns over the investment process and incorporate them in its policies and operations
iii. The MSE should fast track its computerization process to ensure that all share certificates and any other information related to investors are kept in a secure electronic form. The aim is to discourage duplication of work as well as minimizing the problem of forged shareholder certificates, both of which can discourage actual and potential investors and increase stock trading at the MSE
iv. As the number and average size of limited companies remain small in Malawi, the MSE should create a viable alternative investment market (AIM). This should allow smaller companies to get listed without fulfilling the strict requirements of full public company listing
v. There should be policies to minimize insider dealing activities in which directors make use of their knowledge of the current or likely financial position of their corporations to purchase or dispose shares. This discourages other investors and is likely to lead to reduced trading at the stock exchange. The MSE, in consultation with the RBM, should involve different stakeholders to find out exactly

how to go about the formulation and implementation of such policies.

vi. The MSE should engage in various fundraising and alternative financing activities. This should result in a more commercially operated stock exchange with its own reliable sources of finance. The aim is to reduce its reliance on listed companies and minimize the charges paid by companies to the MSE when making an initial public offer (IPO) in order to encourage more firms to get listed.

The study suggests that future researchers should look at the extent to which the Malawi Stock Exchange is regarded as a possible investment conduit by ordinary Malawians and make suggestions on what must be done to ensure participation of more Malawians in the stock market

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