CAUSALITY RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND STOCK MARKET DEVELOPMENT: EVIDENCE FROM BAHRAIN

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ABSTRACT

This paper investigates the relationship between macroeconomic variables and Bahraini stock market development by using the Autoregressive Distributed Lag model. The development of a financial market is closely related to the overall development in the national economy. Well functioning financial system achieves efficiencies that provide good and easily accessible information, lower transaction costs and efficient resource allocation then boost economic growth. Many macroeconomic variables have significant effects on a stock market and its functions, development, and role in the national economy. The central bank actions, governmental policies and individual behavior affect the financial system development. For instance, monetary policy links with stock market development through affecting money supply, interest rates, investment activities in stocks and the market values of stocks. Expansion monetary policy raises money supply, decreases interest rates and raises investment in stocks and market values of stocks. A similar effect can be done by fiscal policy but the effect will be gone directly through interest rates and investment. The main findings of the paper are that income level, domestic investment, banking system development; private capital flows and stock market liquidity are important determinants of Bahraini stock market development. The results of the paper support the theoretical and empirical literature on macroeconomic variables and stock market development nexus.

JEL: C32, C53, G15

KEYWORDS: Macroeconomic variables, Stock markets development, Autoregressive Distributed Lag Model, Bahrain.

INTRODUCTION

Stock markets play an important role in national economy through mobilizing domestic savings, allocating them among the efficient fields of investment and attracting foreign investment (Levine and Zervos, 1998). Consequently, the effects of financial development on growth can be viewed in three distinct ways: The first one is to raise the proportion of savings actually invested, which depends on the efficiency of financial intermediation in the economy. The effects of stock market on investment, through changes in stock prices that reflect the marginal productivity of capital, should be positively correlated with investment growth. An increase in the marginal productivity of capital is directly linked to an increase in investment activities. The second is to affect the private saving rate, which works by improving the allocation of capital through information pooling (Greenwood & Jovanovic, 1990) or risk pooling (Bencivenga & Smith, 1991). The third way is to raise the social marginal productivity, which can be done since saving may go either way. On the theoretical side, many models have been developed to illustrate the channels through which the financial market development is affected by economic growth. On the empirical side, a growing body of studies at all levels - firm level, industry level and country level - have reflected the strong correlation between the financial system and economic growth.
The development of a financial market is on one hand closely related to the overall development in the national economy on one hand. Well functioning financial system achieves efficiencies that provide good and easily accessible information, lower transaction costs and efficient resource allocation then boost

economic growth. On the other hand, many macroeconomic variables have significant effects on a stock market and its functions, development, and role in the national economy.

However, on the other hand, the central bank actions, governmental policies and individual behavior affect the financial system development. For instance, monetary policy links with stock market development through affecting money supply, interest rates, investment activities in stocks as well as the market values of stocks. Expansion monetary policy raises money supply, decreases interest rates, raises investment in stocks and market values of stocks. A similar effect can be done by fiscal policy but the effect can be done directly through interest rates and investment. Finally, the effect of individual behavior is captured through the saving rate where the lack of financial institutions in economically poor areas where, people with low-incomes simply do not save at high levels.

Bahrain serves as one of the world's leading examples of a well-implementing sharia-compliant financial framework. Currently, Bahrain as a long-time center of Islamic financial in the Gulf has been challenged by a number of emerging markets in neighboring countries. Bahrain financial sector is relatively immature, and still needs to develop and improve data collection facilities and analytical tools. For these reasons and because Bahraini government believes that the role of the stock market pushes the wheels of economic and social development on one hand, and works to attract foreign direct and indirect investments on the other, the government in Bahrain continuously works to develop the Bahraini stock market to be a regional financial hub. The main question now is: Will macroeconomics help in developing the stock market? Accordingly, the main objective of this paper is to assess the relationships between macroeconomic variables and Bahraini stock market development (BSMD). To achieve this objective, the Autoregressive Distributed Lag (ARDL) model is used to solve the problems that arise in carrying such models that involve macroeconomic variables.

The remainder of the paper will proceed as follows: Section two discusses the literature review while section three analyses Bahrain stock market development and characteristics. Data methodology is discussed in section four. Section five is devoted to show and analyze the results. Finally, some policy implication and conclusion are represented in section six.

LITERATURE REVIEW

The macroeconomic determinants of stock market development are intensively discussed in literature. Pagano (1993) showed that the efficient functioning of stock markets is influenced by regulatory and institutional factors. Demirgue- Kunt and Levine (1996) have found that most market indicators are highly associated with banking sector development. La Porta et al (1997) found that rule of law, anti – director rights, and one-share one-vote, as institutional variables, are important predictors of stock market development. Levine R., (1997) investigates the effect of financial development on economic growth. Garcia and Liu (1999) stated that the GDP growth, domestic investment and financial intermediary sector development are the main factors that determine the stock market development in a sample of Latin America and Asian countries. They showed that real income, saving rate, financial intermediary development and stock market liquidity are important determinants of stock market development. Lamont (2000) observed the positively association between stock market returns and investment growth. Omran (2003) focused on the effect of real interest rate on the Egyptian stock market through the market activity and the traded value. The results revealed significant effects of real interest rate in both short and long run. El-Wassal (2005) studied the relationship between stock market growth and economic growth, foreign portfolio investment, and financial liberalization in 40 emerging markets and found that the mentioned factors were the leading factor of stock markets growth. Lynch (1995) and Caporale et al (2005) explained that investment productivity is the main channel of effecting stock market development on growth. Do and Levchenko (2004) and Huang and Temple (2005) found that trade openness tend to boost the stock market development. Basher and Sadorsky, (2006) investigated the effect of change in oil

prices on the stock market index in 21 emerging economies. The results state that there is a positive and significant relationshipat 10% in most economies in the sample. Yartey (2007) found, in his study of African stock market development, that financial development is an important factor effecting stock market development. Billmeier and Massa (2007) assessed the macroeconomic determinants of stock market capitalization in 17 countries in the Middle East and Central Asia. Their results showed that good institutions and remittances contribute significantly to stock market development. Yartey (2008) studied the determinants of stock market development in South Africa and his results showed that bank credit to the private sector, stock market liquidity, gross domestic investment, GDP per capita, and the lagged depended variable are significant and have positive effects on stock market development. Income level is an important factor of stock market development, increases per capita income by one percentage point and increases stock market development by 7.23 percentage points. The study reported that inflation has a positive but insignificant effect on stock market development.

Looking at the above studies on the macroeconomic variables – stock market development nexus, the studies have investigated both advanced and emerging stock markets using different approaches. However, none of them has investigated the dynamic interactions between macroeconomic variables and stock market development adopting the ARDL, in a small-open economy like Bahrain. This study tries to fill this gap by examining the long-run stability between the macroeconomic variables and BSMD.

Bahrain Stock Market Development

The financial sector in Bahrain is diversified, strong, and well-developed. It consists of a large range of Islamic and conventional markets and institutions. It also includes wholesale and retail banks, finance companies, money changers, mutual funds, insurance companies, specialized banks, investment advisors, securities brokers, and insurance brokers. Furthermore, there is a stock exchange, trading and listing both Islamic and conventional instruments. As a result, the sector is well-positioned to present a large range of financial services and products, which makes Bahrain the most important financial center in the Gulf area. The single largest employer in Bahrain is the financial sector. Over 80% of the employees are Bahrainis. In general, the sector helps supply about 27% of the Gross Domestic Product of Bahrain, which makes it a very important factor that contributes to the growth of the country.

The sector is managed and regulated by the Bahrain Monetary Agency, which is now the CBB, or the Central Bank of Bahrain. Since 2002, the Central Bank of Bahrain has been functioning as the only supervisor for the whole financial system. The Central Bank of Bahrain has a Rulebook known as the CBB Rulebook, which contains the Central Bank of Bahrain's regulatory requirements. The CBB Rulebook contains six different volumes, and each volume contains a different part of the financial system.The Central Bank of Bahrain Rulebook contains requirements that are related to both the on-going regulation and licensing and supervision of licenses, which covers a lot of areas which include risk management, capital adequacy, business conduct, licensing requirements, enforcement actions, and reporting and disclosure requirements. Volume six of the Central Bank of Bahrain's Rulebook, which is presently being developed, also includes requirements that are related to the operation and regulation of Bahrain's capital markets. By Amiri Decree No. 4, the Bahrain stock exchange was founded in the year 1987. It officially started its operations on 17th June 1989. At the start of the Bahrain Stock Exchange, there were 28 listed companies and now there are nearly 51 companies listed on it. The Bahrain Stock Exchange is monitored by an independent board of directors governed by The Central Bank of Bahrain Governor. The Bahrain Stock Exchange is an autonomous body in itself.

There are three indexes in the Bahrain stock exchange: The Bahrain All Share Index, the Dow Jones Bahrain Index, and the Estirad Index. Foreign investors are given all the facilities that domestic investors enjoy in the Bahrain Stock Exchange. They even have rights to vote while taking an important decision for the company. They are also entitled to dividends without being taxed. Moreover, they are allowed to

conduct transactions, buying, selling and owing properties and bonds, units of mutual funds and warrant of domestic joint stock companies in the Bahrain stock exchange.

Trading in the Bahrain stock exchange is carried out through 14 securities' brokers active in the market and day-to-day trading takes place through two main systems that are combined to ensure a fast and efficient trading process, and delivery versus payment on a T + 2 basis. The first system is the Automated Trading System (ATS). The second system is a Clearing, Settlement and Central Depositary System (CDS). The Central Bank's Capital Market Supervision Directorate supervises and regulates the market through overseeing both the primary and secondary markets. A new and comprehensive set of regulations based on international best practices is being introduced followed the enactment of the Central Bank of Bahrain and Financial Institutions Law in 2006. The capital markets rulebook (which will comprise Volume 6 of the CBB Rulebook) will provide a market and disclosure based system of regulation that promotes transparency and fairness in capital market transactions. It will upgrade and bring together into a single publication the various regulations that currently apply to capital markets activity.

Main Characteristics: Market Size – Market Depth

Both the capitalization ratio and the number of listed companies are used to reflect the size of Bahrain stock market. Data states that figures, capitalization ratio and listed companies in Bahrain stock market, increased to reach their peak in 2007 then declined through the years 2008 and 2009 because of the global financial crisis (figure 1). Activity on Bahrain stock market and shares ability to marketing is measured by total value traded relative to GDP. This measure reflects the value of stock transactions relative to the economic activity. Value traded ratio of Bahrain stock market declined through the period 1998 – 2001 from 9.33 in 1998 to reach 2.18 in 2001 then started to increase through the period 2002 – 2006 reaching 8.77 in 2006 then declined in 2007 to 5.8.

The current global financial crisis is affecting the economy in different ways (Abdelbaki, H., 2010). One way is by effecting on foreign direct investment and sovereign wealth funds (SWFs). The effects of the global financial crisis on Bahrain stock market started at the end of year 2007 where the market capitalization decreased from BHD10, 185 million to BHD 7,520 million then to BHD 6,131 million in 2007, 2008 and 2009 respectively. The number of listed companies slightly declined from 51 companies in 2008 to 48 companies in 2009.The value of shares traded also declined from BHD 787.3 million in 2008 to BHD 178.4 million in 2009.The volume of shares traded declined from 1,675.8 in 2008 to 852.3 in 2009 and finally turnover ratio declined from 10% in 2008 to 2.9 % in 2009 (Annual Trading Bulletin, different issues).

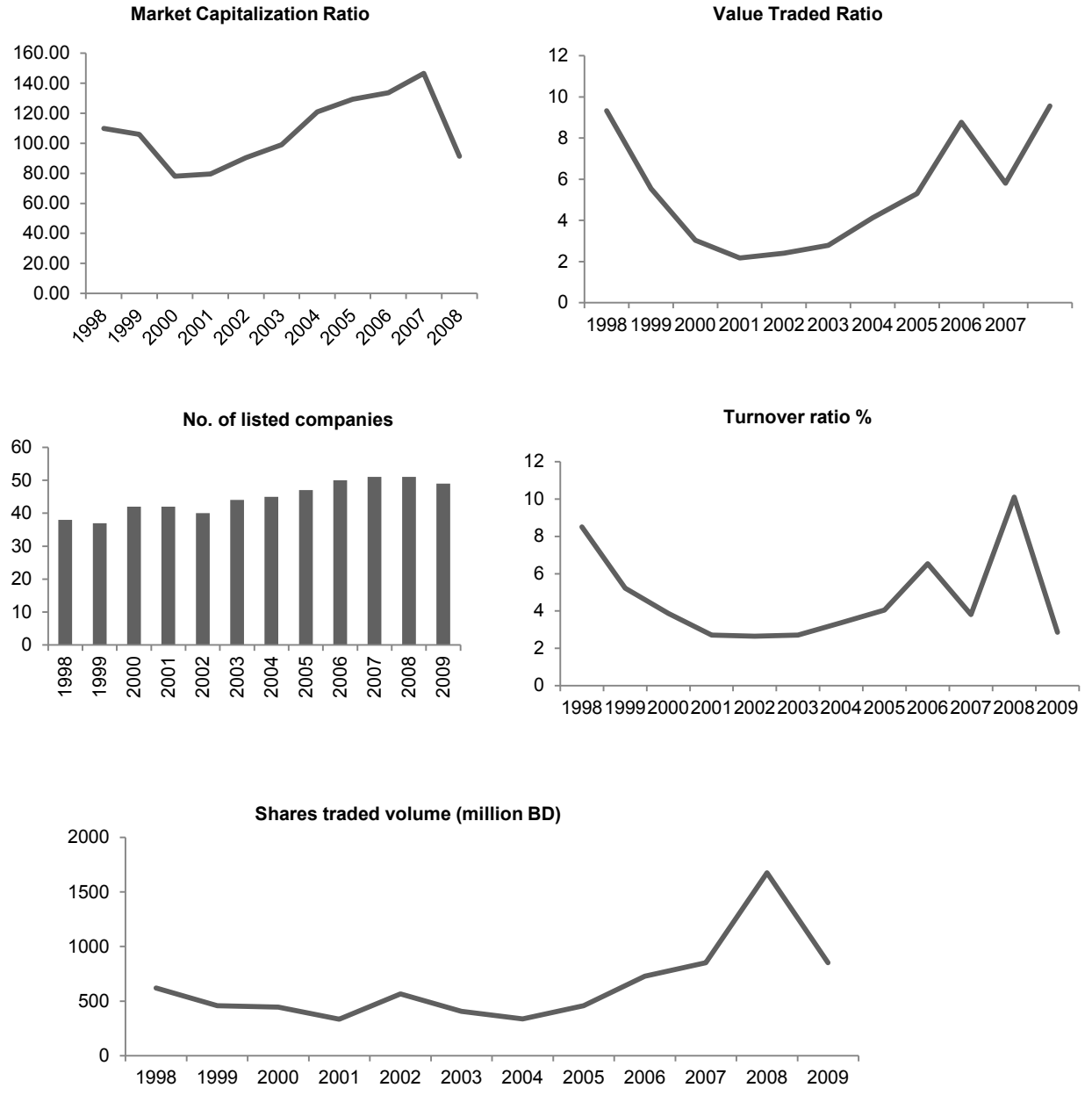
DATA AND METHODOLOGY

The current global financial crisis is affecting both financial and real sectors in all economies of the world. Bahrain is no exception. Therefore, this paper focuses on the time period (1990- 2007) to avoid the effects of the global financial crisis and to give a chance for before-after analysis for both investors and policymakers. Data related to national accounts for Bahrain mainly are; GDP, investment rate, saving rate, credit to private sector, per capita income, M2, and GDP deflators are from economic indicators by the Central Bank of Bahrain (CBB), Numbers 1, 18 and 25. Data about Bahrain stock market are from two sources: annual trading bulletins of the stock market and from economic indicators by the Central Bank of Bahrain. FDI data are from World Investment Report 2006, 2007, 2008 and 2009, and from foreign direct investment report by United Nations in 2008.

The dependent variable is Bahrain stock market development (BSMD). The market capitalization as a percentage of GDP will be used as a proxy of stock market development. Although there are many dimensions like efficiency and infrastructural aspects, use of the market capitalization is consistent with

recent literature, as a better and less arbitrary proxy. Since market capitalization is measured over the year, there is a stock flow problem in this measure. To tackle this issue, the average of two consecutive end of year market capitalization is used to estimate the mid-year value. According to Calderon – Rossell, R. Jorge, (1990) and Yartey, C., (2008), market capitalization is defined as follows: Y = PV where Y is market capitalization in local currency, P is the number of listed companies in the stock market, and V is the local currency coverage price of listed companies.

Figure 1: Bahrain Stock Market Characteristics



This figure shows the size of Bahrain stock market via development of capitalization ratio and number of listed companies. It shows activity on Bahrain stock market as well through total value traded relative to GDP. Finally, it represents the effect of the global financial crisis on the said market by using market capitalization, the number of listed companies, the value of shares traded and the volume of shares traded. Source: Annual Trading Bulletin, Bahrain stock market, different issues.

Macroeconomic stability: two measures will be used to determine the impact of macroeconomic stability on market capitalization: real interest rate and current inflation. Following the IMF, the implicit index number is used to discard the price effect on GDP. Real interest rate and current inflation are important in influencing macroeconomic stability. Development of per capita income affects demand for financial services, as well as stock market development. Log of GDP per capita is used to capture the income level. Banking system development: ratio of M2 to GDP is used to capture the banking system development. Both saving rate and investment rate are gross saving and gross investment as each is a percentage to GDP. Stock market liquidity: this is expected to reduce risk and the cost of long run assets. In other words, the investors are able to convert their assets into cash without losses or with low losses. Consequently, more liquid stock markets could enhance investment, profitability, and support allocation efficiency and stock market development. In this paper, value traded as a percentage of GDP is used to measure the Bahrain stock market liquidity. Private Capital Flows: FDI as a percentage of GDP is used as a proxy of private capital flows.

Table 1: Summary of Data and Proxies

Macroeconomic Variable	Proxy(ies)
Bahrain Stock Market Development	Bahrain Market Capitalization / GDP
Macroeconomic Stability	Real Interest Rate and Current Inflation Rate
Income Level	Log GDP per capita
Banking System Development	M2 / GDP
Bahrain Stock Market Liquidity	Value traded / GDP
Private Capital Flow	Foreign Direct Investment
Investment and Saving Rates	Gross Investment / GDP and Gross Saving / GDP

Source: designed by the author

To explore the short and long run relationship between the macroeconomic variables and stock market development, four models are used as follows:

$$Y_{it} = \alpha + \beta_1 PERIC + \beta_2 INVRT + \beta_3 VTRDRT + \beta_4 INFLT + \beta_5 M2GDP + \xi_{it} \quad (1)$$

$$Y_{it} = \alpha + \beta_1 PERIC + \beta_2 INVRT + \beta_3 VTRDRT + \beta_4 REALIT + \beta_5 M2GDP + \xi_{it} \quad (2)$$

$$Y_{it} = \alpha + \beta_1 PERIC + \beta_2 SAVRT + \beta_3 VTRDRT + \beta_4 INFLT + \beta_5 M2GDP + \xi_{it} \quad (3)$$

$$Y_{it} = \alpha + \beta_1 PERIC + \beta_2 FDIGDP + \beta_3 VTRDRT + \beta_4 INFLT + \beta_5 M2GDP + \xi_{it} \quad (4)$$

Where Y is stock market capitalization relative to GDP, ζ_{it} is the usual white- noise. PERIC is a log of GDP per capita. SAVRT and INVRT are saving and investment rates respectively. REALIT is real interest rate. VTRDRT is stock market value traded as a percentage of GDP. FDIGDP is FDI as a percentage of GDP. M2GDP is money supply (M2) relative to GDP and INFLT is current inflation rate.
The Autoregressive Distributed Lag (ARDL) approach adopted in this study was introduced by Pesaran et al (1996). The ARDL has many advantages: First, it can be used regardless of the stationary properties of the variables. In other words, it can be applied irrespective of whether the series are I(0), I(1), or fractionally integrated (Pesaran & Pesaran, 1997 and Bahmani-Oskooee& Ng, 2002).

This avoids problems resulting from non-stationary time series data (Laurenceson & Chai, 2003). Secondly, the model allows capturing the data generating process by using sufficient numbers of lags. Thirdly, the model estimates $(\rho +1)^k$ number of regressions to obtain optimal lag – length for each variable, where k is the number of variables and ρ is the maximum lag to be used. Finally, and more

important, the ARDL approach provides vigorous results for a small sample size of cointegration analysis (Gujarati, D. N., 2006). Since the sample of this study is small, this adds additional stimulus for the study to use this approach. A dynamic error correction model (DECM) can be derived from ARDL through a simple linear transformation (Banerjee et al, 1993). The error correction version of ARDL framework relevant to the variables in the equations (1), (2), (3) and (4) can be rewritten as follows:

$$Y_t = \alpha + \sum_{j=1}^{k1} \beta_j \Delta Y_{t-j} + \sum_{j=0}^{k2} \delta_j \Delta PERIC_{t-j} + \sum_{j=0}^{k3} \phi_j \Delta INVRT_{t-j} + \sum_{j=0}^{k4} \varphi_j \Delta VTRDRT_{t-j} + \sum_{j=0}^{k5} \gamma_j \Delta INFLT_{t-j} + \sum_{j=0}^{k6} \eta_j M2GDP_{t-j} + \lambda_1 PERIC_{t-j} + \lambda_2 INVRT_{t-j} + \lambda_3 VTRDRT_{t-j} + \lambda_4 INFLT_{t-j} + \lambda_5 M2GDP_{t-j} + \xi_t \quad (5)$$

$$Y_t = \alpha + \sum_{j=1}^{k1} \beta_j \Delta Y_{t-j} + \sum_{j=0}^{k2} \delta_j \Delta PERIC_{t-j} + \sum_{j=0}^{k3} \phi_j \Delta INVRT_{t-j} + \sum_{j=0}^{k4} \varphi_j \Delta VTRDRT_{t-j} + \sum_{j=0}^{k5} \gamma_j \Delta REALIT_{t-j} + \sum_{j=0}^{k6} \eta_j M2GDP_{t-j} + \lambda_1 PERIC_{t-j} + \lambda_2 INVRT_{t-j} + \lambda_3 VTRDRT_{t-j} + \lambda_4 REALIT_{t-j} + \lambda_5 M2GDP_{t-j} + \xi_t \quad (6)$$

$$Y_t = \alpha + \sum_{j=1}^{k1} \beta_j \Delta Y_{t-j} + \sum_{j=0}^{k2} \delta_j \Delta PERIC_{t-j} + \sum_{j=0}^{k3} \phi_j \Delta SAVRT_{t-j} + \sum_{j=0}^{k4} \varphi_j \Delta VTRDRT_{t-j} + \sum_{j=0}^{k5} \gamma_j \Delta INFLT_{t-j} + \sum_{j=0}^{k6} \eta_j M2GDP_{t-j} + \lambda_1 PERIC_{t-j} + \lambda_2 SAVRT_{t-j} + \lambda_3 VTRDRT_{t-j} + \lambda_4 INFLT_{t-j} + \lambda_5 M2GDP_{t-j} + \xi_t \quad (7)$$

$$Y_t = \alpha + \sum_{j=1}^{k1} \beta_j \Delta Y_{t-j} + \sum_{j=0}^{k2} \delta_j \Delta PERIC_{t-j} + \sum_{j=0}^{k3} \phi_j \Delta FDIGDP_{t-j} + \sum_{j=0}^{k4} \varphi_j \Delta VTRDRT_{t-j} + \sum_{j=0}^{k5} \gamma_j \Delta INFLT_{t-j} + \sum_{j=0}^{k6} \eta_j M2GDP_{t-j} + \lambda_1 PERIC_{t-j} + \lambda_2 FDIGDP_{t-j} + \lambda_3 VTRDRT_{t-j} + \lambda_4 INFLT_{t-j} + \lambda_5 M2GDP_{t-j} + \xi_t \quad (8)$$

The term with summation signs in the above equations represents the error correction dynamic, while the second part, term with λ, corresponds to the long-run relationship. To start with, the null hypothesis of the non-existence of a long-run relationship is tested against the existence of a long-run relationship. The calculated F-statistic of the null hypothesis of no cointegration is compared with the critical values tabulated by Narayan (2004). If the computed F-statistic falls above the upper bound critical value, then the null hypothesis of no cointegration is rejected. Likewise, if the test statistic falls below a lower bound, the null hypothesis cannot be rejected. Finally, if it falls inside the critical value band, the result would be inconclusive. Once cointegration is confirmed, the long-run relationship between stock market development and macroeconomic variables using the selected ARDL models are estimated. The next step is to estimate the associated ARDL error correction models. Finally, the diagnostic and stability tests are conducted to ascertain the goodness of fit the selected ARDL model.

RESULTS

The regression model includes these variables: log per capita income, investment rate, current inflation rate, stock market value traded and money supply (M_2). The results show that income level, investment, stock market value traded and money supply are significant and have positive effects on BSMD. Current inflation has a positive sign even though it is statistically insignificant. GDP per capita is an important determinant of BSMD. In particular, a rise in money supply by 1% increases BSMD by 2.7 %. To examine the effect of real interest rate as a proxy of macroeconomic stability on BSMD, Real interest rate (REALIT) is used in model 2 instead of inflation rate in model 1. Real interest rate has the expected

negative sign even though it is not statistically significant. To investigate the impact of saving on BSMD, saving rate is used instead of investment rate. Saving is positive but statistically insignificant in explaining BSMD. In particular, a percentage point increase in save rate increases stock market development by 0.0139 percentage point. Foreign direct investment (FDI) as a percentage of GDP is used instead of investment rate to find the effect of private capital flows on BSMD in model 4. The result shows that FDI is positive sign but statistically insignificant in explaining the development of Bahrain stock market (table 2).

Table 2: Regression Estimates

Regressor	Model 1	Model 2	Model 3	Model 4
logperic	2.721	1.256	1.933	0.4992
	(3.029)***	(2.144)**	(1.683)**	(2.011)***
lm2gdp	0.376	0.4523	1.659	1.481
	(0.9946)*	(1.432)**	(1.033)**	(0.8729)*
vtrdrt	0.0389	0.0396	0.0845	0.0442
	(12.389)***	(10.531)***	(13.054)***	(12.074)**
inflt	0.2692	-	0.0482	0.0792
	(1.151)		(1.613)	(1.834)
invrt	0.0053	0.1534	-	-
	(0.3834)			
realit	-	- 0.0599	-	-
		(0.6437)		
savrt	-	-	0.0139	-
			(0.1534)	
lfdigdp	-	-	-	0.1014
				(1.497)
Constant	2.069	3.638	3.507	4.127
	(3.734)***	(4.279)***	(3.497)***	(2.879)***
Adjusted R-Square	0.6693	0.7128	0.6549	0.8192
F-Statistics	14.961	12.870	13.762	13.063
DW-Statistics	2.299	3.143	2.974	3.091

*Source: Microfit outputs This table shows the regression estimates of the equations: Yit = α + β_1 PERIC + β_2 INVRT + β_3 VTRDRT + β_4 INFLT + β_5 M2GDP + ξit , Yit = α + β_1 PERIC + β_2 INVRT + β_3 VTRDRT + β_4 REALIT + β_5 M2GDP + ξit , Yit = α + β_1 PERIC + β_2 SAVRT + β_3 VTRDRT + β_4 INFLT + β_5 M2GDP + ξit , and Yit = α + β_1 PERIC + β_2 FDIGDP + β_3 VTRDRT + β_4 INFLT + β_5 M2GDP + ξit . Second column shows the results of the first equation (model 1), third column shows the results of the second equation (model 2), fourth column shows the results of the third equation (model 3), and finally, fifth column shows the results of the fourth equation (model 4). Figures inside the parentheses are the values of t-ratio. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively.*

The determined lag orders are used to estimate equations (5) – (8) according to the appropriate lag length criteria based on Akaike Information Criterion (AIC). According to results evident in table (3), the cointegration test indicates that the set of macroeconomic variables in equations (1- 4) are cointegrated with the stock market development in Bahrain over the period of analysis. Individually, stock market value traded and current inflation (model 1), stock market value traded and investment (model 2), money supply, stock market value traded and current inflation (model 3) and stock market value traded and current inflation (model 4) are all found significant.

The Error Correction (ECM) Model

If cointegration relationships among variables exist, there must be an error–correction specification that can be applied to the data (Engle and Granger, 1987). The error correction term refers to the speed with which the model returns to equilibrium following an exogenous shock. It should be negatively signed, indicating a move back towards equilibrium; a positive sign indicates movement away from equilibrium. The coefficient lies between 0 and 1, 0 suggests no adjustment one time period later, and 1 indicates full adjustment. Table (4) shows error correction representation for the ARDL model. The table shows that the adjusted R–square are 0.77, 0.72, 0.87, and 0.76 for the four models respectively.

Table 3: Long run Coefficient Estimates of Bahraini Stock Market Development

Regressor	Model 1 (0,1,0,0,0,0)	Model 2 (1,0,0,1,0,1)	Model 3 (1,1,1,0,1,1)	Model 4 (0,1,0,0,0,0)
logperic	0.4055	0.4167	0.1557	0.5823
	(1.374)	(2.015)	(0.4733)	(1.329)
lm2gdp	0.310	0.0286	0.7251	0.3256
	(0.9211)	(0.0948)	(1.879)*	(0.9389)
vtrdrt	0.0625	0.0558	0.0736	0.0649
	(6.815)***	(5.712)***	(8.228)***	(6.448)***
inflt	0.0380	-	0.0902	0.0478
	(1.764)*		(3.242)***	(2.421)**
invrt	0.0063	0.0201	-	-
	(0.8667)	(4.418)***		
realit	**-**	**0.0127**	**-**	**-**
		(1.028)		
SAVRT	-	-	- 0.0086	-
			(- 1.298)	
LFDIGDP	-	-	-	- 0.0335
				(- 0.3073)
Constant	1.445	2.319	0.7724	0.9832
	(1.182)	(1.915)	(0.8323)	(0.6890)

*Source: Eviews outputs This table shows Long run Coefficient Estimates of the four models. The cointegration test indicates that the set of macroeconomic variables in the four equations are cointegrated with the stock market development in Bahrain over the period of analysis. Figures inside the parentheses are the values of t-ratio. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively.*

In addition, the computed F-statistics clearly reject the null hypothesis that all regressors have zero coefficients for the four models. Moreover, the error correction representations carry negative signs for all models and highly significant for model 2 and model 3. This, therefore, substantiates with earlier findings that selected macroeconomic variables are cointegrated with stock market development in Bahrain as provided by F- test. Furthermore, the speed of adjustment for the models is rather fast, ranging 59 (for model 4) to 88 (for model 2). This indicates that the last period disequilibrium is, on average, created by about 59 to 88 percent in the following year.

Table 4: Error Correction Representation for the ARDL Model (Dependent Variable is dLYIT)

Regressor	Model 1 (0,1,0,0,0,0)	Model 2 (1,0,0,1,0,1)	Model 3 (1,1,1,0,1,1)	Model 4 (0,1,0,0,0,0)
logperic	-1.541	0.7458	-1.638	-1.653
	(-1.878)	(1.805)	(-1.814)	(-1.942)
lm2gdp	0.3100	0.0512	1.509	0.3256
	(0.9211)	(0.0957)	(3.362)***	(0.9389)
vtrdrt	0.0626	0.0721	0.0890	0.0649
	(6.815)***	(4.454)***	(5.816)***	(6.448)***
inflt	0.0380	-	0.0542	0.0478
	(1.764)		(3.005)*	(2.421)**
invrt	0.0063	0.0150	-	-
	(0.8668)	(1.148)		
realit	-	0.0228	-	-
		(1.039)		
savrt	-	-	0.0130	-
			(2.514)**	
lfdigdp	-	-	-	-0.0335
				(-0.3073)
Constant	1.445	4.152	0.9348	0.9832
	(1.182)	(1.516)	(0.8337)	(0.6890)
ecm (-1)	0.6310	-0.8789	-0.7210	-0.5921
		(-4.324)***	(-5.489)***	
Adjusted R-Square	0.7727	0.7195	0.8709	0.7579
F–Statistic	10.065	7.746	19.648	9.349

*Source: Eviews outputs This table shows the error correction representations, adjusted R-square and F-statistic for the four models. ECMs equations carry negative signs for all models and highly significant for model 2 and model 3. Figures inside the parentheses are the values of t-ratio. *, **, and *** denotes significance levels at 10%, 5%, and 1%, respectively.*

Goodness of Fit Test

To ascertain the goodness of fit of the selected ARDL model, the diagnostic and the stability tests are conducted. The results are shown in Figure 2. The structural stability test employs the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of square of recursive residuals (CUSUMSQ). The

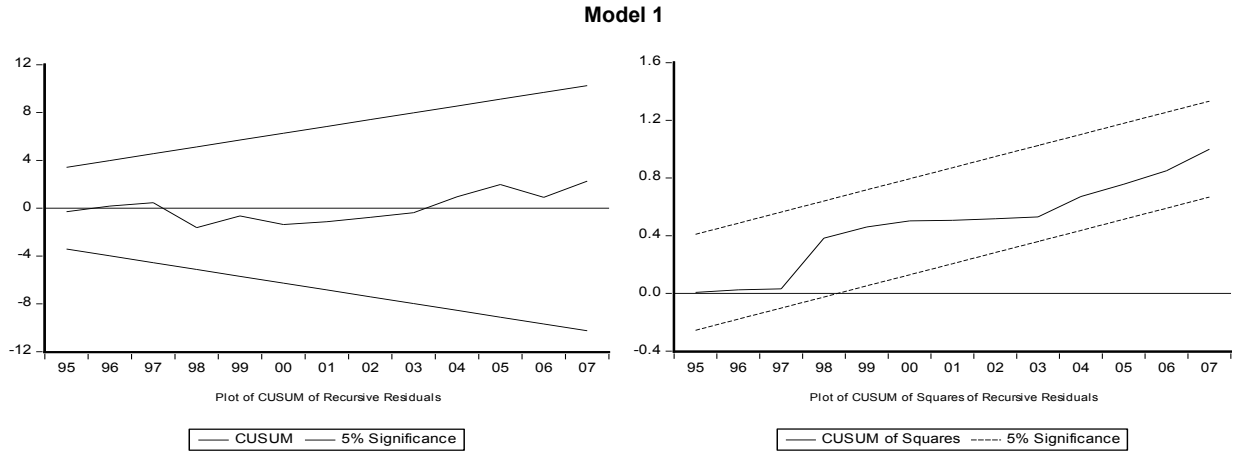
CUSUM test basically uses the cumulative sum of recursive residuals based on the first set of n observations and is updated recursively and then plotted against the break points. If the plot of CUSUM remains within the critical bounds at 5% significance level, the null hypothesis that all the coefficients and the error correction model are stable cannot be rejected. However, if the two lines are crossed, the null hypothesis of coefficient constancy can be rejected at 5%. The same analysis applies for CUSUMSQ test, which is based on the squared recursive residuals. Consequently, the stability of the long run coefficients together with the short run dynamic based on Pesaran and Pesaran (1997) by CUSUM and CUSUMSQ are applied. Figure 2 shows the graphical representations of CUSUM and CUSUMSQ plot applied error correction model based on the adjusted R- squared criterion. Neither the CUSUM nor CUSUMSQ indicate evidence of any structural instability for all models tested. The Durbin-Watson (D-W) statistic also indicates that there is no problem of autocorrelation for all models.

Variance Decomposition (VD) And Impulse Response Function (IRF)

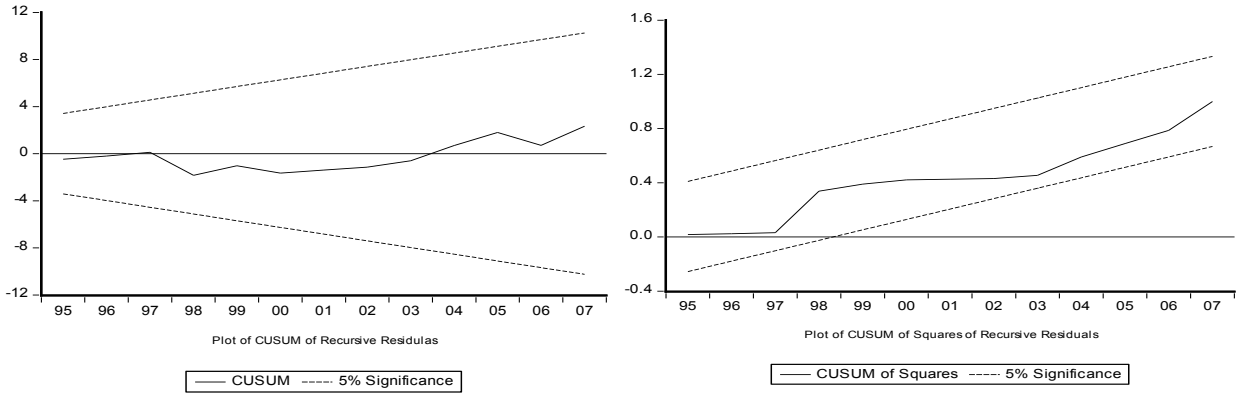
The objective also attempts to examine the relative strength of each independent variable in explaining the change in the dependent variable, Variance Decomposition (VD) and Impulse Response Function (IRF) analyses were applied.To examine the relative strength of each variable in explaining the changes in the dependent variable, the variance decompositions (VD) is applied. As table (5) indicates, the results for VD for model 1 shows that in a 10 – year horizon, investment accounts for 11.24% of the shocks in BSMD compared to the contributions of stock market value traded (10.74%), per capita income (2.3%), inflation (1.2%) and money supply (1.05%).

As for model 2, investment accounts for 9.3% in a 10 – year horizon whereas, stock market value traded, money supply, per capita income and real interest rate account for 8.4%, 1.6%, 0.59% and 0.52% respectively. Stock market value traded in model 3 accounts for 9.3% in the period horizon compared to 2.2%, 2%, 1.5% and 0.34% for inflation, saving, per capita income and money supply respectively. Finally, results for model 4 indicate that stock market value traded recorded 28.95% in explaining the change in BSMD and foreign direct investment, inflation, per capita income and money supply account for 8.23%, 2.5%, 1.87% and 1.8% respectively.

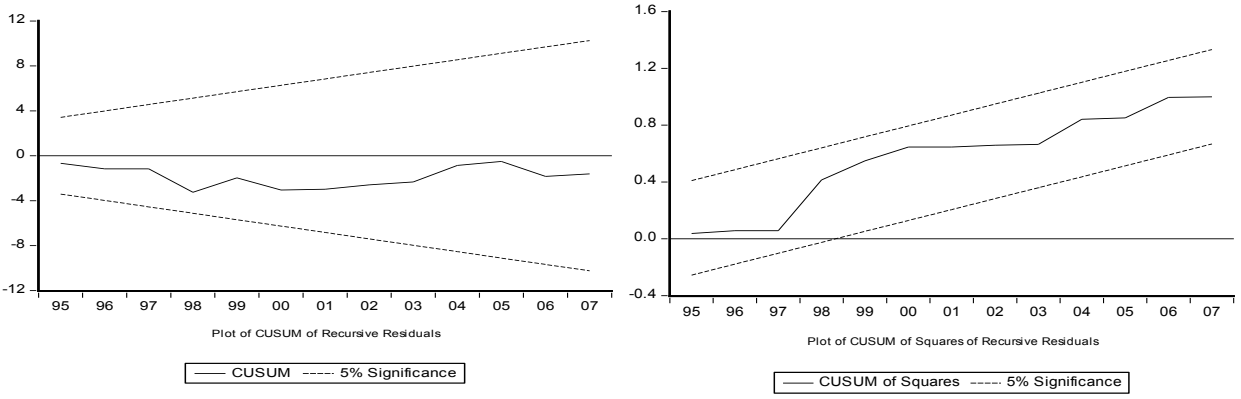
Figure 2: CUSUM and CUSUMSQ Statistics for Coefficient Stability



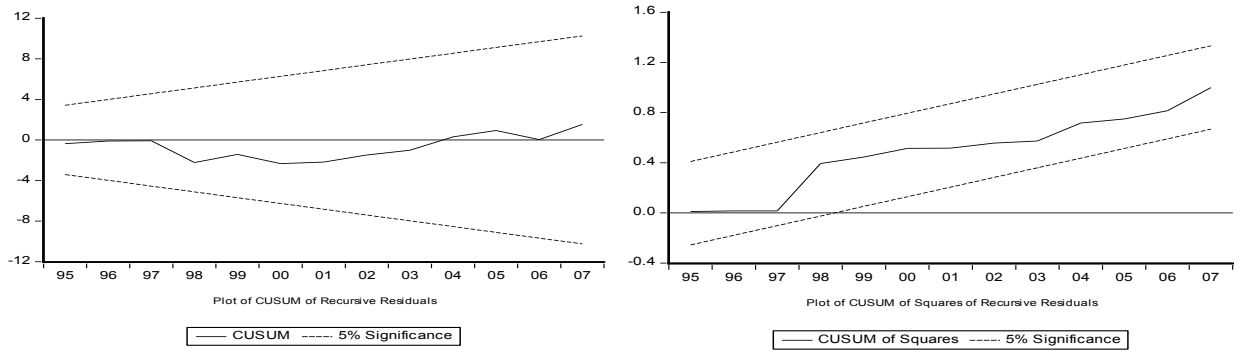
Model 2



Model 3



Model 4



Source: Eviews outputs This figure shows the graphical representations of CUSUM and CUSUMSQ plot applied error correction model based on the adjusted R-squared criterion.

Granger Causality Test

The Granger causality test was implemented within an error-correction framework to examine the existence of a long-term relationship between each two variables. The Granger causality test is used to

indicate the direction of the effect between each two variables. A general specification of the Granger causality test in a univariate context can be expressed as follows:

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + ...a_m y_{t-m} + b_p x_{t-p} + ... + b_q x_{t-q} + \zeta_t \quad (9)$$

Figure (3) represents the causality results with lag 2. The results show that unidirectional causality exists from inflation, investment, and stock market liquidity to money supply in model 1. In model 2, results report unidirectional causality from investment and stock market liquidity to money supply. The unidirectional causality has been found from inflation to saving and from stock market liquidity to money supply in model 3. Finally, in model 4, inflation has effects as unidirectional causality on both money supply and foreign direct investment; unidirectional causality has also been found from stock market liquidity and foreign direct investment to the dependent variable and money supply respectively.

Table 5: Variance Decomposition of Bahrain Stock Market Development

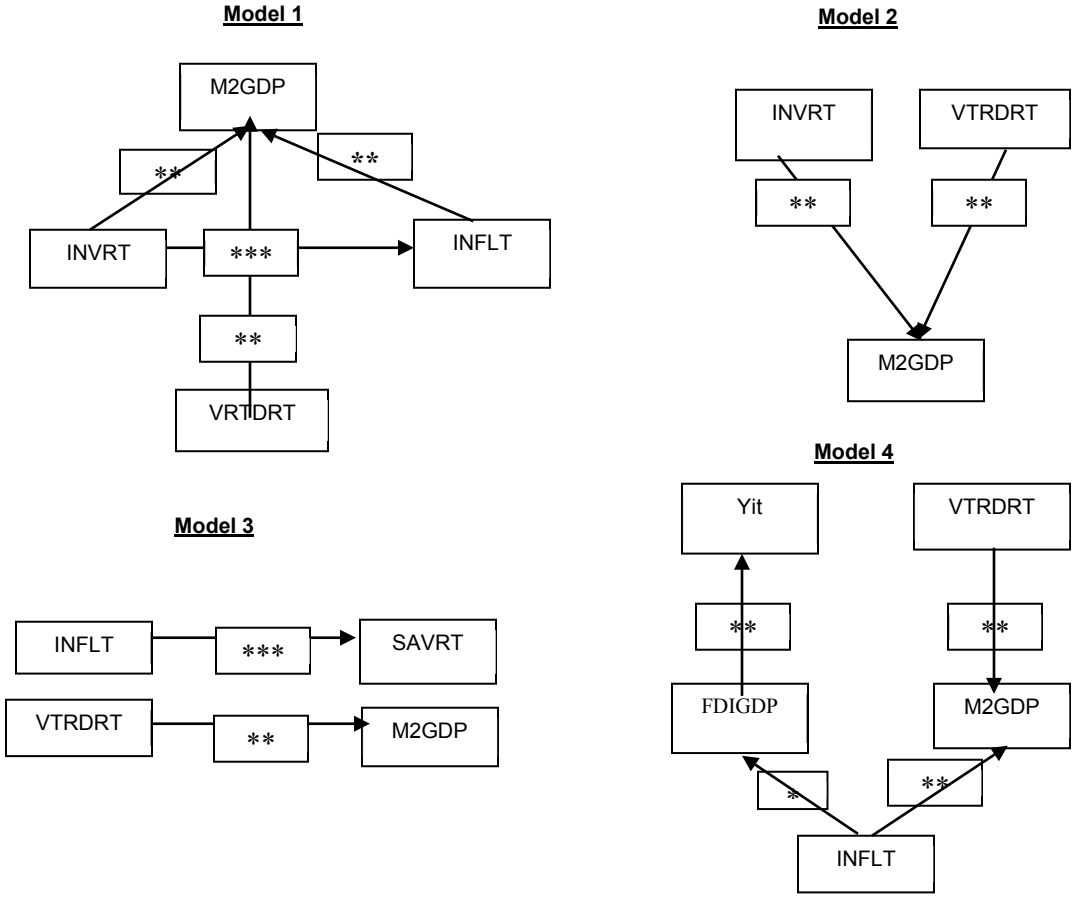
Model 1						
Period	DYIT	DPERIC	DM2GDP	DVTRDRT	DINFLT	DINVRT
1	100.00	0.00	0.00	0.00	0.00	0.00
2	94.914	0.0187	0.0488	3.687	1.331	1.875
3	88.984	0.1329	0.6650	3.476	1.239	5.501
4	86.414	0.9634	1.037	4.558	1.227	5.800
5	84.104	1.032	1.026	5.758	1.205	6.874
6	81.704	1.332	1.009	6.594	1.200	8.161
7	79.489	1.625	1.049	7.768	1.192	8.875
8	77.363	1.833	1.044	8.807	1.182	9.769
9	75.356	2.082	1.047	9.776	1.188	10.551
10	73.477	2.302	1.052	10.739	1.191	11.239
Model 2						
Period	DYIT	DPERIC	DM2GDP	DVTRDRT	DREALIT	DINVRT
1	100.00	0.00	0.00	0.00	0.00	0.00
2	93.748	0.1301	0.2573	5.491	0.2655	0.1089
3	88.842	0.2224	0.5002	5.373	0.5688	4.494
4	87.586	0.4446	0.8177	5.784	0.5566	4.812
5	85.883	0.4599	0.9984	6.521	0.5599	5.578
6	84.434	0.4748	1.067	6.848	0.5495	6.627
7	83.145	0.5201	1.228	7.295	0.5435	7.268
8	81.861	0.5415	1.3425	7.709	0.5359	8.009
9	80.688	0.5669	1.449	8.066	0.5279	8.703
10	79.574	0.5925	1.561	8.425	0.5216	9.326
Model 3						
Period	DYIT	DPERIC	DM2GDP	DVTRDRT	DINFLT	DSAVRT
1	100.00	0.00	0.00	0.00	0.00	0.00
2	87.629	0.9604	0.1149	7.167	2.354	1.774
3	85.339	1.181	0.3136	8.961	2.257	1.948
4	84.971	1.387	0.3169	9.091	2.243	1.992
5	84.780	1.435	0.3303	9.222	2.244	1.989
6	84.707	1.449	0.3327	9.279	2.244	1.988
7	84.679	1.456	0.3336	9.300	2.243	1.988
8	84.667	1.459	0.3344	9.308	2.243	1.988
9	84.662	1.460	0.3349	9.312	2.243	1.989
10	84.659	1.461	0.3353	9.314	2.243	1.989
Model 4						
Period	DYIT	DPERIC	DM2GDP	DVTRDRT	DINFLT	DFDIGDP
1	100.00	0.00	0.00	0.00	0.00	0.00
2	67.711	0.0241	8.261	23.561	0.6104	8.094
3	57.211	0.6968	1.107	29.761	2.596	8.629
4	56.705	1.836	1.699	28.998	2.523	8.239
5	56.703	1.862	1.821	28.821	2.553	8.239
6	56.627	1.859	1.823	28.903	2.552	8.236
7	56.585	1.864	1.822	28.945	2.552	8.231
8	56.581	1.869	1.824	28.945	2.552	8.228
9	56.581	1.869	1.824	28.945	2.552	8.228
10	56.579	1.869	1.824	28.946	2.552	8.228

Source: Eviews outputs This table shows the variance decompositions (VD) for the four models to examine the relative strength of each variable in explaining the changes in the dependent variable .For instance, In model 2, investment accounts for 9.3% in a 10 – year horizon whereas, stock market value traded, money supply, per capita income and real interest rate account for 8.4%, 1.6%, 0.59% and 0.52% respectively.

CONCLUDING COMMENTS

This paper examines empirically the causality relationship between some of macroeconomic variables and BSMD. The paper uses the ARDL model, the recent technique in time series analysis. The main findings of the paper are that income level, domestic investment, banking system development, private capital flows, and stock market liquidity are important determinants of BSMD. The results of this study support the theoretical and empirical literature on macroeconomic variables and stock market development nexus. For instance, Garcia and Liu (1999) found that income level and financial intermediary development have positive impacts on stock market development. In addition, Demirgue – Kunt and Levine (1996) found that most stock market indicators are highly correlated with financial intermediary development i.e., countries with well-developed stock markets tend to have well-developed financial intermediaries. Finally, Yartey (2008) reported that development of the banking system, stock market liquidity, gross domestic investment, and economic growth are significant and have positive effects on stock market development. The findings of this paper include important policy implications for Bahrain.

Figure 3: Pairwise Granger Causality Tests Summary



*Source: designed by the author based on the Granger Causality Test results. This figure shows the Granger causality test, which indicates the direction of the effect between each two variables with lag 2. For instance, in model 4, inflation has effects as unidirectional causality on both money supply and foreign direct investment; unidirectional causality has also been found from stock market liquidity and foreign direct investment to the dependent variable and money supply respectively. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Lags =2.*

Firstly, the stock market liquidity plays an important role in BSMD. Improving stock market liquidity in Bahrain stock market can be another approach of pushing BSMD. Secondly, this paper provides evidence that macroeconomic stability is a crucial factor in affecting stock market development. The Bahraini

government should focus on this issue by implementing effective policies. Thirdly, the development of a banking system is important for stock market development. Bahrain should use policies to continue banking system development. Fourthly, Bahrain should implement policies to encourage more capital flows into the Bahrain stock market along with promoting domestic investment. Finally, economic growth is an important determinant for stock market development. Therefore, it is crucial for Bahrain to initiate policies to foster growth and development.

In this paper, we only examine the causality relationship between some of macroeconomic variables of Bahrain stock market development. It is therefore interesting to extend this research to consider institutional quality effects on stock market development, specially, in small country like Bahrain Finally; another possible venue of future research is to extend this study to a comparative study of developed and emerging stock markets.

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