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TEST FOR DYNAMIC RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN MALAYSIA

A Vector Error Correction Modeling Approach

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This paper purports to study the effectiveness of financial development to Malaysian economic growth utilizing quarterly data. In view of the priority given to dynamic relationship in conducting this study, Vector Autoregressive (VAR) method which encompasses Johansen-Juselius' Multivariate cointegration, Vector Error Correction Model (VECM), Impulse Response Function (IRF), and Variance Decomposition (VDC) are used as empirical evidence. The result reveals a short-term and long-term dynamic relationship between financial development and economic growth. The importance of financial sector in influencing the economic activity is proven as a clear policy implication.

Keywords: financial development; economic growth; VECM

Introduction

Solow (1956),[1] a Neo-classical economist, states that in addition to capital and labor, investment generated through financial sector plays a significant role in the growth process. Meanwhile, endogenous growth theory introduced in the end of 1980s by Romer (1986) and Lucas (1988) brings an array of theoretical and empirical studies to observe the causal factor of economic growth. Since then, a large empirical literature has concentrated more on the sources of long-term growth, such as investment and real capital, human capital, tax and technology (Barro 1991); (Barro and Sala-i-Martin 1997); (Benhabib and Spiegel 1994); (Mankiw et al. 1992).[2] The effect of financial sector development on economic growth has been a topic of interest and debate in recent years. Several financial measurement proxies have been used to examine the relationship. In theory, financial development can influence the economic growth through resource allocation. The theoretical argument for linking financial development to growth is that a well-developed financial system performs several critical functions to enhance the efficiency of intermediation by reducing information, transaction, and monitoring costs. A modern financial system promotes investment by identifying and funding good business opportunities, mobilizing savings, monitoring the performance of managers, enabling the trading, hedging, and diversification of risk, and facilitating the exchange of goods and services. These functions result in a more efficient allocation of resource, a more rapid accumulation of physical and human capital, and faster technological progress, which in turn feed economic growth.

In actual fact, this theory has long been introduced dating back to 1911; Joseph Schumpeter stresses that national savings distribution to firms will encourage the process of economic growth and development which are channeled through an increase in productivity and technological advances. In other words, the introduction of miniaturization in the financial sector will be transformed to the form of credit creation which will support economic activities resulting in higher economic growth. Notwithstanding the facts discussed above, the statement is still debated as a variety of results have been obtained from previous studies depending on the methodology, sample, and estimation procedures adopted.

Since previous empirical studies provide mixed findings on the direction of causality, this study will continue the efforts of earlier researchers (Choong et al. 2003; Ang and McKibbin 2005) using the Malaysian time series data to

[1] Depicted from discussion in Christopoulos and Tsionas (2004).

[2] The extensive studies in relation to the growth theory and the factors that cause it, the empirical results are mixed as reviewed by Face and Abma (2003).

re-examine the relationship between financial development and economic growth dynamically. The objectives of this study are: (1) to conduct stationary tests on all time series under consideration, (2) to conduct Johansen's multivariate cointegration test, (3) to conduct Granger's causality test in Vector Error Correction Model (VECM) framework; and in addition to existing studies we will (4) view the Impulse Response Function (IRF) and Variance Decomposition (VDC) in supporting the VECM findings.

Previous Studies

There are two forms of study often performed by researchers in observing the relationship between financial development and economic growth, either by using the cross-section or using time series data. Researchers who used the cross-section data applied the GMM (Generalised Method of Moments) and Instrumental Variable (IV) estimation methods in analyzing the data. The finding on the effectiveness of financial sector development to economic growth varies, depending on the case or country under studied. King and Levine (1993), Levine et al. (2000), Beck et al. (2000), and Nourzad (2002) agree that a positive relationship exists between financial indicators and economic growth after taking into consideration biases and specific effect in the sampling framework.

Those who used the time series data applied the Engle-Granger's and Johansen's cointegration tests to examine the relationship between financial development and economic growth. The results of the studies vary based on the period and the sample utilized in those studies, depending on economic environment faced by the sample. Arestis and Demtriades (1997) show a positive and significant association between financial development and real economic growth in Germany whilst insufficient proof is obtained for the data of the United States. Neusser and Kugler (1998) find an existence of long-term relationship between financial activities and Gross Domestic Product for manufacturing sector in 13 OECD countries. Shan et al. (2001) show the prevalence of causal relationship, depending on economic condition, in nine OECD countries and China. They state that financial development is not exactly the primary cause for economic growth. Using Granger's causal relationship in the error correction framework, Ghali (1999), Chang (2002), and Khalifa (2002) find that the results depend on the specific nature of the country under observation and the proxies used as indicators of economic growth.

In Malaysian context, Choong et al. (2003) provide evidence on the finance-led growth hypothesis. Using autoregressive distributed lag (ARDL) bound test approach and VECM framework, their examination reveals that the evolution of stock market (a proxy for financial development) is the leading sector in stimulating domestic growth. Ang and McKibbin (2005) conduct cointegration and various causality tests to assess the finance-growth link by taking savings, investments, trades, and real interest rate into account using annual data. In contrast to the conventional findings, their results support the view that output growth causes financial depth in the long run.

Data, Model and Methodology

To study the relationship between financial development and economic growth, the following model is derived:

$$G_t = \beta_0 + \beta_1 F_t + \beta_2 XM_t + \beta_3 I_t + u_t \quad ....(1)$$

where

- G_t : real output growth
- F_t : financial sector indicator, the ratio of the total credit in the economy to GDP
- XM_t : total transactions with external economy: ratio of total export and import to GDP
- I_t : inflation rate

The selection of key variables is predicated on the theoretical framework of previous studies, for instance, as discussed by Levine et al. (2000), Face and Abma (2003), Christopoulos and Tsionas (2004), and Choong et al. (2005). In view that the direction of causal relation is unclear, it is also specified that:

$$F_t = \alpha_0 + \alpha_1 G_t + \alpha_2 XM_t + \alpha_3 I_t + v_t \quad ....(2)$$

With the existence of XM and I, the following equations can be considered:

$$XM_t = \gamma_0 + \gamma_1 G_t + \gamma_2 F_t + \gamma_3 I_t + e_t \quad ....(3)$$

$$I_t = \delta_0 + \delta_1 G_t + \delta_2 F_t + \delta_3 XM_t + g_t \quad ....(4)$$

u_t, v_t, e_t, g_t are terms for disturbances, and all the equations are long-term equilibrium relations. The quarterly data of the Malaysian economy for the period of 1990:1 to 2003:2 obtained from the International Financial Statistics and Bank Negara Malaysia's Monthly Bulletin is used in the empirical analysis.[3] The SAS and E-Views packages are harnessed to analyze the data.

Step 1: Stationary Test

A unit root test is vital in observing the stationary of time series data. Do the variables observed have a tendency to return to the long-term trend following a shock (stationary) or the variables follow a random walk (containing a unit root)? If the variables

[3] The financial market in Malaysia has undergone financial development since late 1970s but the availability of quarterly data only began in 1990 especially for GDP (in order to arrive at real output growth). As a result, it constrains our sample period.

follow a random walk after a temporary or permanent shock, the regression between variables is spurious. According to Gauss-Markov's theorem, in such cases, the series do not have a finite variance. Hence, the OLS will not produce consistent parameter estimates. This study utilizes two tests on the individual stochastic structure, which are the Augmented Dickey-Fuller test (5) and the Phillip-Perron test (6), which have been frequently used for time series data.

$$\Delta X_t = \lambda_0 + \lambda_1 T + \lambda_2 X_{t-1} + \Sigma\lambda_i \Delta X_{t-i} + \varepsilon_t; \quad i = 1, 2, 3\ldots, k \quad \ldots\ldots(5)$$

(The equation presented above includes both a drift term and a deterministic trend; the equation with a drift term but without a deterministic trend will also be tested accordingly)

The hypotheses tested:

$H_0 : \lambda_2 = 0$ (contains a unit root, the data are not stationary)

$H_1 : \lambda_2 < 0$ (does not contain a unit root, the data are stationary)

$$\Delta X_t = \eta_0 + \eta_1 T + \eta_2 X_{t-1} + \nu_t \quad \ldots\ldots(6)$$

The hypotheses tested:

$H_0 : \eta_2 = 0$ (contains a unit root, the data are not stationary)

$H_1 : \eta_2 < 0$ (does not contain a unit root, the data are stationary)

(The equation presented above includes both a drift term and a deterministic trend; the equation with a drift term but without a deterministic trend will also be tested accordingly).

Step 2: Cointegration Test

Cointegration means that even though the variables are not stationary individually, the linear combination between two or more variables may be stationary.[4] The cointegration theory put forward by Granger (1981) is expanded by Engle and Granger (1987) integrating the short-term and long-term dynamic relationship. Components in vector X_t is said to be cointegrated at d,b degree, presented by *CI(d,b)* if:

(i) All components of X_t is *I(d)*

(ii) There is a non-zero vector $\beta = (\beta_1, \beta_2, \ldots\ldots, \beta_n)$ so that the linear combination of $\beta X_t = \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots\ldots + \beta_n X_{nt}$ will be cointegrated at $(d - b)$ degree where $b>0$. Vector β is the cointegration vector. In the case of $b=d=1$, X_t is $I(1)$ and their linear combination is $I(0)$.

Granger (1981), Granger and Weiss (1983) and Engle and Granger (1987) have presented a relationship between error corrections with cointegration concept through the Granger's theorem. Johansen (1991) and Johansen and Juselius (1990) produce the maximum likelihood approach

[4] For more details on cointegration analysis, see Enders (2004).

using the VAR model to estimate the cointegration relationship amongst components in vector k variable X_t. Consider VAR model for x_i:

$$A(L)x_i = \varepsilon_t \quad \text{...(7)}$$

The parameter can be presented in the form of Vector Autoregressive Error Correction Mechanism:

$$\Delta X_t = \sum_{i=1}^{p-1} \Pi_i \Delta X_{t-i} + \alpha\beta X_{t-p} + \varepsilon_t \quad \text{.. (8)}$$

where vector $\beta = (-1, \beta_2, \beta_3, \ldots\ldots\ldots, \beta_n)$ that contain r cointegration vectors, and speed adjustment parameter is given as $\alpha = (\alpha_1, \alpha_2, \ldots\ldots\ldots, \alpha_n)$ when rank $\beta = r<k$, k is the number of endogenous variables. If the number of cointegration relations is known, hypothesis testing on α and β can be performed. Lag length specification for the model can be determined by VAR equation using the *AIC* and *SBC* criteria.

Step 3: Granger's Causality Test

Cointegration techniques of Granger (1986), Hendry (1986), and Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990) have given a significant contribution to Granger's causality test. If cointegration is found from the variable series, error correction term (ECT) obtained from cointegration regression must be taken into consideration in the causality test to avoid the problem of miss-specification (Granger 1981). When two or more variables are cointegrated, they will show the existence of long-term relationship if the variables contain mutual stochastic trend. This being the case, there exists at least one Granger's causality either in one or in bi-directional (feedback effect). The result from the cointegration relationship between variables has set aside the probability of spurious estimation. Nevertheless, cointegration only shows the existence or non-existence of Granger's causality, but does not indicate the direction of causality between variables.

Vector Error Correction Model (VECM)

VECM is a restricted VAR designed and used for non-stationary variables known to be cointegrated. VECM specification restricts the long-run behavior of endogenous variables to converge to their cointegrating relationships whilst allowing for short-run adjustment dynamics. Engle and Granger (1987) show that if the variables, say X_t and Y_t, are found to be cointegrated, there will be an error representative which is linked to the said equation, which gives an implication that changes in dependent variable are a function of the imbalance in cointegration relation (represented by the error correction term and by other explanatory variables). Intuitively, if X_t and Y_t have the same stochastic trend and current variable of X_t (dependent variable) is in part, the result of X_t moves in line with the trend value of Y_t (independent variable). Through the error correction term, VECM allows the discovery of Granger's causality relation which has been abandoned by Granger (1968) and Sims (1972).

The VAR constraint model may derive a VECM model as shown below:

$$\Delta X_t = \mu_i + \sum_{i=1}^{n} A_i \Delta X_{t-i} + \sum_{i=1}^{n} \xi_i \Theta_{t-i} + v_t \quad \text{...(9)}$$

where

X_t : in the form of nx1 vector

A_i and ξ_i : estimated parameters

Δ : difference operator

v_t : reactional vector which explains unanticipated movements in *Yt* and Θ (error correction term)

In the Granger's causality test, the degree of exogeneity can be identified through the t-test for the lagged error correction term (ξ_i), or through the *F*-test applied to the lags of the coefficients of each variable separately of the non-dependent variable (A_i). In addition, VECM method allows the differentiation of short-term and long-term relationships. Error term with lagged parameter ($ECT_{(e1,t-1)}$) is an adaptive parameter measuring the short-term dispersal from long-term equilibrium. In short run, the variables may disperse from one another which will cause system inequilibrium. Hence, the statistical significance of the coefficients associated with ECT provides us with evidence for an error correction mechanism that drives the variables back to their long-term relationship.

Step 4: Impulse Response Function (IRF) and Variance Decomposition (VDC)

F- and *t*- tests in VECM can be described as causality tests within sampling period. Those tests will only determine the degree of endogeneity or exogeneity of dependent variables in the estimated period. They do not provide indicators for the dynamic nature of the system. Furthermore, they do not indicate the degree of exogeneity between variables outside of the sampling period. Variance Decomposition (VDC) can be described as the causality test outside of the estimation period. VDC decomposes variation in an endogenous variable into component shocks to the endogenous variables in the VAR. The VDC gives information about the relative importance of each random shock to the variable in the VAR. In other words, VDC shows the percentage of forecast error variance for each variable that may be attributed to its own shocks and to fluctuations in the other variables in the system.

Information gathered from VDC can also be presented with IRF. Both are obtained from Moving Average (MA) model acquired from the original VAR model. IRF measures the predictable response to a one standard deviation shock to one of the system's variables on other variables in the system. Therefore, the IRF shows how the future path of these variables changes in response to the shock. In fact, they can be viewed as dynamic multipliers giving about the size and the direction of the effect. The IRF is normalized to zero to represent the steady state of the variable reacted upon. As the VAR model used is under-identified, the Choleski's clarification method is utilized to orthogonalize all innovations/shocks. Notwithstanding the fact, this method is very sensitive to and dependent on the order of variables. In this study, the order identified in accordance to the importance of variable is *G*, *F*, *XM*, and *I*.

Empirical Results

Step 1: Stationarity – Individual Stochastic Trend

In this study, two stationary tests on individual stochastic trend are conducted, i.e., the Augmented Dicky-Fuller (ADF) and Phillip-Peron (PP) tests. Both tests are sensitive to the total lag used in estimation. The value of ADF t-statistic and PP z-statistic will be compared to the critical value given by MacKinnon (1991). The time series under consideration should be integrated in the same order before we can proceed to cointegration analysis and causality test. Table 1 presents the results of stationarity tests at level and

Table 1. **Stationary tests at level and first difference**

Variable	ADF(t_C)	ADF (t_t)	PP(z_c)	PP(z_t)
At level				
F	-1.6935	-2.7063	-1.6143	-2.8540
XM	-1.4905	-1.3430	-1.5438	-1.2677
At first difference				
G	-13.1186	-13.7514	-10.3917	-10.5106
F	-10.8449	-11.0246	-10.8449	-11.0246
XM	-7.4673	-7.5810	-7.4673	-7.5810
I	-6.1603	-6.2543	-10.1738	-10.3363

Notes: ADF without trend; t_c critical value at 5% significance level is -2.89; t_t with trend, critical value at 5% significance level is -3.45. PP follows similar value as ADF's critical value; where G-real output growth, F-financial development indicator, XM-total transactions with other countries, I-inflation rate. All values are observed at lag 1.

first difference. From the results, it is found that the null hypothesis of non-stationarity at level for all the time series fails to be rejected. Nevertheless, all null hypotheses are rejected for every test at first difference. The results clearly indicate that all variables are stationary at I(1).

Step 2: Cointegration Test

Cointegration technique for multiple variables by Johansen (1988) and Johansen and Juselius (1990) is used in the equation with four variables which have the same order of stationarity. Johansen suggests two statistic tests to determine the cointegration rank: λ_{trace} and λ_{max}. The results of analysis are reported in Table 2. λ_{max} statistic indicates the existence of cointegration between variables. Null hypothesis of no cointegration vector hypothesis (r=0) is rejected at 5 percent significance level for all lags tested (1, 2, 3, and 4).

Table 2. **Johansen and Juselius' Cointegration Test**

Null Hypothesis	λ_{max}	**5%**
Lag Length=1		
r = 0	93.06 *	28.17
r < 1	39.35 *	21.89
r < 2	8.78	15.75
r < 3	3.32	9.09
Lag Length= 2 lags		
r = 0	75.70 *	28.17
r < 1	23.96 *	21.89
r < 2	10.37	15.75
r < 3	3.12	9.09
Lag Length= 3 lags		
r = 0	29.57 *	28.17
r < 1	17.00	21.89
r < 2	12.53	15.75
r < 3	4.88	9.09
Lag Length=4 lags		
r = 0	28.98 *	28.17
r < 1	13.06	21.89
r < 2	11.31	15.75
r < 3	4.83	9.09

Note: Critical value taken from Osterwald-Lenum (1992). (*) shows the rejection of critical value at 5 percent significance level.

At least one cointegration vector exists for a series of variables in the system. As such, it can be concluded that at any point in time, there is a (n-r) mutual stochastic trend in this model.

The presence of cointegrating relationship is consistent with the economic theory which predicts that financial development and economic growth have a long-run equilibrium relationship. According to Engle and Granger (1987), cointegrated variables must have an error correction representation in which an error correction term (ECT) must be incorporated into the model. ECT forms part of the variables which are exogenous as seen in Table 3. Masih and Masih (1996) reveal that cointegration brings to an end of any need to use other dynamic relationship

Table 3. **Causality test in VECM**

Dependent Variable	ΔG	ΔF	ΔXM	ΔI	ECT $_{(e1,t-1)}$ t value
Lag Length=1	AIC=5.47				
ΔG		0.0376*	0.1784	0.8163	-11.3667*
ΔF	0.0354*		0.1287	0.8550	4.4232*
ΔXM	0.1471	0.9198		0.7332	3.1626*
ΔI	0.2579	0.2062	0.1206		1.0662
Lag Length=2	AIC=5.35				
ΔG		0.00742*	0.0037*	0.6283	-9.4542*
ΔF	0.0052*		0.2163	0.9911	4.1885*
ΔXM	0.0030*	0.7662		0.9378	3.5736*
ΔI	0.4032	0.0250*	0.0651		1.5759
Lag Length=3	AIC=5.04				
ΔG		0.0002*	0.0065*	0.4248	-6.9119*
ΔF	0.0001*		0.2163	0.9911	3.1885*
ΔXM	0.0021*	0.4482		0.4400	1.9624*
ΔI	0.2151	0.0268*	0.1431		3.2445*
Lag Length=4	AIC=5.14				
ΔG		0.0155*	0.0396*	0.1629	-3.3580*
ΔF	0.0001*		0.8196	0.3272	1.4365
ΔXM	0.0054*	0.3525		0.5361	0.8010
ΔI	0.2854	0.0682	0.2882		2.4699*

Note: The above values are the value of–F (p value). * Significant at 5% significance level.

models as these models may be faced with misspecification drawback. As mentioned earlier, cointegration between variables cannot indicate the direction of Granger's causality relationship. It can only be seen using the VECM sample framework.

Step 3: VECM and Granger's Causality Test

VECM specification only applies to cointegrated series. The long-run relationship exists between the fundamental variables, as the error correction term is significant. The results are presented in Table 3. The statistical significance of the coefficients associated with ECT provides evidence of an error correction mechanism driving the variables back to their long-run relationship, which shows the econometric exogeneity of the ECT series. There is also a short-term relationship between economic growth and financial development. The moneterisation effect is clearly viewed through the significance of the said variables dynamically. The feedback effect exists between the variables. If the government implements a policy to influence economic growth through changes in the financial sector, it will be an effective policy in view of the significant relationship between both variables. It is also true in reverse as economic growth will also spur the development in financial sector. The aforementioned relationship can be seen through significant t-test result for ECT and *F*- test result for the endogenous variables involved for lags greater than one.

Another variable that may explain economic growth is the total foreign transactions (XM) which is significant for all lag periods under consideration, except for the first lag. This proves that the volume of exports and imports can be harnessed to promote economic growth. The results obtained for all lag periods examined are not significant for the inflation variable. In other words, inflation rate in Malaysia is of no importance in explaining the economic growth. Only the effect of moneterization can influence the rate of inflation in this country. If the Akaike Criterion (AIC) is viewed, the best model is obtained with the utilization of lag 3, but models with other lags do indicate similar causality relation.[5] It can be noted that some of the ECTs are positive and significant. The endogenous variables (F, XM and I) are adjusted in long run, but their values are too high to be in equilibrium. We conclude that those variables divert from their long-run equilibrium steady state, unlike real output growth which will converge to the long-run equilibrium.

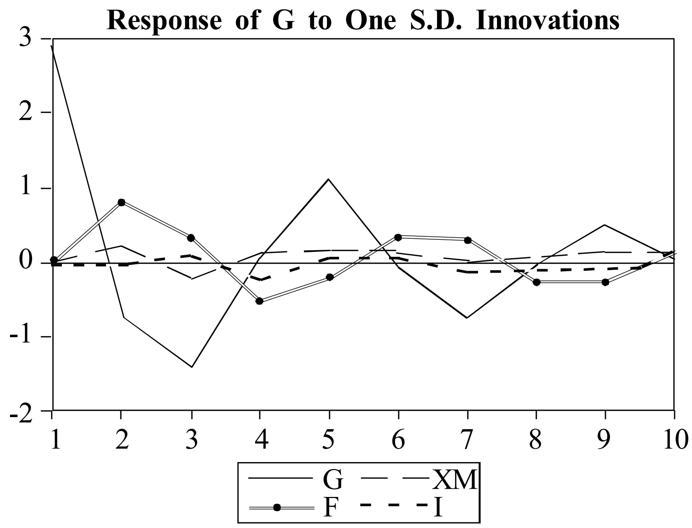
Step 4: IRF and VDC

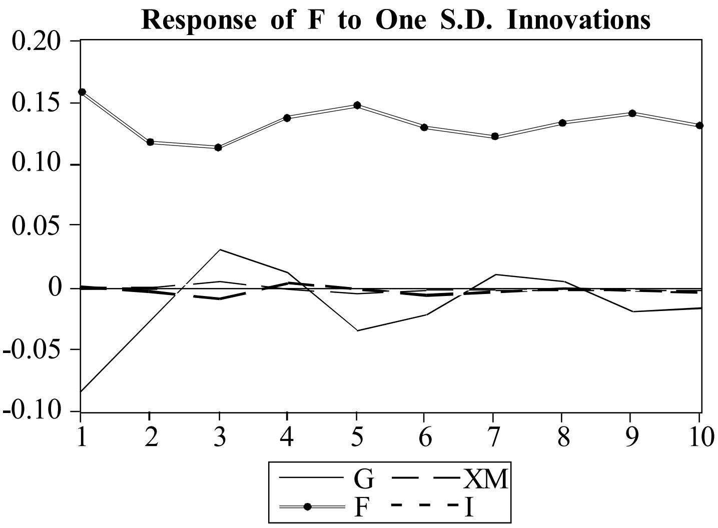
Dynamic simulations are used to calculate VDC and visualize the IRF in order to corroborate the results obtained through VECM. An analysis of the IRF is presented in Figure 1. A ten-

[5] Diagnostic tests such as CUSUM and LM tests on residuals have been performed. The results show that the estimated models are free from structural break as well as serial correlation.

period horizon is employed to allow the dynamics of the system to work out. Shocks to variables in particular F have an impact on *G*, and there is a relatively persistent effect on *G* despite its decreasing trend throughout the horizon. Likewise, the response of F to a shock in G is significant and persistent. Shocks to variables *G* and *F* have a positive small response to I. The impact is not persistent although it is almost stabilized in period 6. Therefore, the IRF

Figure 1. **Impulse Response Functions of One Standard Deviation Shocks/ Innovations**





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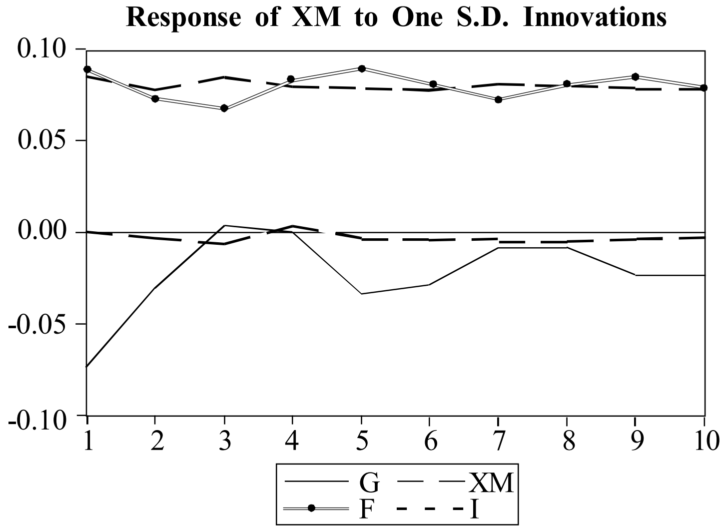

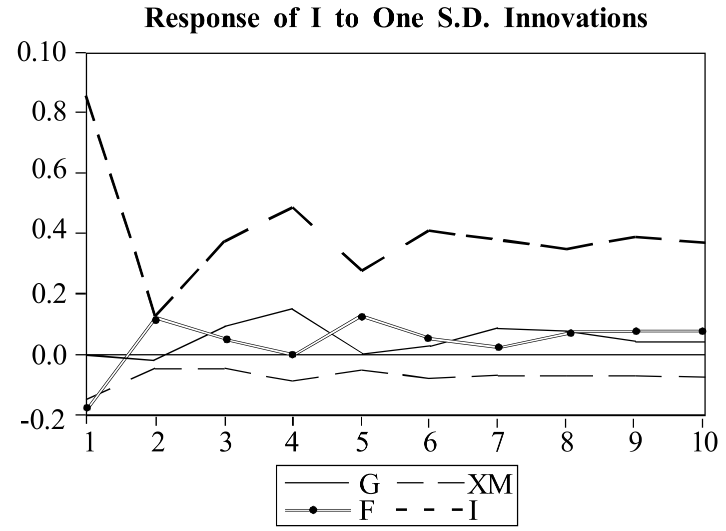

Table 4. **Variance Decompositions (VDCs)**

VD of G: Period	S.E.	G	F	XM	I
1	2.916507	100.0000	0.000000	0.000000	0.000000
2	3.126486	92.78442	6.725320	0.487638	0.002620
3	3.458881	92.68377	6.481362	0.796235	0.038630
4	3.512086	89.92036	8.613908	0.908871	0.556865
5	3.695134	90.21273	8.295245	0.980875	0.511150
6	3.712399	89.39675	9.026841	1.044613	0.531794
7	3.798847	89.38755	9.052390	0.997718	0.562342
8	3.807145	89.02110	9.364066	1.017940	0.596894
9	3.844435	88.95307	9.365487	1.091633	0.589807
10	3.848744	88.76606	9.499611	1.145571	0.588754
VD of F: Period	**S.E.**	**G**	**F**	**XM**	**I**
1	0.172057	24.25044	75.74956	0.000000	0.000000
2	0.210894	17.79923	82.19020	1.30E-05	0.010553
3	0.242165	15.14562	84.70814	0.033833	0.112410
4	0.279954	11.56173	88.30406	0.025524	0.108691
5	0.318243	10.11050	89.77418	0.029236	0.086076
6	0.344817	9.072013	90.79918	0.032855	0.095947
7	0.366078	8.115688	91.76845	0.029153	0.086708
8	0.390229	7.154528	92.74311	0.025668	0.076692
9	0.415173	6.517683	93.38850	0.024909	0.068906
10	0.436139	6.048815	93.85985	0.025365	0.065972
VD of XM: Period	**S.E.**	**G**	**F**	**XM**	**I**
1	0.141155	25.87959	37.94663	36.17378	0.000000
2	0.178898	19.21442	40.13374	40.62457	0.027269
3	0.208124	14.21322	39.52490	46.14261	0.119275
4	0.237165	10.94660	42.26465	46.68820	0.100551
5	0.267069	10.16977	44.34579	45.39828	0.086159
6	0.290414	9.616756	44.84878	45.44264	0.091823
7	0.309662	8.525506	44.85010	46.53847	0.085933

Continued from Table 4

VD of XM: Period	S.E.	G	F	XM	I
8	0.329575	7.589188	45.41034	46.92200	0.078470
9	0.349747	7.176694	46.06498	46.68615	0.072173
10	0.367780	6.910046	46.30836	46.71096	0.070634
VD of I: Period	**S.E.**	**G**	**F**	**XM**	**I**
1	0.888815	0.000390	3.603905	2.508643	93.88706
2	0.906883	0.014296	5.515025	2.644288	91.82639
3	0.987423	0.810735	4.994386	2.479628	91.71525
4	1.113877	2.378279	3.925274	2.602985	91.09346
5	1.156909	2.204766	4.919405	2.661550	90.21428
6	1.230659	1.988230	4.529727	2.776577	90.70547
7	1.293072	2.275881	4.151326	2.828421	90.74437
8	1.345761	2.455116	4.135792	2.840017	90.56907
9	1.406053	2.361225	4.011379	2.883139	90.74426
10	1.456575	2.274346	3.919655	2.938971	90.86703

Ordering: G F XM I

appears to be broadly consistent with earlier VECM results, that there is a bilateral effect between *G* and *F*.

The results of VDCs are reported in Table 4. A ten-period horizon is employed to convey a sense of the system dynamics. Granger's causal chain implied by the analysis of VDC tends to suggest that *F* time series are basically the leading variable, being the most exogenous of all, followed by *I* and *G*. For instance, in the model, even after five and 10-quarter horizons, about 90 to 93 percent of the forecast error is explained by its own shocks compared to the other variables. Decomposition of variance in *G*, besides being explained by its own variable, can be explained by *F*. The same can be said for *F*; in addition to being explained by the variable per se, it is explained by variable *G*.

Conclusions and Policy Implications

We have long known the importance of the financial sector in supporting an efficient allocation of resources and economic growth. The financial system acts as a facilitator of economic growth. Sustainable and rapid growth need to be underpinned by broadening and deepening the financial system capable of serving the needs of all elements in the economy.

With this scenario, the primary objective of this study is to view the relationship between financial development and economic growth using Malaysian data by applying the cointegration test in the VAR framework. Granger's causality test is performed to determine the direction of the relationship between fundamental variables through VECM. The VDC and IRF are viewed to verify the results obtained through VECM. The evidence of cointegration between the variables suggests the existence of a long-run stable relationship or a common stochastic trend between variables. This gives an implication that even though there is a momentary dispersal from the common long-run trend, the power of endogenous variables will promote the relationship back to long-run equilibrium.

The finding of cointegration test or the relationship of long-run stability between variables, especially economic growth and monetarization effect, is vital for policy maker. The combination of Granger's causality through VECM dynamic analysis, VDC, and IRF provide a valuable implication of the direction of relationship (lead-lag) between variables examined. In view of the feedback effect, in the determination of policy, the government may utilize the financial sector to influence the economic growth. If an increase in the growth rate is desired in Malaysia, the financial sector should be refined in terms of efficiency in providing resources which in turn will spur economic activities. Intuitively, given the relatively stable macroeconomic environment in this country, the results are quite in line with our expectations. The results suggest that in Granger's causality sense, financial development plays a leading role of policy variable being the most exogenous of all. It means that monetary expansion in this economy will not necessarily be dissipated merely in terms of higher nominal variables, but it will contribute positively to achieving an impressive rate of economic growth. Inversely, economic growth itself will support the financial sector as the increase in transactions in the economy will subsequently boost up domestic savings and generate more transactions. Other variables that have been chosen as explanatory variables are total foreign transactions and inflation rate. However, the result obtained, especially for inflation rate, is not encouraging. The volume of foreign transactions is still important in influencing the economic growth and financial sector. Conclusively, the empirical results show that financial development significantly causes growth in short run and in long run. There is a bi-directional relationship between financial development and economic growth. In other words, the Malaysian case supports the supply-leading phenomena and the demand-following cases (mutual causality) in long run.

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