Does finance lead or lag economic growth ? the Malaysian evidence

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Does finance lead or lag economic growth ? the Malaysian evidence

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Abstract:The focus of this paper is to investigate the lead-lag or the causal relationship between financial development and economic growth in Malaysia. There are two alternative views – supply-leading and demand-following. Supply-leading view argues that finance leads to growth, while demand-following hypothesis contends that economic growth creates increasing demand for financial services. Since Malaysia is a small, highly open economy, the analysis takes into consideration development in trade openness.

The paper applied the standard time series techniques on annual data incorporating cointegration tests, vector error correction models, variance decompositions and impulse response functions. Our findings offer support for the presence of long run relationships between finance and growth in Malaysia. Furthermore, the results consistently support the demand-following hypothesis for Malaysia. In other words, economic growth tends to lead financial development. This is in line with the findings of Ang and McKibbin (2007), which also found support for the demand-following hypothesis in Malaysia. The findings, in general, concur with the roles that the Malaysian financial sector has played in enabling growth performance. Going forward, more effective intermediation process, better allocation of resources to highly productive sectors, and more inclusive financial services may transform the roles of the financial sector from being a facilitator and enabler of growth, to a driver and catalyst of economic performance.

Keywords: lead-lag, finance, growth, Malaysia

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1. Introduction

With the release of the Financial Sector Blueprint 2011-2020 in December 2011, Malaysia in general, and the Central Bank of Malaysia (BNM) in particular, has identified the future plans and strategies for the financial sector to transform and expand its role from an enabler of growth, to a driver and catalyst of economic growth. The planning continued from the first Financial Sector Masterplan (2000-2010), which was released after the 1997/1998 Asian Financial Crisis (henceforth AFC).

Indeed, after the AFC, many developing economies particularly in Asia have focused on developing and strengthening the financial sector, which is seen as a key pre-requisite for stronger economic performance. In general, these economies view that the financial sector development complements overall economic growth.

The purpose of this paper is to analyse the linkages and causality between financial development and economic growth in Malaysia. There have been many recent research articles on the subject, although the general consensus is that there is no clear agreement as to which development promotes which. Some researchers found financial development leads growth, while others have found the reverse. There are still other researchers who have concluded a two-way causality relationship between the two variables.

This paper adds to the available resources in the finance-growth nexus particularly for the Malaysian case in two key aspects. First, the research intends to look at the finance-growth nexus in view of the trade openness or liberalisation policies that Malaysia, as a small open economy, has practised for a long period. Second, the study also plans to apply recent time series methodology, which is described in detail in the methodology section.

The next section will provide an overview of the finance-growth nexus and a brief review of selected literature. Section 3 will describe the data and methodology in detail, while the results will be discussed in Section 4. The final section will conclude the paper and provide some suggested improvements for future research.

2. Overview and literature review

In recent years, there have been many emerging theoretical and empirical research looking at the role of financial development and economic development. Interests in the subject were also driven by the recent episodes of financial crises. Essentially, the finance-growth nexus analyses two competing hypotheses –supply-leading and demand-following hypotheses.

Supply-leading hypothesis contends that the financial sector leads economic growth. The development and presence of financial institutions and markets induces growth by increasing the supply of financial services, for instance savings in the form of financial assets, which in turn create lending and investment activities, and consequently generating economic growth. On the other hand, demand-following hypothesis argues that growth leads to the development of the financial sector, via increasing demand for financial products and services. In this case, finance is led by, rather than leads, economic growth. Still, there are other researchers who believe that economic growth and financial development complements one another. This implies that there is bi-directional causality between finance and economic growth.

Empirical evidence shows that there is support for all competing hypotheses[1]. Recent articles such as Masih et al (2009) and Wolde-Rufael (2009) provided a sample of articles supporting each hypothesis. For example, Masih et al (2009) found support for the supply-leading hypothesis for Saudi Arabia, while Muhammad and Umer (2010) found significance of the demand-following hypothesis for the Pakistan economy. On the other hand, Wolde-Rufael (2009), analysing the case in Kenya, found a bi-directional causality between financial development and economic growth.

In the case of Malaysia, two recent articles attempted to analyse the relationship between finance and economic growth – Ang and McKibbin (2007) and Ibrahim (2007). Ang and McKibbin (2007) applied multivariate cointegration techniques to examine the role of

[1] The selected literature being surveyed in this paper are limited to those that serve to satisfy the requirement of the course, and are not exhaustive to cover the many recently-published research on the subject.

financial sector reforms and policies in developing and deepening the overall financial sector, and their relationship in supporting long-term economic growth for Malaysia. An interesting feature of the article is the construction of a summary measure of financial development using principal component analysis on three common variables of financial sector development –money supply (M3), commercial banks' assets, and domestic credit to the private sector. Their results support the demand-following hypothesis that economic growth leads to higher financial development.

Ibrahim (2007) applied multivariate cointegration and error correction techniques to analyse the relationship between the two variables of interest. The results, however, seem to differ according to the ordering of the variables in the vector autoregression (VAR) model, and were sensitive to the measure of financial development utilised. As a measure of the development of financial intermediaries, Ibrahim (2007) used total credit to the private sector, and as an alternative, the non-currency components of money supply (M2). He also used the ratio of stock market turnover-to-nominal GDP as a measure of development in financial markets. In general, however, the results suggest that financial market development to be more important than financial intermediaries in supporting long-term growth. More importantly, there seems to be a long-run causality running from the financial variables (except domestic credit) to GDP, but the feedback effect seems to be more ambiguous. This suggests a support for the supply-leading hypothesis, which contrasts with the results from Ang and McKibbin (2007).

More recently, research in the subject has also incorporated trade openness and liberalisation measure in analysing the finance-growth nexus. Trade has always been associated with higher growth. A few empirical studies in the subject of finance-growth nexus have incorporated some measures to reflect the importance of the trade sector, such as Khan and Qayyum (2007), Masih et al (2009), and Wolde-Rufael (2009). At the very least, these studies may find more reliable conclusions of the finance-growth nexus after controlling for trade openness, especially for export- or trade-dependent economies.

Interestingly, Khan and Qayyum (2007) found financial sector development to have a larger impact on growth than trade liberalisation in Pakistan. Masih et al (2009) also found

support for similar conclusion in Saudi Arabia, where financial development leads economic growth. Wolde-Rufael (2009) also found evidence suggesting stronger link between financial development and growth compared with trade openness measure.

In terms of Malaysian economic development, the policies to attract foreign direct investment and promote export-led growth in mid-1980s have helped to transition the economy towards higher growth performance particularly in the 1990s. The two studies on the finance-growth nexus for Malaysia, however, did not include any measure of trade openness or liberalisation as a control variable. Incorporating trade openness may change the nature of the results, especially since external trade has a large influence on the Malaysian economy, who is the third most open economy in the world after Singapore and Hong Kong, with total trade in goods and services accounting for about 180% of GDP in 2011 (BNM).

3. Empirical Methodology and Data

The paper follows the time series methodology employed in Masih et al (2009). The time series method has advantages over the traditional regression method in three key aspects. First, almost all economic variables are known to be non-stationary. Hence, traditional regression method using variables in level forms without ascertaining the stationarity properties may suffer from misleading results and hypothesis testing. Regression on first differenced variables, on the other hand, excludes important information on the long-run relationships between the variables. Hence, the use of time series techniques can incorporate both short- and long-run information into the regression.

Second, the long-run properties of the variables are tested under the time series technique, rather than presumed under the traditional regression method. Therefore, theories can be tested with the available data. Finally, the time series technique lets the data determine which variable is exogenous and which is endogenous. Traditional regression

presumes a specific variable to be dependent and endogenous, while the other independent variables are exogenous.

The first step in the time series method is to examine unit root and stationarity conditions of the variables. The second step determines the order of the VAR, followed by the Johansen cointegration test. The next step is subjecting the cointegrating vectors to "Long Run Structural Modelling" (LRSM) tests of exact- and over-identifying restrictions, based on theoretical or *a priori* information about the economy. To assist in determining leading or lagging variables, a vector error correction model (VECM) will be estimated, which analyses both short- and long-run relationship between the variables.

The VECM, however, cannot determine which variable is relatively more endogenous or exogenous than others. Hence, the next step is variance decomposition method, which analyses the composition of variability of each variable due to a shock in other variables. The variable with the highest proportion of variability due to its own shock, and not from others, is the most exogenous variable. In addition, we can also see the graphical representation of the relative exogeneity or endogeneity of the variables through the impulse response function, which is the dynamic response of a variable due to a shock in each variable, including its own. Finally, a system-wide shock and its impact on all the variables can be mapped out with the persistence profile, which will provide an estimate of the time the system recovers to the equilibrium state from the period of shock.

In this study, only three variables are examined – financial development, trade openness and economic performance. To simplify, only a single measure of financial development is used – the ratio of the domestic credit to the private sector to nominal GDP. Trade openness is measured as a ratio of total exports and imports of goods and services to nominal GDP. Finally, economic performance is proxied by real GDP per capita. All the variables are transformed into logarithms.

The data covers annual frequency sourced from various Monthly Statistical Bulletins of BNM, and the International Financial Statistics (IFS) of the International Monetary Fund (IMF).

4. Empirical Results and Analysis

4.1. Step 1 –Stationarity Test

A critical starting point in the time series technique is to ascertain the unit root properties of the variables. A series is stationary if its mean, variance and covariance are constant over time. For this purpose, a unit root test is applied to all the variables, with the null hypothesis of non-stationarity. Results from the Augmented Dickey Fuller (ADF) tests are summarised in Table 1 (details in Appendix 1).

Table 1: Unit root test results

Variable	Test statistic	Critical value	Conclusion
Variables in level form			
LGDP	-0.7189	-2.9591	Non-stationary
LTRADE	-1.2996	-2.9591	Non-stationary
LFIN	-2.8450	-2.9706	Non-stationary
Variables in first differenced form			
DLGDP	-4.5711	-2.9627	Stationary
DLTRADE	-3.9714	-2.9627	Stationary
DLFIN	-3.8841	-2.9750	Stationary

* Test statistic displayed is based on AIC. Using SBC would still yield the same conclusions

Based on Table 1, all the three variables are non-stationary at levels, and are thus considered as I(1), or stationary at first differenced form.

4.2. Step 2 – VAR Order

Before we proceed with the cointegration test, we need to specify the order of the VAR model, or the optimal number of lags of the variables. For this purpose, we estimated

the VAR up to a maximum lag length of 5, and compare the optimal lag length based on the information criterion (Akaike Information Criterion or AIC, and Schwarz Bayesian Criterion or SBC). Based on AIC, the optimal lag length is 1, while SBC suggests an optimal lag length of 0 (details in Appendix 2a).

Due to the conflict between the two recommendations, we tried to look at the diagnostic test of serial correlation for the individual equations in the VAR system. Table 2 outlines the results (details in Appendix 2b-d).

Table 2: Diagnostic test of serial correlation for VAR equations

Variable	Chi-square p-value	Conclusion (5% significance)
DLGDP	0.217	No serial correlation
DLTRADE	0.026	Serial correlation present
DLFIN	0.083	No serial correlation*

* Serial correlation is present if the critical value is at 10% significance level

Clearly there is an autocorrelation issue in at least one of the three variables. If we were to adopt a lower order, we may encounter the effects of serial correlation. Therefore, we decided to proceed with a VAR(1).

4.3. Step 3 – Cointegration test

Table 3: Johansen maximum likelihood cointegration test*

Variables: GDP per capita, Ratio of total trade to GDP and Ratio of private sector credit to GDP

H0	H1	Statistic	95% critical value	90% critical value
Maximal eigenvalue statistic				
r = 0	r ≥ 1	25.99	25.42	23.10
r ≤ 1	r ≥ 2	7.53	19.22	17.18
Trace statistic				

r = 0	r ≥ 1	38.98	42.34	39.34
r ≤ 1	r ≥ 2	12.99	25.77	23.08
Rank	Max LL	AIC	SBC	HQC
r = 0	157.45	154.45	152.04	153.60
r = 1	170.45	161.45	154.20	158.90
r = 2	174.22	161.22	150.75	157.53
r = 3	176.94	161.94	149.86	157.68

* Based on cointegration with unrestricted intercept and restricted trend in VAR.

We applied the standard Johansen cointegration test to the VAR specified earlier. The null hypothesis to be tested is no cointegration. From Table 3, the maximal eigenvalue statistic suggests that there is one cointegrating vector, whereas the trace statistic indicates no presence of cointegrating relationship. Other information criteria, in particular AIC suggests that there are three cointegrating vectors, while SBC and Hannan-Quinn Criterion (HQC) indicates that the number of cointegrating vector is one.

We are more inclined towards the presence of cointegration among the three variables based on the many theoretical studies on the relationship and influence of trade liberalisation, financial development and economic growth. Most of the above test statistics indicate the presence of cointegrating relationship among the variables, except for the trace statistic. Therefore, based on theoretical arguments and statistical tests above, we shall assume the presence of one cointegrating vector in the above specification.

The presence of cointegration among the variables suggests that there are long-term relationships among these variables, and they do not move randomly. The relationship between these variables is not spurious, and they move together in the long run.

However, the presence of cointegration does not indicate which variable is the leader and which variable is the follower. To determine this, we need to estimate a vector error correction model (VECM), but only after identifying the exact relationship of the cointegrating vector using the long run structural modelling method.

4.4. Step 4 – Long run structural modelling

We now proceed to quantify the exact relationship between the variables to compare with theoretical or intuitive expectations. By normalising the key variable of interest (LGDP=1), Panel A of Table 4 shows the maximum likelihood estimates (standard error in parenthesis) of the cointegrating vector under exact identification. Panels B and C show the results of over-identifying restrictions imposed on the other two variables.

Table 4: Exact and over-identifying restrictions on the cointegrating vector

	Panel A	Panel B	Panel C *
LGDP	1.0000 (*None*)	1.0000 (*None*)	1.0000 (*None*)
LTRADE	-0.3552 (0.1098)	0.0000 (*None*)	67.5075 (*None*)
LFIN	-0.0174 (0.0492)	-0.1129 (0.0831)	0.0000 (*None*)
Trend	-0.0310 (0.0029)	-0.0410 (0.0053)	-5.6010 (*None*)
Log-likelihood	170.451	167.032	164.158
Chi-sq. (p-value)	*None*	6.8384 (0.009)	12.5863 (0.000)

* No convergence was achieved for the over-identifying restriction in Panel C after 600 iterations

The Panel A estimates show that all the variables are statistically significant (standard errors in parenthesis), except for LFIN. All the coefficients have the expected signs. However, the over-identifying restriction on LTRADE=0 in Panel B is rejected, as can be seen from the p-value of the Chi-square statistic of 0.009, which is smaller than the 5% significance level. Meanwhile, the over-identifying restriction on LFIN=0 did not converge to find a solution. Therefore, we proceed with Panel A estimates for the remainder of this study.

4.5. Step 5 – Vector error correction model (VECM)

The next step is to determine which variable is the leader and which variable is the follower. For this purpose, a VECM incorporating short-run adjustments and long-run deviations are estimated using the information from the exactly-identified cointegrating vector.

To identify whether a variable is a leader or a follower, it is important to analyse the statistical significance of the error correction terms in each equation. The error correction term provides an indication of the short-run adjustment in each period due to a previous period deviation in the long run behaviour based on the cointegrating vector. If the error correction term is statistically significant, this means that the dependent variable (in level form) is endogenous, in the sense that it is influenced by the movements of other variables in the previous periods. If the error correction term is statistically insignificant, then the variable in question is exogenous and leads other variables.

Table 5 shows the key findings from estimates of the VECM. Panel A provides results on the estimates and significance of the error correction terms in each equation, while Panel B provides the diagnostic tests of each equation in the system.

Table 5: Major findings from VECM

Panel A – Significance of error correction term			
	Dependent variables		
	dLGDP	dLTRADE	dLFIN
Error correction term *(p-value)*	-0.1253 *(0.199)*	0.2096 *(0.236)*	0.8355 *(0.000)*
Panel B –Diagnostic tests (Chi-square statistics)			
Serial Correlation *(p-value)*	0.8227 *(0.364)*	1.1804 *(0.277)*	0.4125 *(0.521)*
Functional Form *(p-value)*	1.6332 *(0.201)*	0.0245 *(0.876)*	1.8688 *(0.172)*
Normality *(p-value)*	24.0477 *(0.000)*	1.5990 *(0.450)*	0.4063 *(0.816)*
Heteroskedasticity *(p-value)*	2.9214 *(0.087)*	1.6493 *(0.199)*	0.7147 *(0.398)*

From Panel A of Table 5, it is clear that the exogenous variables are LGDP and LTRADE, based on the insignificant error correction terms (p-value > 0.05). Also, LFIN is an endogenous variable, as its error correction term is statistically significant (p-value <0.05). Except for normality test of the LGDP equation, all the diagnostic statistics in Panel B suggest that the equations are well-specified. The Chi-square statistics indicate non-rejection of the null hypotheses of no serial correlation, no functional form problem, no normality issue, and no heteroskedasticity patterns in all the equations.

The results suggest that financial development (as proxied by LFIN) is led by, rather than leads, economic growth. This means that, based on the VECM estimates, the finance-growth nexus for Malaysia is more of a demand-following hypothesis. Economic growth tends to bring increasing demand for financial products and services, which drives the ongoing development of the financial sector.

The error correction term coefficient also provides an indication of how much adjustment of the long run deviation is corrected in each period. For the LFIN equation, the adjustment is relatively fast, in that 84% of the imbalances are corrected in the first period alone. This implies that when there is a shock to LFIN, it tends to move back to its long run equilibrium movement with other variables within a little more than a year (or about one year and two months).

4.6. Step 6 – Variance decompositions

While the VECM provides an indication of variables that are exogenous (leader) or endogenous (follower), it does not rank the variables in terms of relative exogeneity or endogeneity. For this purpose, we need to apply forecast variance decomposition (VDC) method. VDC decomposes the variance of the forecast error of each variable into proportions attributable to shocks from each variable in the system, including its own. The most exogenous variable is the one whose variation is explained the most by a shock of its own

rather than from other variables. Table 6 provides VDC estimates for selected periods (details in Appendix 3).

Table 6: Generalised forecast variance decompositions

Relative variance in:	Years	Percentage explained by innovations in:		
		dLGDP	dLTRADE	dLFIN
dLGDP	1	90.30	8.81	0.89
	3	86.03	12.68	1.28
	5	82.05	16.31	1.65
	10	74.15	23.48	2.37
dLTRADE	1	8.84	80.59	10.57
	3	13.97	75.98	10.05
	5	18.37	72.04	9.59
	10	25.92	65.29	8.79
dLFIN	1	3.51	15.62	80.87
	3	15.60	19.89	64.51
	5	25.14	21.45	53.41
	10	37.03	22.42	40.55

The out-of-sample results from the VDC tend to agree with the earlier results from the VECM estimates. Both LGDP and LTRADE are exogenous variables, while LFIN is the least exogenous, i.e. the most endogenous variable. LGDP is relatively more endogenous than LTRADE, as can be seen from the higher percentage of forecast variance explained by its own shock (74% compared with 65% respectively). On the other hand, only 41% of LFIN forecast variance is explained by its own shock. Shocks to the other two variables (LGDP and LTRADE) explain about 59% of the forecast error variability in LFIN, especially from LGDP.

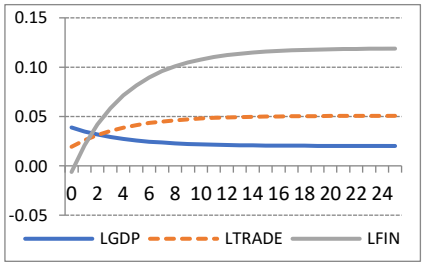
Therefore, similar to the conclusion from the VECM estimates, LFIN seems to be led by economic growth, which indicates support for the demand-following hypothesis.

4.7. Step 7 – Impulse response function (IRF)

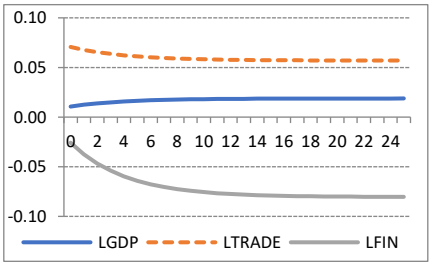
To have a graphical representation of the impact of the shocks transmitting through the system similar to VDC, we applied the generalised impulse response function (IRF). Figure 1 provides the profile of the impact transmission over a period of 25 years.

Figure 1: Generalised impulse response function to 1 S.E. shocks

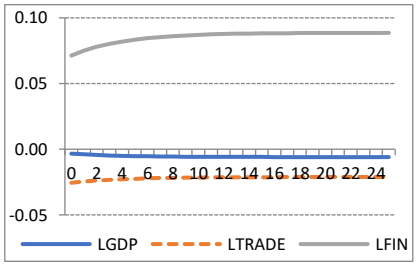
Panel A: Response to 1 S.E. shock in LGDP



Panel B: Response to 1 S.E. shock in LTRADE



Panel C: Response to 1 S.E. shock in LFIN



* Note: The horizontal axis in all three charts refer to time period in years

Consistent with the earlier findings from VECM and VDCs, LFIN is the most sensitive (endogenous) variable. Based on Panel A and B, LFIN responded the most to shocks in LGDP and LTRADE respectively, compared with the reverse responses of LGDP and LTRADE to shock in LFIN (Panel C).

Further analysis into the IRF reveals a few notable findings. First, a shock to growth has an initial negative impact on financial development (Panel A). However, it recovers to record positive impact and stays positive throughout. This may suggest that the sudden increase in per capita income leads to demand for better financial products and services,

which the financial sector is rather slow to respond. Over time, however, the financial sector improves and can fulfil the increase in demand.

Second, trade openness and economic growth seems to have a positive relationship (Panel A and B). Positive shocks to either growth or trade openness tend to elicit similar positive responses from each other. As mentioned in the early part of this paper, Malaysia is a small, highly open economy, with trade accounting for about 180% of GDP. This means that Malaysia has been relying partly on external demand as an important contributor to growth performance. Any shocks to external factors may affect trade performance, and subsequently impact overall growth conditions. Similarly, domestic shocks affecting producers or households may have an impact on domestic demand and overall GDP, which will impact ability to produce export products, competitiveness, or simply import demand[2].

Another notable but surprising result is the apparent negative relationship between financial development and trade openness. Panel B suggests that a positive shock to trade openness has a positive impact on economic growth, but negative consequences on financial development. More importantly, a positive shock in financial development leads to small but negative impact on growth and trade (Panel C). Although this result is unexpected, it is similar to the findings of Ibrahim (2007) when he used the same measure of financial development, i.e. the ratio of total credit to private sector to nominal GDP[3]. Further research, however, is needed to confirm this result, and may help to provide an improved picture of the findings.

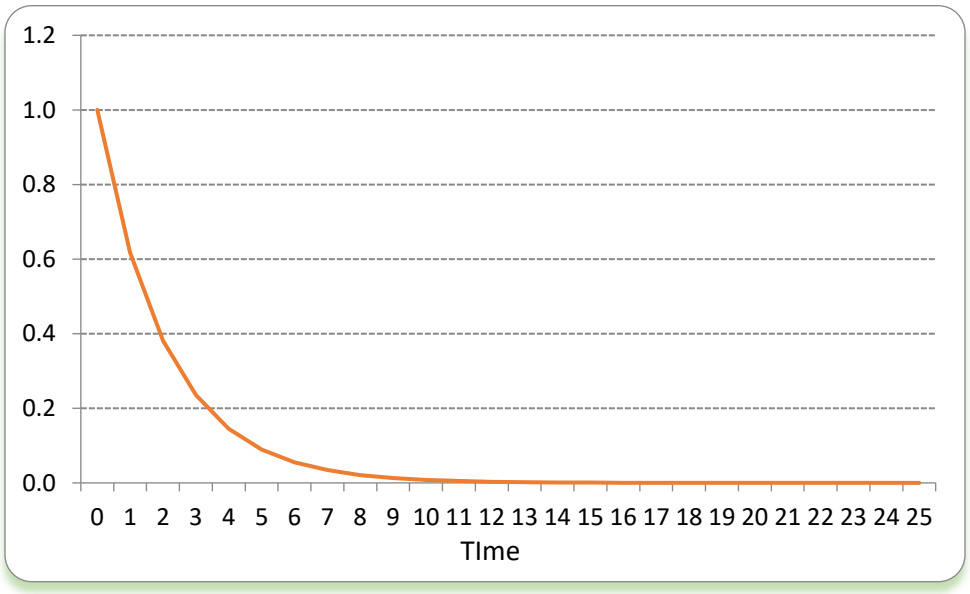
4.8. Step 8 – Persistence profile

[2] LTRADE is constructed as a ratio of total exports and imports to GDP. A decline in imports, therefore, implies a lower total trade to GDP ratio. This may come from lower demand for imported consumption and capital (or investment) goods.

[3] Ibrahim (2007) measures financial development from two perspectives – intermediaries and markets. To measure financial market development, he used stock market turnover-to-GDP ratio, which is generally found to have a positive relationship with growth. On financial intermediaries' development, he used credit-to-GDP ratio and non-currency M2-to-GDP ratio. The results, however, are qualitatively similar.

As a final analysis, the persistence profile illustrates the situation when the entire system is shocked (rather than variable-specific shock in IRF), and indicates the time it would take for the relationship to move back to equilibrium. Figure 2 below shows the persistence profile of the cointegrating system in this study.

Figure 2: Persistence profile of a system-wide shock to cointegrating vector



The profile indicates that it would take approximately 10 to 11 years for the cointegrating relationship to restore equilibrium following a system-wide shock.

5. Summary and Conclusion

The focus of this paper is to investigate the causal relationship between financial development and economic growth in Malaysia. There are two alternative views – supply-leading and demand-following. Supply-leading view argues that finance leads to growth, while demand-following hypothesis contends that economic growth creates increasing demand for financial services. Since Malaysia is a small, highly open economy, the analysis takes into consideration development in trade openness.

The paper applied recent time series techniques on annual data from 1970 to 2010, incorporating cointegration tests, vector error correction models, variance decomposition and impulse response functions. Our findings offer support for the presence of long run relationships between finance and growth in Malaysia. Furthermore, the results consistently support the demand-following hypothesis for Malaysia. In other words, economic growth tends to lead financial development. This is in line with the findings of Ang and McKibbin (2007), which also found support for the demand-following hypothesis in Malaysia. The findings, in general, concur with the roles that the Malaysian financial sector has played in enabling growth performance. Going forward, more effective intermediation process, better allocation of resources to highly productive sectors, and more inclusive financial services may transform the roles of the financial sector from facilitator and enabler of growth, to a driver and catalyst of economic performance.

Notwithstanding these results, further improvements can be made to the study in three key areas. First, other measures of financial development may yield a better understanding of the relationship. For instance, there have been studies which developed a single summary measure of financial development based on principal component analysis of a few common indicators, including credit-to-GDP ratio. At the same time, researchers have also analysed in greater detail aspects of financial development and its impact on the finance-growth nexus. For example, repressionist policies such as interest rate controls, banking sector restrictions, or targeted credit measures may lead to better insight into the linkages between finance and growth. Second, the use of other control variables may also alter or provide improved understanding of the results. Some papers have used, among others, interest rates, inflation rate, fixed capital formation and consumption spending as control variables. Finally, the study also did not include any dummy variables, especially to address potential structural breaks over the sample period, for instance, during the 1997/1998 AFC or the recent global financial crisis. This may solve the issue with normality in the LGDP equation of the VECM estimates.

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