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FINANCE, FINANCIAL VOLATILITY AND ECONOMIC DEVELOPMENT TIME SERIES EVIDENCE FROM MALAYSIA

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ABSTRACT

The present paper examines causal interactions between real output, financial developments and financial volatility for the case of Malaysia. It applies the Toda-Yamamoto non-causality test and, to add confidence to the results, estimates levels vector autoregressive models and simulates variance decompositions and impulse-response functions. The results consistently suggest the significant causal role of the stock market development in the nation's real output. Additionally, we document evidence of temporary negative effects of financial volatility. The relations between banking sector development and economic activity, however, are empirically ambiguous. Among the financial variables, there seems to be a feedback effect between stock market development and financial volatility. Lastly, the development of financial markets tends to have positive influences on the banking sector development. This means that banking sector development and stock market development are complementary. Overall, our results support initiatives to further develop and strengthen the stock market as a catalyst for economic development. While financial liberalization tends to result in financial volatility, its impacts on real output are noted to be temporary.

JEL Classification: O16; G18; G28

Keywords: *Finance, Financial Volatility; Economic Development; Toda-Yamamoto Test; Innovation Accounting*

1. INTRODUCTION

The role of finance in economic development is a subject that has attracted considerable attention. Theoretically, there are two competing hypotheses on the relationship between finance and economic development, namely, the 'supply-leading' hypothesis and the 'demand-following' hypothesis. According to the 'supply-leading' hypothesis, financial development exerts a causal impact on economic growth, a view that can be dated back at least to the work of Schumpeter (1911). The essential role of financial institutions in reducing transaction and information costs makes more funds available for investments. Moreover, it is argued that the financial sector can channel funds more efficiently to productive investments through effective fund pooling, better identification of profitable investments, improved monitoring, and risk diversification (Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990; and Levine, 1997). By contrast, the "demand-following" hypothesis postulates a causality that runs from economic growth to financial development. In the words of Robinson (1952), "where enterprise leads, finance follows". That is, economic development creates the needs for financial services and, thus, leads to financial sector development.

These competing hypotheses have become the focus of many empirical studies. However, no empirical consensus seems to emerge. Although cross-national studies by King and Levine (1993), Levine and Zervos (1998) and Rajan and Zingales (1998) tend to support the "supply-leading" view, their results are criticized on various grounds particularly the unrealistic assumption of structural homogeneity across countries and the inability of their frameworks to address causality issue. The recent time series studies, furthermore, yield mixed results. An illustrative list of these studies include Al-Yousif (2002), Arestis and Demetriades (1997), Demetriades and Hussein (1996), Rosseau and Watchel (1998), Rosseau and Vuthipadadorn (2004), Shan et al. (2001), and Xu (2000). Among these studies, only Rosseau and Watchel (1998), Rosseau and Vuthipadadorn (2004), and Xu (2000) find strong support for the causal role of finance in economic development. Meanwhile, the remaining studies tend to conclude that the relationship between finance and economic growth is either weak or is country-specific, with evidence supporting either the "supply-leading" hypothesis or the "demand-following" hypothesis or both.

The objective of the present paper is to investigate the causal interactions between finance and economic development for the case of Malaysia. It attempts to contribute to the existing empirical literature in the following ways. While most studies focus only on one aspect of financial development, namely, development of financial intermediaries, we focus on both financial intermediary development and financial market (i.e. stock market) development. Thus, their relative contribution to the growth process can be assessed. Moreover, we also consider financial volatility as a factor that may have repercussion on economic development. Notably, financial liberalization policies adopted by many developing countries including Malaysia to promote the financial sector tend to be accompanied by increasing financial volatility and, in some cases, financial crises. Indeed, the recurring financial crises such as the 1997/1998 Asian crisis have doubted many on the benefits of financial liberalization. Accordingly, the potential adverse effect of financial volatility needs to be incorporated such that full assessment of the financial sector's role can be made. Malaysia provides an interesting case study. Over the years, Malaysia has witnessed rapid economic development. In parallel, Malaysia's banking sector and stock market have also progressed rapidly. Yet, Malaysia succumbed to financial turbulences of the 1997. Thus, the various aforementioned aspects of finance can be readily evaluated.

Apart from the wider aspects of finance that it covers, the analysis also contributes to existing studies by its application of a recent Granger non-causality framework of Toda and Yamamoto (1995) in addition to the normally employed innovation accounting based on vector autoregressive (VAR) framework. The Toda-Yamamoto test has the advantage in that it does not require pre-testing of variables for unit root and cointegration and thus circumvents the pre-testing bias. Moreover, according to Toda and Yamamoto (1995), the test is simple and can be applied even in the case of non-cointegration. Then, the innovation accounting is used to assess the relative importance of various aspects of financial development on economic growth as well as the directional impacts of shocks to variables in the system. The rest of the paper is structured as follows. In the next section, we outline the empirical framework. Then section 3 details the variables used in the analysis. Section 4 presents estimation results. Finally, section 5 summarizes the main findings and provides concluding remarks.

2. EMPIRICAL FRAMEWORK

The analysis relies on a VAR framework to uncover dynamic causal interactions between finance and real activity. To begin, the VAR in levels specification is written as:

$$X_t = \mu + \sum_{i=1}^{k} \Gamma_i X_{t-i} + u_t \quad (1)$$

where X is a $(p \times 1)$ vector of the variables under consideration, μ is a vector of constant terms, and Γ are matrices of coefficients. The error terms, u, are assumed to satisfy the classical assumptions. In assessing causal interactions among the variables, researchers normally apply unit root and cointegration tests to ensure non-spurious results. However, it is also well known that these pre-tests can cause pre-testing bias. Moreover, the normally applied unit root tests such as the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are known to lack power against the alternative hypothesis of trend stationary, making establishing the variables' integrated properties uncertain. In the case of uncertain and conflicting results, researchers tend to proceed to cointegration tests by arguing that the variables are integrated of the same order. The tests for causal interactions are then carried out using the VAR or vector error-correction (VECM) models or using levels or first-differenced variables depending on the pre-testing results.

Recently, Toda and Yamamoto (1995) develop a framework that bypasses these pre-tests and yet allows valid causality tests to be implemented in a simple manner using the variables in levels. In short, prior knowledge of the integration and cointegration properties of the variables is not needed. Moreover, their normally termed non-causality test can be applied even for the non-cointegrated series. The test can also be used when stability and rank conditions are not satisfied provided that the maximum integration order suspected in the system does not exceed the VAR lag order (i.e. *k*) (Toda and Yamamoto, 1995, p. 225). Basically, the test is based on an augmented levels VAR model as follows:

$$X_t = \mu + \sum_{i=1}^{k+d\max} \Gamma_i X_{t-i} + u_t \quad (2)$$

where *dmax* is the maximum order of integration of the variables considered and *dmax* d" *k*. To illustrate the testing procedure for causal interactions between for instance real output and banking sector development, we write the output and banking sector development equations as follows:

$$y_t = \alpha_0 + \sum_{i=1}^{k+d\max} \alpha_{1i} y_{t-i} + \sum_{i=1}^{k+d\max} \alpha_{2i} bd_{t-i} + \sum_{i=1}^{k+d\max} \alpha_{3i} sd_{t-i} + \sum_{i=i}^{k+d\max} \alpha_{4i} vol_{t-i} + \varepsilon_t \quad (3)$$

$$bd_t = \beta_0 + \sum_{i=1}^{k+d\max} \beta_{1i} y_{t-i} + \sum_{i=1}^{k+d\max} \beta_{2i} bd_{t-i} + \sum_{i=1}^{k+d\max} \beta_{3i} sd_{t-i} + \sum_{i=i}^{k+d\max} \beta_{4i} vol_{t-i} + u_t \quad (4)$$

where *y* is a measure of economic development, *bd* is a measure of banking sector development, *sd* is a measure of stock market development, and *vol* is a measure of financial volatility. Note that the equations for stock market development and financial volatility can be formulated in the same manner.

The Toda-Yamamoto procedure involves several steps. In the first steps, unit root tests are implemented to establish the maximum order of integration, or I(*d*), of the system. While it is well noted that time series variables are mostly I(1) and in few cases I(2), these tests are generally taken as indicative and re-assuring of the I(1) or I(2) properties of the variables. In the second step, the optimal lag length of the VAR, i.e. *k*, is specified. Rather than relying on various information criteria in selecting the VAR lag order, we impose the requirement that the error terms must be non-autocorrelated. Then, step 3 involves estimation of VAR(*k* + *dmax*) model. Finally, restriction tests on the *k* coefficients of right-hand side variables using a modified Wald statistics are conducted. For instance, in testing whether *bd* Granger causes *y*, the null hypothesis H_0: $\alpha_{21} = \alpha_{22} = ... = \alpha_{2k} = 0$ is tested against an alternative hypothesis that at least one of the coefficients is non-zero. The test statistics is asymptotically chi-squared distributed with *k* degrees of freedom. All directions of causality among the variables can be tested in the same manner.

To further add credence to our results, we also apply an innovation accounting based on estimated levels VAR models. More specifically, we simulate impulse response functions and variance decompositions to further assess dynamic interactions among the variables. Basically, impulse response functions trace temporal responses of a variable to its own shocks and shocks in other variables. Thus, from the functions, we can observe for example the direction, magnitude and persistence of output responses to innovations in financial sector development. Meanwhile, the variance decompositions indicate the fraction of a variable's forecast error variance attributable to shocks in other variables. The VDC provides a natural measure of the relative importance of each shock in the system. Thus, in our context, it allows us to assess the relative importance of financial intermediaries and financial markets or financial developments and financial volatility in accounting for variations in real activity.

3. VARIABLES

We employ quarterly data from 1986.Q1 to 2003.Q4 to analyze the causal interactions between economic development and finance. We use real gross domestic products (*y*) as a measure of economic development. Three aspects of the financial sector are considered – banking sector development, financial market development, and financial volatility. In line with the literature, two alternative measures of banking sector development are employed. They are the ratio of total credit to the private sector to nominal GDP (*bd1*) and the ratio of non-currency components of M2 to nominal GDP (*bd2*). Respectively, reflecting the development of the banking sector, they capture the extent of financial intermediation from savers to investors and of deposit usages and, thus, financial sophistication, in transactions. The development of financial markets is represented by stock market development. More specifically, we use the ratio of total value traded to nominal GDP (*sd*) for the purpose. This ratio indicates the level of market liquidity, which is normally viewed to be associated with stock market development. The 12-quarter moving-average standard deviation of the Kuala

Lumpur Composite Index (*vol*) is used to represent financial volatility. We contend that it is a reasonable measure of financial volatility since it captures the volatility aspect of financial liberalization that has heightened capital flows, market growth and market speculation. We form two 4-variable VAR systems, one with the ratio of total credit to nominal GDP and the other with the ratio of non-currency components of M2 to nominal GDP as a measure of banking sector development. All variables are expressed in natural logarithm. These data are obtained from various issues of Bank Negara's *Monthly Statistical Bulletin* and *Quarterly Statistical Bulletin* as well as from IMF's *International Financial Statistics* (CD-ROM).

Figure 1 provides time-series plots of these variables. As may be observed from the figure, the real gross domestic products exhibit an upward trend, a clear seasonal pattern, and a drastic drop in 1998 (i.e. by more than 7%) due to the Asian crisis. Despite the recession of 1998, Malaysia records an average annual growth rate of more than 6%. This achievement is deemed remarkable. On the whole, indicators of financial sector development indicate that the banking sector and stock market have progressed rapidly especially during the early years. Prior to the crisis, both measures of banking sector developments had accelerated at a fast pace. Then, the measures have stabilized and generally remained constant afterwards. A similar upward pattern is also observed for the ratio of value traded to nominal GDP in the early years. However, it witnesses a decline since 1994. The market volatility has been particularly high from 1994 to 2000, a period marked by the Mexican crisis in 1994 and the Asian crisis in 1997/1998. The widely-cited observation that these turbulences in the financial market may have adverse repercussion on growth must be considered in the analysis of finance and growth. Otherwise, full assessment of the role of finance in economic development can not be made.

Before we proceed, we first test for the stochastic properties of each variable. To this end, we apply the commonly used ADF and KPSS unit root tests. The former tests the unit root null hypothesis against an alternative hypothesis of stationarity. Meanwhile, the latter has a stationarity null hypothesis. The results of the tests are given in Table 1. The tests agree in classifying *y* and *sd* as an I(1) process; that is, they are stationary in first difference. They also reach similar conclusion in the case of the credit ratio to nominal GDP(*bd1*). Namely, it is stationary in level or I(0). For the ratio of deposit liabilities to nominal GDP (*bd2*), the ADF test suggests a potential two unit roots (I(2)) while KPSS test classifies the variable as an I(1) process. Lastly, financial volatility (*vol*) is found to be I(1) under the ADF test and I(0) under

Table 1
ADF and KPSS Unit Root Tests

	ADF		*KPSS*	
Variable	*X*	*ΔX*	*X*	*ΔX*
y	-0.604	-4.170*	0.250*	0.110
bd1	-4.241*	—	0.119	—
bd2	-3.415	-2.333	0.154*	0.127
sd	-1.107	-4.736*	0.248*	0.042
vol	-2.750	-4.590*	0.129	—

Note: * denotes significance at better than 5% significance level. The tests include both drift and trend terms. The lag length for the ADF test is chosen using the Akaike Information Criterion (AIC).

the KPSS test. These conflicting results of the tests are not uncommon. The VAR systems that we form, thus, not only have a mixture of I(0) and I(1) variables but also have variables with uncertain stochastic properties. These make the Granger non-causality test suggested by Toda and Yamamoto (1995) most appropriate when interest is to uncover dynamic interactions among the variables, to which we now turn.

4. ESTIMATION RESULTS

In this section, we discuss the estimation results. Given the seasonal pattern of real GDP, we incorporate seasonal dummies in all estimations that we perform. First, we provide the Granger non-causality test results. Then, to add credence to the analysis, we report innovation accounting results simulated from levels VAR models.

4.1 Granger Non-Causality

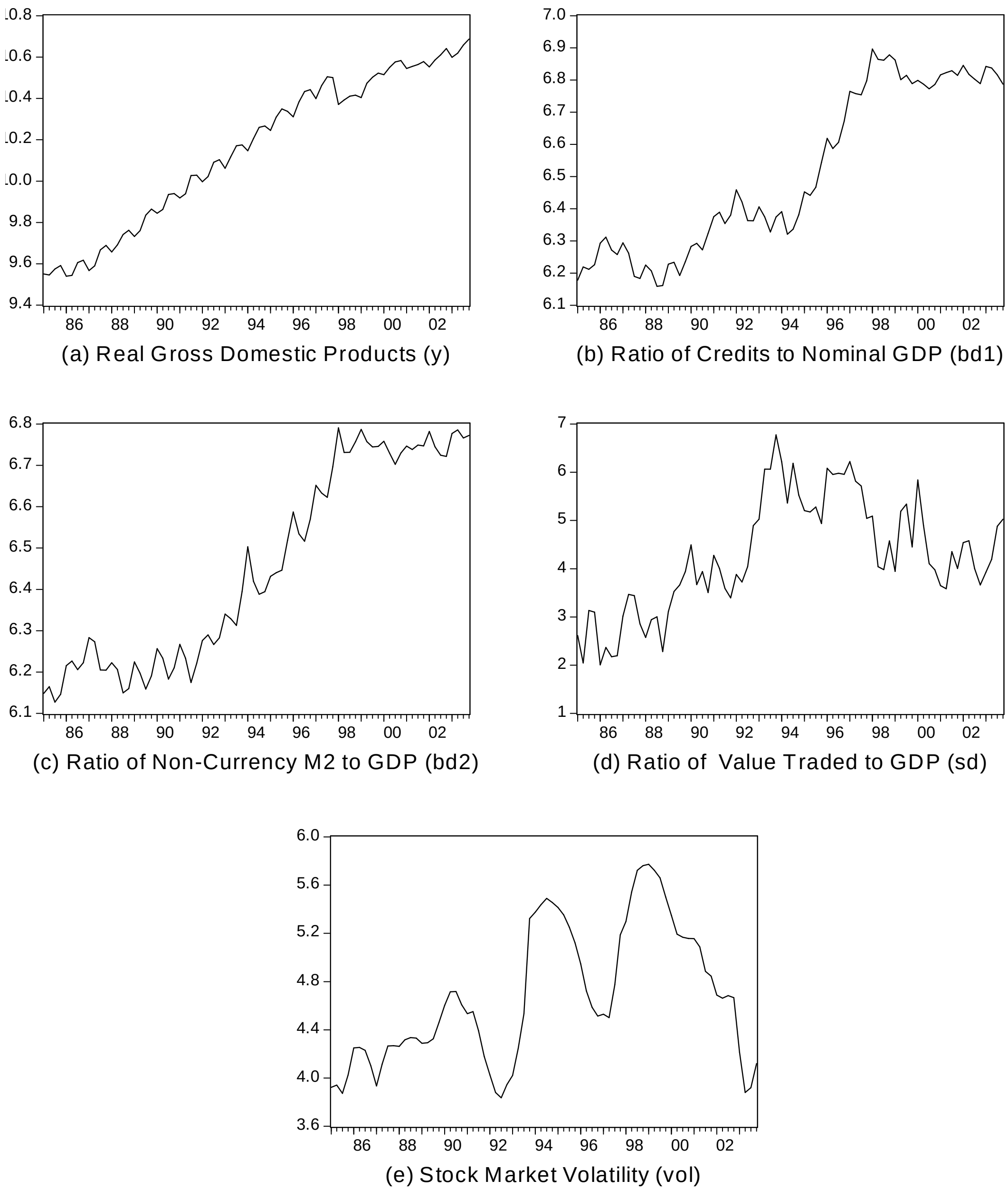
Table 2 presents Toda-Yamamoto's Granger non-causality results with panel (a) corresponds to the system using credit to GDP ratio and panel (b) non-currency components of M2 or deposit liabilities to GDP ratio. Based on the requirement that the error terms are serially uncorrelated, we set the optimal lag length to 5, i.e. $k = 5$, for both systems. The maximal order of integration in the system is set to 1 ($dmax = 1$). Since, as noted above, the deposit liabilities to GDP ratio is potentially an I(2) process, we also experiment with $dmax = 2$ for the latter system. The results are largely similar and thus not reported here to conserve space.

Table 2
Granger Non-Causality Test Results

Dependent Variables	*Lagged Independent Variables* *y*	*bd*	*sd*	*vol*
	(a) System with credit to GDP ratio			
y	—	17.08 [0.004]	19.58 [0.002]	9.055 [0.107]
bd	11.25 [0.047]	—	10.54 [0.061]	3.262 [0.660]
sd	2.221 [0.818]	5.628 [0.344]	—	14.77 [0.011]
vol	18.29 [0.003]	13.03 [0.023]	17.51 [0.004]	—
	(b) System with deposit liabilities to GDP ratio			
y	—	14.81 [0.011]	24.86 [0.000]	14.95 [0.011]
bd	16.40 [0.006]	—	2.240 [0.815]	15.89 [0.007]
sd	3.181 [0.672]	4.226 [0.517]	—	12.55 [0.028]
vol	3.847 [0.572]	1.964 [0.854]	11.04 [0.050]	—

Note: the bolded figures indicate consistent significant results across the two systems. Numbers in parentheses are p-values.

Figure 1: Time-Series Plots of the Variables



The bolded figures in Table 2 represent similar significant results under the two systems. As may be observed from the table, both banking sector development and stock market development have a causal impact on real activity. In addition, there seems to be a feedback effect from real activity to banking sector development, thus supporting the "supply-leading" hypothesis and "demand-following" hypothesis in the case of banking sector development. Finally, the consistent results of the two systems are the bi-directional causality between the stock market development and financial volatility. Perhaps, financial volatility reflects active trading in the market and thus promotes market development. Conversely, the stock market development propelled by financial liberalization measures may contribute to financial volatility. Apart from these results, the system with *CR* also suggests significant causal link that runs from stock market development to banking sector development, raising an important issue of whether the two are complementary or substitute. Moreover, financial market volatility is also preceded by fluctuations in real activity and banking sector development. Lastly, from the system with *DP*, we note significant influences of financial volatility on output as well as stock market development. In short, our Toda-Yamamoto test results suggest an important link between finance and growth.

4.2 Innovation Accounting

To further evaluate causal interactions among these variables such that robust and concrete results can be drawn, we re-estimate the levels VAR with the optimal lag order of 5 for both cases[1]. From the estimated VAR, we simulate variance decompositions (VDC) and impulse-response functions (IRF). In the analysis, identification of the shocks is based on Cholesky factorization. The approach tends to depend on the pre-causal ordering of the variables unless the contemporaneous correlations between the variables' innovations are insignificant or small. In our case, we order real output (*y*) first followed by banking sector development, stock market development and then financial volatility. Thus, we take real output to be most exogenous while financial volatility most endogenous. However, we also should note that the correlations between all pairs of innovations are small except between those in real output and banking sector development; namely, their correlation exceeds 0.50 for both cases. Accordingly, we also experiment with the alternative ordering that places financial variables first followed by real output. With two VAR systems and two alternative orderings, we have four sets of variance decompositions and impulse-response functions. We take consistent results across these four sets to indicate robustness and add confidence to the early conclusions. On the whole, our earlier conclusions are generally supported.

Table 3 and table 4 present the variance decompositions of the two systems with figures in squared brackets represent those from the alternative ordering. The most consistent result that we observe is the high contribution of stock market development to variations in real activity. At 20-quarter horizon, the proportion of real activity forecast error variance attributed to innovations in stock market development is in the range of 38% to 59%. However, the evidence supporting the role of banking sector development is not as strong. More specifically, the banking sector development tends to contribute significantly to real output variations only when we order real output last. Indeed, in the system using deposit ratio and with real output ordered first, the proportion of real output variations attributable to banking sector development is too small to signify significance. Interestingly, we find quite robust evidence of the role played by financial volatility in influencing real output especially at short horizon. At 4-quarter horizon, about 12%-24% of the variations in real output is attributable to innovations in financial volatility.

Table 3
Variance Decompositions of VAR with Credit Ratio

		Explained by innovations in		
Period	*y*	*bd*	*Sd*	*vol*
	(a) Variance Decomposition of Real Output (*y*)			
4	57.37 [46.81]	13.66 [15.96]	15.83 [23.06]	13.14 [14.17]
8	54.02 [33.23]	6.78 [18.53]	29.65 [38.00]	9.55 [10.24]
12	48.32 [23.82]	5.45 [22.19]	38.73 [46.13]	7.49 [7.86]
20	49.00 [19.47]	4.81 [27.34]	38.40 [44.99]	7.79 [8.20]
	(b) Variance Decomposition of Banking Sector Development (*bd*)			
4	25.30 [7.24]	55.45 [76.10]	17.30 [14.89]	1.94 [1.77]
8	17.72 [12.98]	68.26 [75.25]	11.77 [9.74]	2.25 [2.02]
12	12.95 [13.22]	63.30 [62.89]	19.11 [19.57]	4.63 [4.31]
20	9.12 [6.85]	32.50 [32.98]	53.56 [55.53]	4.82 [4.64]
	(c) Variance Decomposition of Stock Market Development (*sd*)			
4	0.75 [0.90]	5.53 [2.25]	79.19 [82.17]	14.52 [14.69]
8	3.62 [2.05]	5.34 [3.12]	77.25 [80.85]	13.79 [13.98]
12	7.99 [2.06]	7.41 [9.82]	69.63 [72.95]	14.96 [15.17]
20	11.57 [1.84]	12.02 [18.73]	62.36 [65.19]	14.05 [14.24]
	(d) Variance Decomposition of Financial Volatility (*vol*)			
4	6.79 [5.39]	0.61 [3.93]	26.40 [23.59]	66.20 [67.09]
8	7.65 [6.09]	0.94 [5.63]	52.36 [48.61]	39.04 [39.67]
12	7.09 [6.52]	3.02 [5.69]	50.14 [47.37]	39.75 [40.42]
20	12.26 [8.81]	4.12 [9.91]	44.92 [41.81]	38.69 [39.48]

*Note:*the figures in squared brackets are based on the alternative ordering [*bd*, *sd*, *vol*, *y*]

Table 4
Variance Decompositions of VAR with Deposit Ratio

		Explained by innovations in		
Period	*y*	*bd*	*Sd*	*vol*
	(a) Variance Decomposition of Real Output (*y*)			
4	68.64 [32.48]	4.65 [11.16]	14.45 [32.25]	12.26 [24.10]
8	65.72 [28.25]	2.60 [11.35]	24.20 [46.04]	7.48 [14.35]
12	53.99 [20.32]	2.15 [13.89]	35.53 55.19]	8.33 [10.59]
20	52.63 [18.21]	1.72 [15.40]	39.14 [59.57]	6.51 [6.82]
	(b) Variance Decomposition of Banking Sector Development (*bd*)			
4	15.92 [3.22]	80.22 [94.15]	0.61 [0.26]	3.24 [2.37]
8	19.87 [4.22]	69.03 [85.20]	2.66 [1.79]	8.44 [8.79]
12	15.74 [5.47]	67.45 [75.06]	2.56 [1.69]	14.24 [17.78]
20	18.87 [7.76]	54.52 [57.85]	14.05 [18.80]	12.55 [15.59]
	(c) Variance Decomposition of Stock Market Development (*sd*)			
4	4.25 [3.46]	34.61 [16.30]	51.80 [66.85]	9.34 [13.39]
8	7.45 [5.27]	35.29 [18.92]	48.80 [64.06]	8.46 [11.75]
12	14.62 [5.09]	36.40 [30.13]	41.97 [55.17]	7.02 [9.61]
20	19.12 [5.03]	36.31 [36.97]	36.66 [48.27]	7.90 [9.72]
	(d) Variance Decomposition of Financial Volatility (*vol*)			
4	5.08 [1.16]	2.03 [5.15]	38.13 [30.12]	54.76 [63.56]
8	4.53 [1.08]	16.06 [18.19]	44.99 [40.45]	34.42 [40.27]
12	4.51 [1.31]	19.61 [20.11]	41.28 [37.84]	34.60 [40.74]
20	10.80 [1.91]	22.38 [28.88]	35.13 [31.37]	31.69 [37.84]

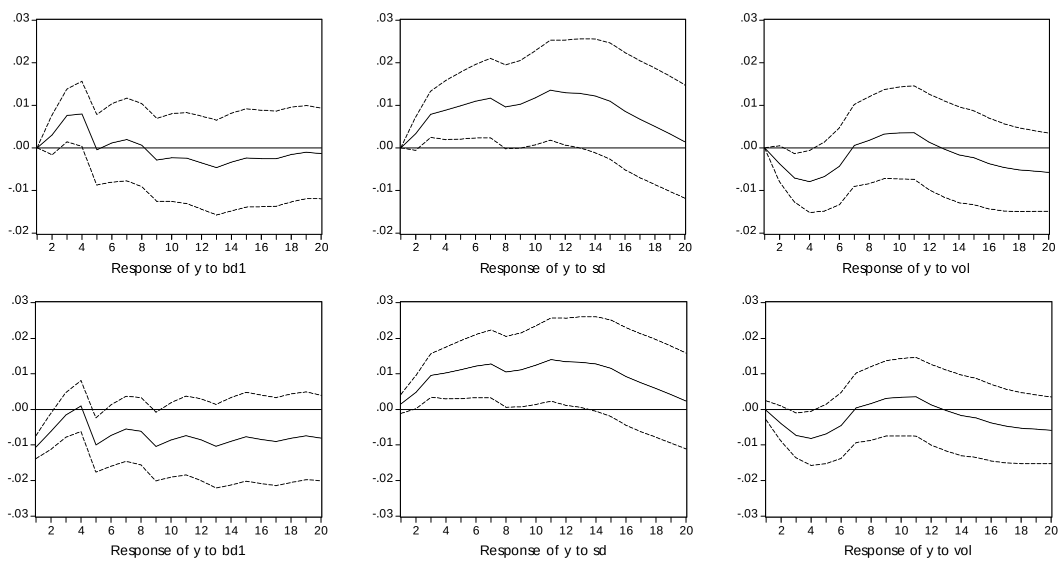
Note: the figures in squared brackets are based on the alternative ordering [*bd*, *sd*, *vol*, *y*]

The feedback effect from real activity to financial variables tends to depend critically on the ordering of the variables. Namely, the feedback effect is evidenced only when real GDP is ordered first. Among the financial variables, we note the following robust results: (i) significant feedback interactions between stock market development and banking sector development at long horizon and (ii) significant feedback interactions between stock market development and financial volatility. For the interactions of other pairs of variables, the results tend to depend on which measure of banking development and which ordering is used.

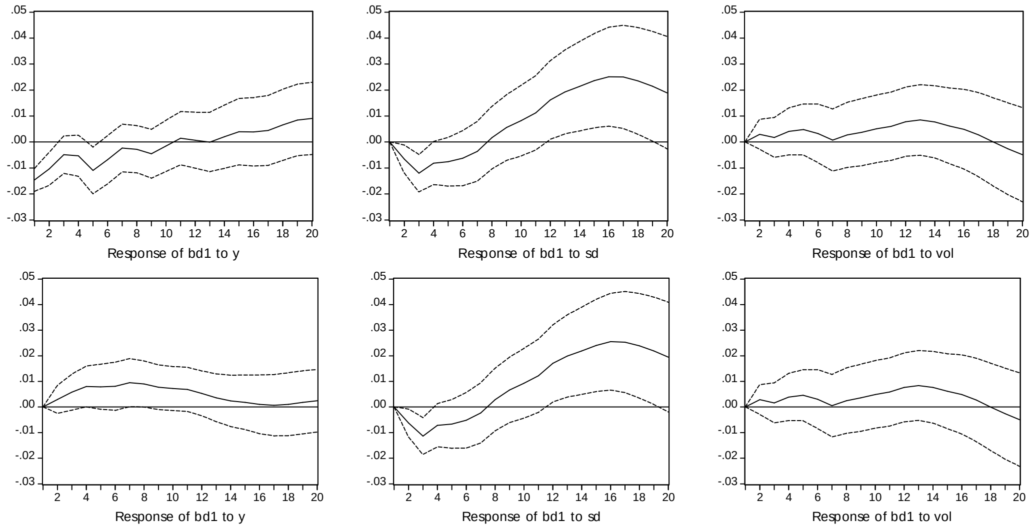
The impulse-response functions tend to echo these variance decomposition results. To conserve space, we report only the results from the system with credit ratio and they are presented in Figure 2. The first row of the graphs represents the responses based on the first ordering while the second row based on the second ordering. Again, we note that, consistently, innovations in stock market development lead to positive and significant responses from real activity. It is pleased to note that the pattern of responses is the same in the system with deposit ratio. Moreover, financial volatility also exerts a negative but temporary effect on real activity. However, the relations between banking sector and real activity are perverse. Namely, while real activity responds positively to banking sector development in the first ordering, it reacts negatively in the second ordering at short horizons. Interestingly, we note that, at short horizon, the stock market development exerts a negative impact on the banking sector development. However, the responses of banking sector development to innovations in the stock market development turn positive and significant at long horizons. We also observe from the functions that financial volatility tends to hinder stock market development as the latter reacts negatively and significantly to financial volatility shocks. At the same time, the stock market development is likely to lead to higher financial volatility. We contend that financial liberalization policies aiming at promoting the capital markets may have brought together greater market volatility.

Figure 2: Impulse-Response Functions

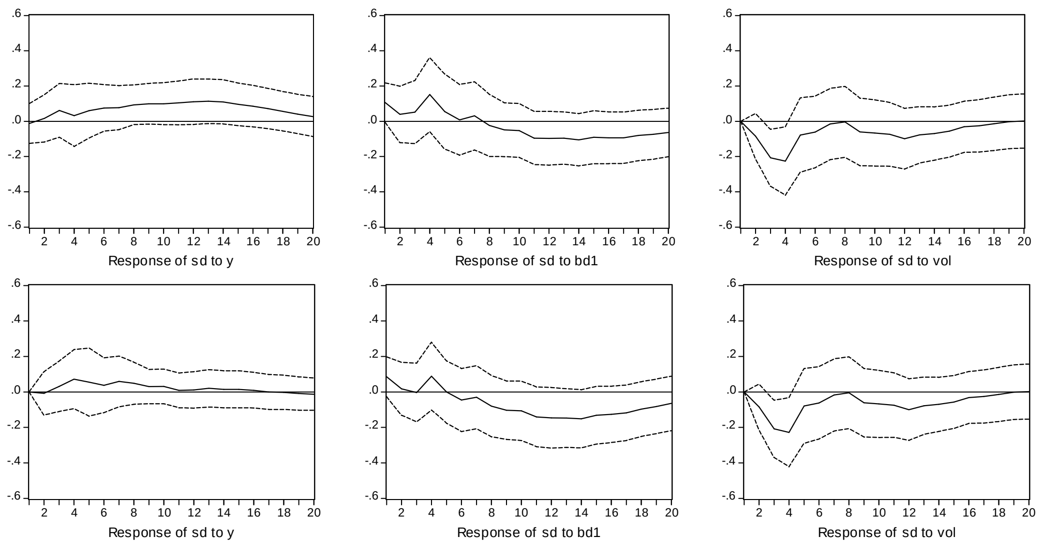
(a) Read GDP



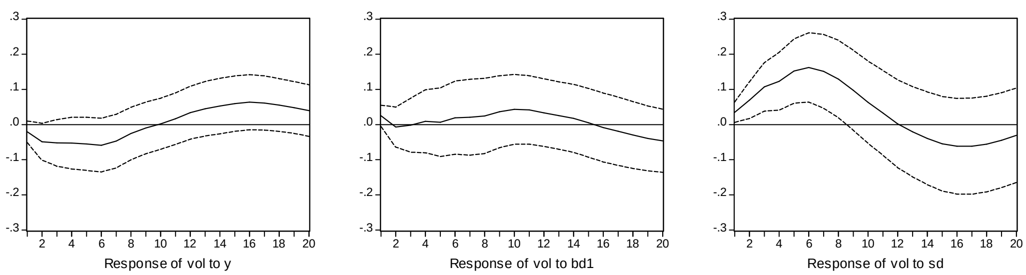
(b) Banking Sector Development

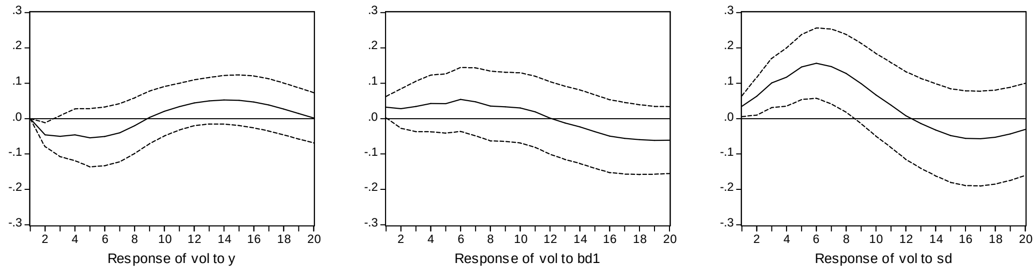


(c) Scok Market Development



(d) Financial Volatility





In a nutshell, the stock market development is likely to bring benefits since it not only promotes real activity but also tends to boost banking sector development. Moreover, the volatility that accompanies financial market development is likely to exert only temporary negative effect on real activity.

5. CONCLUSION

The once widely proclaimed benefits of financial development have recently been placed under the spotlight due to increased financial volatility that can be harmful to growth performance. In this paper, we examine the causal relations between the financial sector and economic development for the case of Malaysia. In the analysis, the Toda-Yamamoto non-causality is utilized. We argue that the approach is most appropriate due to the mixture of I(0) and I(1) variables and uncertain nature of certain variables' integrated processes. To add credence to our analysis, we also simulate variance decompositions and impulse-response functions. Apart from checking robustness of the results, they add further insights into the analysis. More specifically, we can observe the relative contribution of innovations in financial variables to real activity as well as their directions of influences.

From the analysis, we observe consistent and robust evidence that the stock market development contributes positively to real activity. The stock market development is also not likely to displace financial intermediation services provided by the banking sector. Indeed, in the long run, the stock market development tends to have positive influences on the banking sector development. Meanwhile, the influence of banking sector development is uncertain. Moreover, we find as expected a significant negative causal effect of financial volatility on real output. However, the effect is only temporary. Financial volatility also temporarily hinders financial development. At the same time, the financial market development also heightens volatility aspect of the market. The increasing financial liberalization to promote financial market development, thus, inevitably breeds volatility as it allows quick inflows and outflows of short-term investments. As long as this volatility does not exert persistent and strong negative impacts on real and financial performance, it needs to be taken as part of financial liberalization outcomes. At the same time, the possible destabilizing effects of financial volatility need to be monitored. Thus, on the whole, our results support policy initiatives to further develop Malaysia's financial markets as a catalyst for Malaysia's future development.

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