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Bank lending, macroeconomic conditions and financial uncertainty: Evidence from Malaysia

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Abstract

In this paper, we examine the interrelations between bank lending, macroeconomic conditions and financial uncertainty for an emerging economy, Malaysia. Adopting time series techniques of cointegration, causality and vector autoregressions (VARs), we arrive at the following main results. We note long run positive relations between real output and both real bank credits and real stock prices. However, with slow adjustment of real output in responses to credit expansion or stock price increase and weak exogeneity of the latter two variables, both credits and stock prices can be persistently higher than their fundamental values. The phenomenon can be detrimental since it heightens market uncertainty. Our results suggest that heightened market uncertainty is negatively related to output in the long run and, on the basis of dynamics analysis, it is likely to depress real output, real credit and real stock prices. At the same time, we note significant dynamic impacts of interest rate shocks on other variables. Taken together, these results have important implications for macroeconomic performance and stability for the case of Malaysia.

JEL classification: C32; E44; G21

Keywords: Bank credits; Financial uncertainty; Macroeconomy; Time series; Malaysia

1. Introduction

Bank lending behavior and its interrelations to macroeconomic and financial variables is a subject that has attracted much attention in recent years. While the Classical theory of economic fluctuations downplays the role of financial markets in accounting for aggregate fluctuations, recent recurring financial turbulences and ensuing macroeconomic difficulties have placed banks and their lending decisions at the center of policy and academic discussion. Arguably, based on theories that build upon asymmetric information and capital market imperfections, bank credits have the ability to amplify aggregate fluctuations through either their role in monetary transmission mechanism or their pro-cyclical nature. According to the credit channel of monetary transmission mechanism, in responses to monetary tightening, banks are forced to contract loan supply unless sufficient capital buffers are available. As a consequence, the access to financing of especially bank-dependent borrowers is curtailed and real activities are contracted (Bernanke and Gertler, 1995). The pro-cyclical nature of bank loans is normally depicted in the following way. The observed increase in bank loans during economic expansions is likely to be characterized by the deterioration of bank loan quality due to over-optimism, risk exposure underestimation and relaxation of lending standards. Then, following a shock that sends asset prices to nosedive and leads to recession, banks experience losses in their balance sheets. In reaction, banks curtail credit supply and, in the process, amplify cyclical fluctuations (see Marcucci and Quagliariello, 2008 for details). In relation to this, some have noted that excessive credit growth can be taken as a warning signal or predictor of financial instability and crises (Kaminsky and Reinhart, 1996; Borio and Lowe, 2002, 2004).

At the same time, financial uncertainty may also play an important role in influencing bank lending decisions. Baum et al.

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(2005) frame bank decisions of asset allocation to loans and bonds based on a portfolio balance model, in the same vein as nonfinancial firms' investment decisions (Beaudry et al., 2001). In determining the optimal portfolio, banks assess the signals on expected returns of investments and, accordingly, their lending decisions. Macroeconomic uncertainty, by making the signals to be noisier, prompts banks to reallocate their assets away from risky loans toward safer bonds. Using the mean–variance optimization framework, Baum et al. (2005) demonstrate that cross-sectional variance of the loan-to-asset ratio declines following the increase in uncertainty. In other words, the optimal share of loans in the asset portfolio is distorted as a result of increasing uncertainty (see also Quagliariello, 2009). If this is the case, bank loans can be viewed to play an important role in transmitting financial shocks and uncertainty to the real sector.

In the context of Asian crisis-hit countries, the eruption of the crisis and its consequences has been related in great extent to bank credits. The leading years to the Asian crisis had been pictured by excessive credit growth at the rates far higher than the growth rates of GDP (Corsetti et al., 1998; Goldstein, 1998; Kamin, 1999). With the problem of asymmetric information coupled with lack of managerial expertise in risk management and inadequacy of regulatory framework, the excessive growth of credits resulted in substantial loan losses and deterioration of banks' balance sheets (Mishkin, 1999). Kwack (2000) notes that the non-performing loan rates, which was surmounting during the period, is a major determinant of the Asian crisis. In her description of the Asian crisis, Athukorala (2001) places banks as a key channel through which exchange rate and stock market collapses are transmitted to the real sector. Apart from these, the Asian crisis seems to have a lasting impact on private investment activities, which have remained low since then. Indeed, the slumps in investment activities after the crisis have prompted various empirical works attempting to identify their determinants, among which include Kinkyo (2007), Jongwanich and Kohpaiboon (2008), Ang (2010) and Ibrahim (2011). Jongwanich and Kohpaiboon (2008), in particular, identify the shortages of capital as a prime determinant of investment slumps in Thailand. These studies also note the significant role played by macroeconomic and financial uncertainties.

In light of these, this paper analyses the interrelations between bank lending, macroeconomic conditions and financial shocks and uncertainty for Malaysia. Being a bank-based system, Malaysia has witnessed the important role of bank credits in driving firms' activities and, accordingly macroeconomic performance. According to a survey conducted in Malaysia by Bank Negara Malaysia (i.e. Malaysia's Central Bank) among 206 manufacturing companies in 1996, roughly 67% of them depend on bank loans for their working capital and 44% for their export activities (Public Bank, 1998). Then, excessive expansion of bank credits prior to the 1997/1998 Asian crisis and their drastic drop during the course of the crisis has normally been noted to be a key reason underlying amplified aggregate downturns observed in 1998 (Athukorala, 2001). While efforts have been made by the government to promote a market-based system through the development of financial markets, the banking system is likely to continue its dominant in Malaysia's financial scene. The shift by Bank Negara Malaysia from monetary aggregate targeting to interest rate targeting in mid 1990s and the restructuring of the banking system through mergers and increasing participation of foreign banks after the crisis hint on the acknowledged importance of bank credit. In short, the interrelations between bank credit and other macroeconomic variables in Malaysia is a subject that deserves attention.

In the next section, we provide an overview of related literature. Then, Section 3 details the empirical approach used in the analysis. The measurement of financial uncertainty is also discussed in the same section. Section 4 describes the data and presents estimation results. Finally, Section 5 concludes with a summary of the main findings and some concluding remarks.

2. Related literature

That banks may play an important role in accounting for aggregate fluctuations has motivated numerous studies on bank lending behavior. While majority of studies have focused on the role of bank credits in monetary transmission mechanisms,[1] several studies have directly focused on the interrelations between bank loans and macroeconomic and financial variables. They either relate bank lending to key macroeconomic variables (i.e. real GDP and interest rate), assess its relation to asset prices (i.e. house and stock prices), or examine its links to macroeconomic uncertainty.

Fase (1995) estimates a two-equation structural model of short-term loans and lending rate using quarterly data from 1970 to 1990 for the Netherlands. The evidence obtained is fairly conclusive in indicating the significance of interest rate elasticity of credit demand and, accordingly, hints on credit targeting for monetary policy. Calza et al. (2003) model the demand for loans to the private sector in the euro area specifying real loans to be a function of real GDP and real short-term and long-term interest rates and using quarterly data from 1980:1 to 1999:2. They document a long run positive relation between real loans and real GDP and a negative relation between real loans and both interest rate measures. The dynamics of real loans, which are analyzed using a vector error-correction modeling (VECM) exhibits slow adjustment toward the long run path. These findings are further reiterated in a subsequent study by Calza et al. (2004) for the euro area using real GDP, nominal lending rate and inflation rate as determinants of real bank loans. The results, thus, suggest that credit overhangs/shortfalls can last for an extended period. Calza et al. (2004) further demonstrate that these credit overhangs/shortfalls contain predictive content for the euro area inflation.

Kim and Moreno (1994) and Ibrahim (2006) focus on bank lending-stock price relations for respectively Japan and Malaysia. Kim and Moreno (1994) estimate the first-differenced

[1] Extensive literature examines the role of bank credit in monetary transmission mechanism. Among these studies include Romer and Romer (1990), Bernanke and Blinder (1992), Bernanke and Gertler (1995), Iturriaga (2000), Bacchetta and Ballabriga (2000), Kasyap and Stein (2000), Safaei and Cameron (2003), and Vera (2012). Readers may refer to these studies and references therein for details.

VAR system consisting of bank loans, industrial production, consumer price, interest rate and stock price using monthly data from January 1970 to May 1993. They also estimate the model for two sub-samples: January 1970–December 1983 and January 1984–May 1993. They document evidence for significant positive responses of bank loans to innovations in stock price. In addition, the predictive role of stock price tends to be strengthened in the later years, i.e. the second sub-sample. Ibrahim (2006) documents similar results in his analysis for Malaysia using quarterly data from 1978:1 to 1998:2. Estimating a 6-variable VAR model,[2] he finds significant responses of bank loans to stock price, real GDP and interest rate. By contrast, bank loans do not seem to exert influences on real GDP and stock prices. A larger number of studies have assessed the linkages between bank lending and housing prices for various countries. These include Hofmann (2004) and Goodhart and Hofmann (2007) for many developed countries, Chen (2001) for Taiwan, Collyns and Senhadji (2002) for Hong Kong, South Korea, Singapore and Thailand, Gerlach and Peng (2005) for Hong Kong, Liang and Cao (2007) for China, Oikarinen (2009) for Finland, Gimeno and Martinez-Carrascal (2010) for Spain, and Inoguchi (2011) for Malaysia, Singapore and Thailand, to name a few. Some studies highlight the significant role of bank credit in influencing house price (e.g. Collyns and Senhadji, 2002; Liang and Cao, 2007). Meanwhile, others note the causality to run from housing price to bank credit (Chen, 2001; Hofmann, 2004; Gerlach and Peng, 2005). Still, bidirectional causality between the two variables are also uncovered (Oikarinen, 2009; Gimeno and Martinez-Carrascal, 2010; Goodhart and Hofmann, 2007). Interestingly, Inoguchi (2011) notes insignificant influence of real estate price on bank lending for Malaysia, Singapore and Thailand prior to the Asian crisis.

More recently, some studies have also evaluated the role of macroeconomic uncertainty in bank lending decisions. Baum et al. (2005) employ a portfolio model to demonstrate that macroeconomic uncertainty has important implications on banks' allocation of loanable funds. More specifically, in responses to increasing macroeconomic uncertainty, the dispersion of loans to assets ratio across the US banks diminishes. They interpret the results as reflecting distortions in banks' portfolio allocation and herding behavior (see also, Baum et al., 2009). Quagliariello (2009) extends the analysis by Baum et al. (2005) to Italian banks and reaffirms a significant role of macroeconomic uncertainty in banks' investment decisions. Most recently, Talavera et al. (2012) focus on the relation between macroeconomic uncertainty and bank lending for the case of Ukraine based on a dynamic model of banks' profit maximization. They demonstrate that, in times of heightened macroeconomic uncertainty, banks tend to decrease their loan ratios.

While uncertainty is more a characteristics of emerging markets and its implication can be costly, the empirical analyses on the subject for the emerging markets remain scarce. Several aforementioned studies have focused on the emerging markets of Asia (including Malaysia), but their focuses on bank lending have been restricted to the roles of asset prices (i.e. stock price and house price) without any consideration given to the potential importance of uncertainty. Moreover, the role of these asset prices on bank lending remains uncertain – significant influence of stock prices on bank lending in Ibrahim (2006) and insignificant role of house price on bank credit for Malaysia in Inoguchi (2011). We update these studies by considering both asset prices (represented by stock prices) and uncertainty (represented by stock market uncertainty) in the present analysis.

3. Empirical approach

We adopt a vector autoregression (VAR) framework to examine the interactions between real bank loans, macroeconomic conditions and financial uncertainty. While the framework permits the inclusion of any variables deemed relevant by theories, we consider only variables as guided by the present interest as well as indicated by existing literature on bank lending behavior. These variables include real bank loans, real GDP, nominal lending rate, real stock prices and a measure of stock market volatility. While the inclusion of real GDP and nominal interest is standard, the incorporation of real stock prices is to capture potential reinforcing behavior of bank lending and asset prices and potential asset price misalignments.[3] Potential implication of financial uncertainty is also examined and hence the inclusion of stock market volatility. Given identification uncertainty whether the relations among the variables reflect loan demand or loan supply behavior (Calza et al., 2004) or even a stock or output equation, we focus on their dynamic interactions. The VAR framework is well suited for the purpose at hand since it allows all variables to be potentially endogenous with minimal theoretical restrictions.

Since time series variables normally exhibit non-stationarity and their linear combination can be stationary, we first subject each series to the standard unit root and cointegration tests. In the paper, we apply the widely used augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests to determine the variables' stationarity properties or integration orders. To see whether they share a common path over the long run, i.e. whether they are cointegrated, we adopt a VAR-based cointegration test as suggested by Johansen (1988) and Johansen and Juselius (1990). With the finding of cointegration, we first estimate their long run relation. Then, the dynamic interactions among the variables are evaluated using the vector error-correction model (VECM), written as:

$$\Delta X_t = \alpha + B(L)\Delta X_{t-1} + \lambda u_{t-1} + e_t \quad (1)$$

In (1), X is a vector of included variables, α is a vector of constant terms, $B(L)$ a matrix of polynomials in the lag operator L, and u is the error-correction term. In the above formulation, the

[2] The variables included are bank loans, stock price, real GDP, consumer price, interest rate and exchange rate.

[3] Another asset price that has captured much attention is the house price. However, incorporation of the house price will unnecessarily shorten the sample and, thus, it is not considered here. For Malaysia, the quarterly house price data are available only from 1999 onwards.

error-correction term represents deviations of the variables from their common long run path. As such, λ capture the variables' speed of adjustment to restore the long run equilibrium.

As an example, in assessing dynamic relations of the included variables to bank credit, the bank credit equation from (1) is:

$$\Delta bc_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\Delta bc_{t-i} + \sum_{i=1}^{k} \beta_{2i}\Delta y_{t-i} + \sum_{i=1}^{k} \beta_{3i}\Delta r_{t-i} + \sum_{i=1}^{k} \beta_{4i}\Delta sp_{t-i} + \sum_{i=1}^{k} \beta_{5i}\Delta vol_{t-i} + \lambda_{bc}u_{t-1} + e_t \quad (2)$$

In the VECM setting, changes in bank credit respond not only to lagged changes of the variables in the system but also to the deviation of the variables from their common path. Specification (2) enables us to evaluate the Granger causality from the included variables to bank credit based on the statistical significance of the error-correction term and of the coefficient sum of lagged first-differenced terms for each right-hand-side variable. The former is termed as the "long-run" causality while the latter the "short-run" causality (Masih and Masih, 1996). Assessments of other equations in system (1) can be done in the same manner. From these tests, the patterns of Granger causality between each variable pair can then be determined.

Apart from the Granger causality tests, we also simulate impulse-response functions to further assess the variables' dynamic interactions. To this end, we specify the corresponding level VAR as a basis of the simulation, which is common in monetary studies (Kim and Roubini, 2000; Mehrotra, 2007). Essentially, the impulse-response functions depict the temporal responses of a variable to its own shocks and to shocks in other variables. Note that the Granger causality tests provide only information on the direction of the variables' causal interactions. Accordingly, the generation of impulse-response functions is a necessary complement to the Granger analysis since they indicate the magnitudes as well as signs of a variable's responses to impulses in other variables. Moreover, the impulse-response functions are able to capture both direct influences of a variable (say stock prices) on another variable (say bank credit) as well as indirect influences that are propagated through other variables. Accordingly, the dynamic linkages among the variables can be fully addressed.

A final point relating to our empirical implementation is the measurement of financial uncertainty. We employ stock market returns, defined as the logarithmic difference of the market index, for the construction of financial uncertainty. In the literature, a variant of GARCH model has been widely applied. By using data for the entire period under investigation to estimate the GARCH model and then extract its measure of uncertainty, we allow data in for example 2010 to influence the construction of uncertainty for all years before. This should not be a cause of concern if the estimated coefficients can be treated as known true parameter values or are stable over time. Since this is unlikely to be the case, we believe that it is more appropriate to measure uncertainty for a specific quarter using only information available in that quarter or before. Accordingly, in the present paper, we adopt

Table 1
ADF and PP unit root tests.

Variables	Level		First difference	
	ADF	PP	ADF	PP
LRC	−1.129	−3.289	−3.969*	−8.193*
LRY	−3.459	−2.516	−6.138*	−6.138*
INT	−2.850	−2.521	−5.543*	−4.918*
LRS	−1.684	−2.559	−5.138*	−9.908*
LRV	−2.858	−3.743**	−12.511*	−12.945*

Notes: both constant and trend terms are including in the test equations for the level variables while only the constant term included for the first-differenced variables. The AIC is used to determine the lag order in the ADF test equation.
* Significance at 1%.
** Significance at 5%.

the realized stock market volatility suggested by Merton (1980) and Anderson et al. (2003). It is measured as the sum of daily squared returns in the quarter under consideration:

$$RV_t = \frac{\sum_{d=1}^{D_t} R_d^2}{D_t} \quad (3)$$

where D_t is the number of days in quarter t. According to Anderson et al. (2003), the realized volatility estimates of financial uncertainty are unbiased and highly efficient. Moreover, being a realized measure the measures should be within the banks' information set in making their lending decisions.

4. Data and results

4.1. Data preliminaries

We employ quarterly data spanning the period 1991.Q1–2011.Q2. We use nominal GDP and total bank credit to the private sector, both deflated by GDP deflator, to represent respectively real income (*LRY*) and real bank credit (*LRC*). Due to the obvious seasonal patterns in the GDP data, we further seasonally adjust the real GDP using the X12 procedure. Following Calza et al. (2004), we employ the nominal lending rate as a measure of the interest rate (*INT*). The real stock price is captured by the Kuala Lumpur composite index deflated by GDP deflator (*LRS*). As noted, the realized volatility (*LRV*) is constructed using daily stock market index returns, i.e. $r_t = \ln(I_t/I_{t-1}) \times 100$ where I is the Kuala Lumpur composite index. Except the interest rate, all variables are expressed in natural logarithm. All data are retrieved from *Datastream International* and the estimation is done using EVIEWS.

Table 1 presents the results of the ADF and PP unit root tests. Except the uncertainty measure, these tests are consistent in classifying all variables to be integrated of order 1; that is, they are stationary in first difference. For the realized uncertainty, the ADF tends to suggest that it is non-stationary while the PP test indicates its stationarity property. To proceed, we treat the realized uncertainty measure to be $I(1)$. Table 2 provides the results from the cointegration tests. The lag order of the test equations is set to 2, which we find sufficient to render the error terms in all equations to be serially uncorrelated. Since the eruption of the Asian crisis may have shifted the dynamic patterns of the

Table 2
Cointegration tests.

Null hypothesis	No crisis dummy		With crisis dummy		CV (5%)	
	Trace	Max	Trace	Max	Trace	Max
None	80.538	32.204	79.598	37.275	69.819	33.877
At most 1	48.334	21.706	42.323	21.579	47.856	27.584
At most 2	26.628	14.609	20.744	14.786	29.797	21.132
At most 3	12.019	9.689	5.958	4.094	15.495	14.265
At most 4	2.330	2.330	1.864	1.864	3.841	3.841

Note: The lag VAR order is set to 2, which is sufficient to render the error terms serially uncorrelated.

included variables, we also conduct the tests by including a crisis dummy variable taking the value 1 for 1997.Q3 and afterwards and 0 otherwise. The results from the tests seem to indicate the presence of a unique cointegrating vector linking these variables together in the long run regardless of whether the crisis dummy is included or not. In what follows, the crisis dummy in included in the modeling since its coefficient is found to be significant in some equations.

4.2. Long-run relation

Given the presence of cointegration among the variables, it would be interesting first to see how these variables are tied in the long run. To this end, we normalize the long run relation on real GDP.[4] It is estimated as (the asterisk indicates significance at 1%):

$$\mathrm{LRY}_t = 2.888 + 0.339^{*}\mathrm{LRC}_t + 0.386^{*}\mathrm{LRS}_t - 0.026\mathrm{INT}_t - 0.225^{*}\mathrm{LRV}_t \quad (4)$$

In the long run, real output is positively related to both real credit and real stock price but negatively related to stock market uncertainty. These results should be expected given the well-noted importance of financial intermediaries and markets in resource allocation and the impact of uncertainty on consumption and investment. By contrast, while the long run interest rate coefficient is negative, it turns out to be insignificant. Note that, while the equation provides information on how output is related to bank credit and other variables in the long run, it does not reveal the causal patterns among the variables and, more importantly in our context, on how bank credit is related to, for example, financial uncertainty. Hence, we proceed to examining the variables' interactions using VECM/VAR.

4.3. Dynamic interactions

To further refine the VECM, we perform the variables' exogeneity test. The results are presented in Table 3. From the results, we find bank credit, real stock prices and interest rate to be weakly exogenous. This means that, while they may respond

[4] The estimated long run coefficients are extracted from the Johansen procedure.

Table 3
Exogeneity test.

	LY	LRC	LRS	INT	LRV
Statistics	5.692	0.036	0.267	1.146	6.931
p-Value	(0.017)	(0.850)	(0.605)	(0.284)	(0.008)

Note: The test statistics follows a chi-square distribution with degree of freedom = 1.

to cyclical changes in other variables, they do not bear the burden of adjustments toward the long run. The null hypothesis that real GDP and stock market uncertainty are weakly exogenous, however, is rejected at better than 5% significance level. Accordingly, in what follows, we restrict the error-correction coefficients of bank credit, stock price and interest rate to zero. In addition, the long-run coefficient of interest rate is also set to zero.[5] In other words, we only allow the interest rate to have only short-run interactions with other variables. These restrictions are not rejected given $\chi^2 = 2.584$ and p-value = 0.630.

Table 4 provides the Granger-causality results based on the VECM as well as the estimated long run coefficients after the aforementioned restrictions. As we have noted earlier, both real income and financial uncertainty are not weakly exogenous. In other words, these two variables are the ones that adjust to the deviations from the variables' long run path. The estimated coefficient of the error-correction for the output equation is negative as should be expected for the convergence toward the long run to take place. The low magnitude of the coefficient, i.e. −0.028, suggests that the speed at which real output moves toward the long run is slow. The error correction coefficient of market uncertainty also carries a negative sign. It magnitude, however, is between −2 and −1. This suggests that the market uncertainty moves in oscillating fashion in responses to disequilibrium among the variables. Statistically, the results suggest the long run causality from the included variables to both real output and financial uncertainty.

To see the adjustment and the noted causal relation in a more intuitive way, we write the estimated output and financial uncertainty equations as:

$$\Delta\mathrm{LRY}_t = f(\Delta Z) - 0.028u_{t-1} \quad (5)$$

$$\Delta\mathrm{LRV}_t = f(\Delta Z) - 1.646u_{t-1} \quad (6)$$

$$u_{t-1} = \mathrm{LRY}_{t-1} - (4.323 + 0.304\mathrm{LRC}_{t-1} + 0.474\mathrm{LRS}_{t-1} - 0.302\mathrm{LRV}_{t-1}) \quad (7)$$

where $f(\Delta Z)$ represents the first-differenced terms in respective equations. From (5) and (6), we can see that both output and market uncertainty increase when output is below the long run line as given in (7) or $u_{t-1} < 0$. Thus, given the initial equilibrium (i.e. $u_{t-1} = 0$), adverse shocks in output, expansions in bank credits, run-ups in stock prices, or moderation of stock market

[5] The exclusion of interest rate from the long run relation does not materially affect the long run coefficients of real income, bank loan ratio and financial uncertainty (see Table 4).

Table 4
VECM results.

Dep. variables	χ^2-Statistics for short-run causality					ECT (t-ratio)
	ΔLY	ΔLRC	ΔLRS	ΔINT	ΔLRV	
ΔLY	–	1.819 [0.403]	1.821 [0.402]	11.735 [0.003]	1.146 [0.564]	−0.028 (3.49)*
ΔLRC	8.791 [0.012]	–	2.371 [0.306]	1.589 [0.452]	1.728 [0.421]	–
ΔLRS	1.467 [0.480]	0.243 [0.886]	–	2.713 [0.258]	1.406 [0.495]	–
ΔINT	1.323 [0.516]	3.477 [0.176]	1.252 [0.535]	–	7.471 [0.024]	–
ΔLRV	1.127 [0.570]	1.199 [0.549]	1.463 [0.481]	1.436 [0.488]	–	−1.646 (4.01)*

Long run relation
$LRY_t = 4.323 + 0.304^{*}LRC_t + 0.474^{*}LRS_t - 0.302^{*}LRV_t$

Note: Numbers in squared brackets are *p*-values.
* Significance at 1% level.

volatility lead output to be below its equilibrium level. This will be followed by the upward correction in both output and market uncertainty. Thus, the expansion of bank credits and increase in stock prices will not only lead to increasing output but also heightening market volatility, the latter perhaps captures a part that reflects over-expansion of bank credits or misalignment of asset prices.

The table, however, indicates limited short-run interactions among the variables. From the results, we only note the causality that runs only from interest rate to real output, output to bank credit, and market volatility to interest rate. This limited evidence may be due to the inability of the Granger causality test to capture the indirect effects of a variable on the remaining variables. In essence, the results do suggest the indirect influence of market volatility on both real output and bank credit through the changes in the interest rate. Accordingly, to fully appreciate the full impacts that an innovation in a variable of interest on the remaining variables, we simulate the generalized impulse-response functions using a level VAR specification. We opt for the generalized impulse-response functions developed by Pesaran and Shin (1998) to circumvent the results' sensitivity to the variables' alternative orderings in the traditional Cheslesky decomposition. We set the VAR lag order to 3 on the basis of serially uncorrelated errors. Fig. 1 presents the plots of the impulse-response functions.

While our main interest is on the dynamic interactions among bank credits, financial uncertainty and selected economic variables (real GDP, interest rate and stock prices), it is pleased to note that the interactions among the three economic variables generally conform to expectations. Namely, we observe a reduction in real output and real stock price following positive shocks in the interest rate. While the significant reduction in stock price lasts for roughly 5 quarters, the drop in real output seems significant for the entire plotted horizons, i.e. over 5 years or 12 quarters. This may reflect the amplifying effect of asset prices in transmitting interest rate shocks to the real sector. In addition, we also observe significant responses of real output to stock market price innovations, in line with the notion that the stock market summarizes expectations of future economic conditions. The interest rate also tends to increase following shocks in real output and real stock price, though the increase is not significant.

As regards to our main inquiry, the results tend to suggest significant interactions among the variables highlighting the significant roles played by all variables in influencing bank credit as well as significant bearings of market uncertainty on other variables. We find bank credit to react positively to real output but with no feedback effect, in line with the earlier study by Ibrahim (2006). The bank credit also tends to respond positively to real stock price. As we have expected, bank credit reacts negatively to the interest rate. However, the significant effect of interest rate shocks comes with lags. This result conforms well to monetary transmission mechanism literature that bank credits tend to react to interest rate shocks with lags, normally explained in terms of the availability of capitals to buffer against tightening monetary conditions. We also find evidence that the market volatility tends to depress real bank credits. Apart from its adverse effect on bank credit, heightened market uncertainty also tends to depress real output, interest rate and stock prices. In an environment of heightened market uncertainty, firms and households may postpone their investment and consumption of durable goods as posited by the value of option theory or irreversible investment. Moreover, the market uncertainty may have depressed the stock price by increasing investment risk. Finally, we also observe the marginal significance of interest rate shock in increasing market uncertainty.

With the noted results, what are the implications that we can draw? The long run results that we obtain hint on the importance of both banking activities and stock market performance for real output. However, given the slow adjustment of real output toward the long run equilibrium, credit expansion and stock market run-up can be misaligned from the values justified by fundamentals for an extended period of time. The presence of the credit overhangs or building-up of stock prices can fuel market uncertainty. From the observed impulse-response functions,

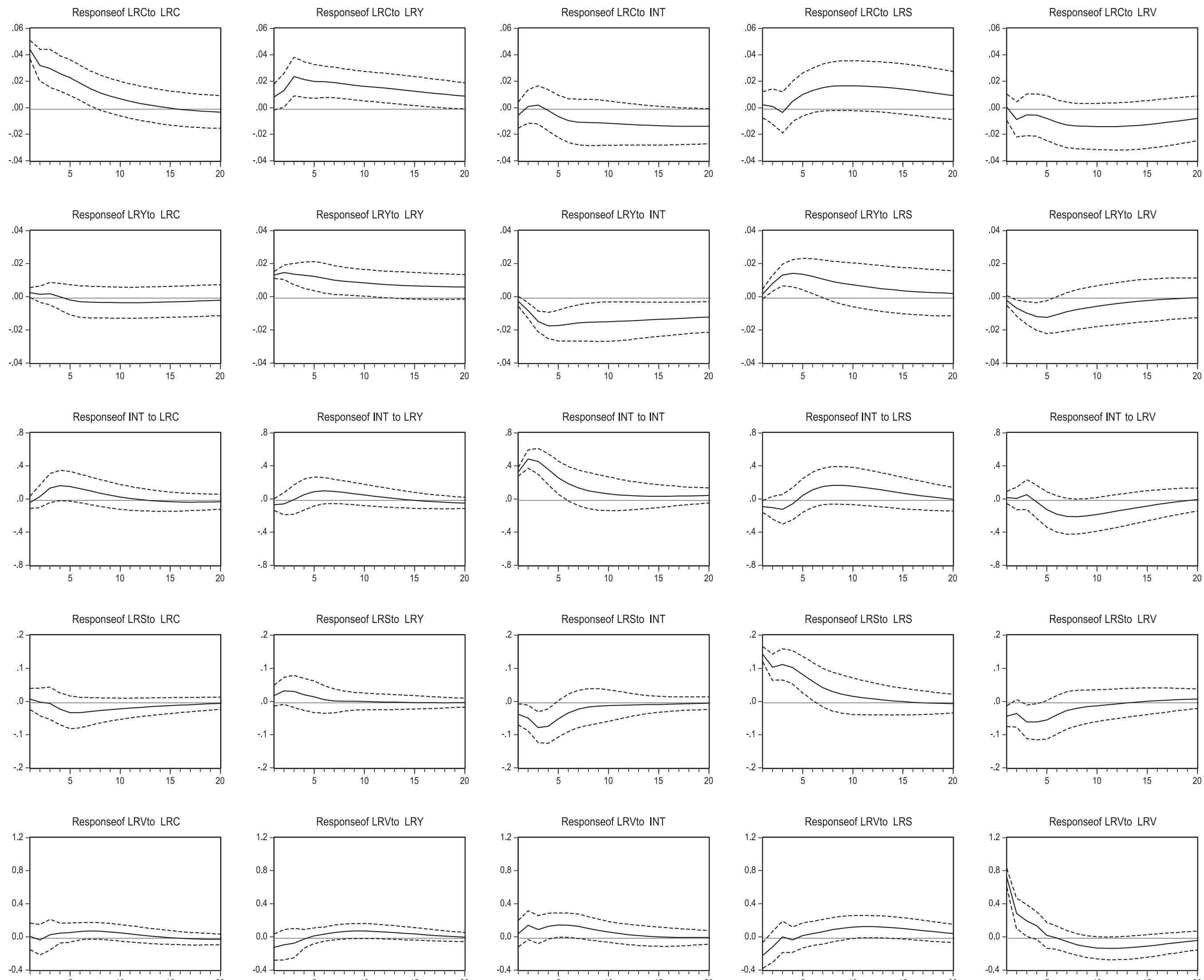

Fig. 1. The generalized impulse-response functions.

the heightened market uncertainty can be detrimental to real and financial stability of the economy since it depresses real output, real stock prices and bank lending activities. Finally, the country's monetary environment may also be crucial in influencing real output. While we note the lagged responses of real bank credits, the responses of real stock prices can be immediate, which later is fed through the banking sector. In short, bank credits and stock prices may play a critical role in lengthening the significant reactions of real output to interest rate shock.

5. Conclusion

This paper utilizes time series techniques of cointegration, causality and VAR modeling to evaluate the interrelations between bank lending, macroeconomic conditions (i.e. real output, interest rate and stock prices) and financial market uncertainty. The findings from the cointegration test suggest that there is a common path that ties these variables together in the long run. From the estimated long run equation, we note long run relations between real output and both real bank credit and stock prices. Meanwhile, financial uncertainty is negatively related to real output. Moreover, real output and financial uncertainty are responding to deviations of the included variables from the long run. From the adjustment process, we note that credit expansion or stock market build-up solicits positive adjustment from both real output and financial uncertainty. Thus, given the weak exogeneity of bank credits and stock prices and slow adjustment of real output, both bank credits and stock prices can be persistently higher than their fundamental values as defined by the equilibrium line. The presence of credit overhangs and stock market run-ups, in turns, may bring up heightened market volatility. This can act as a countering force in depressing real output as reflected by the negative real output – financial uncertainty long run relations and their dynamic interactions.

From the short-run dynamic analysis, we find significant reactions of bank credits to other variables. Meanwhile, reaffirming the long run result, shocks in market uncertainty exert negative and significant responses from real output as well as real bank credits and stock prices. Thus, financial uncertainty has the ability to distort bank lending decisions as well as to depress the stock market in the short run. Moreover, we also note that interest rate shocks can immediately affect stock prices and, through their interactions with bank credits, tend to have prolonged implications on real economic activity. Taken together, these results hint on the importance of financial markets and financial uncertainty in Malaysia's macroeconomic performance and stability. Credit overhangs, rapid stock market price escalation and excessive market volatility should serve as useful pieces of information for gauging future macroeconomic conditions of the country.

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