

AN EXAMINATION OF THE CAUSAL RELATIONSHIP BETWEEN BANK LENDING AND ECONOMIC GROWTH: EVIDENCE FROM ASEAN

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1. Introduction

Many factors have contributed to economic growth. For ASEAN economies, the crucial factors often singled out are the successful promotion and expansion of the export sector (see, Bahmani-Oskooee and Alse, 1993). On the other hand, in the emerging Asian economies, financial intermediation was seen as one cause of its rapidly economic growth, and these economies have favored banks over security markets for financial intermediation and little or no public debt exists to be traded (Bosworth, 1998). An empirical study by Tang (2002) has documented that the existing financial liberalization policies are able to lead the ASEAN towards becoming international or regional financial centers in other time zones due to the existence of a long-run equilibrium relationship in the progress of financial liberalization among the five ASEAN founding economies. Traditional theories insist on the passive role of the financial system, which merely adapts itself to the financial needs of the economy's real sector and fits in with the autonomous development of that sector. In contrast, contemporary theories put forward the idea that financial development has a causal influence on growth (Berthélemy and Varoudakis, 1996a, p. 17). Garson (1998) has viewed that financial intermediaries are the main engines of economic growth because they cause the money to circulate in the economy by actively seeking deposits and lending mobilized funds to those who need credit. Despite, credit is not to be regarded as input, but engine of growth. An advantage of banking intermediaries over the stock markets or bond markets is that they can be more efficient in terms of information gathering and cost monitoring (Berthélemy and Varoudakis, 1996a, p.27).

The motivation to study ASEAN five founding economies is that they have experienced a remarkable growth in recent years. From the period 1990 to 1996, Malaysia has achieved an averaged annual real GDP (Gross Domestic Product) growth of 9.5 per cent, following 8.8 percent in Singapore; 8.6 per cent in Thailand; and 7.2 per cent in Indonesia. At the meantime, the annual growth of bank lending from money deposit bank has being increased rapidly, and is found to be higher than real GDP growth that are averaged 18.7 per cent in Malaysia; 17.1 per cent in Singapore, 27.7 per cent in Indonesia; 22.2 per cent for Thailand; and 29.6 per cent for the Philippines (these figures are calculated on the data obtained from International Financial Statistics, International Monetary Fund). Summary statistics for the logarithms of real GDP and real bank lending in levels of five ASEAN founding economies are provided in Table 1. Consequently, a rapid domestic credit growth was one of the signals of Asia finan-

cial crisis - lending booms (Bacha, 1997; Kaminsky, Lizondo and Reinhart, 1998; Sharma, 1999). This has been mentioned by Goldstein (1998) that 'More than anything else, it was financial-sector weaknesses that got the Asian countries into deep trouble. During the 1990s, each of the ASEAN 4 economies (Thailand, Indonesia, Malaysia, and the Philippines) experienced a credit boom, that is, the growth of bank and non-bank credit to the private sector exceeded by a wide margin the already rapid growth of the real economy. The credit boom was stoked in part by large net private capital inflows, and much of it was directed to real estate and equities' (Goldstein, 1998, on-line). However, these relationships are unclear. Berthélemy and Varoudakis (1996a, p.26) have noted that 'To know whether the comparative development of financial markets (equity and bond markets) and banks can influence economic growth has long been a hotly debated question - to date unresolved - in economic theory'.

Table 1: Data Table of Real Bank Lending and Real GDP (In log levels)

Country:	Malaysia		The Philippines		Singapore		Indonesia		Thailand	
Variable:	LnY	LnB	LnY	LnB	LnY	LnB	LnY	LnB	LnY	LnB
Mean	11.17	10.24	6.87	5.46	10.56	10.30	12.03	10.28	6.97	5.87
Maximum	12.58	12.71	7.81	7.34	11.84	12.08	13.29	12.78	8.40	8.62
Minimum	9.67	6.99	5.59	3.16	8.94	7.99	10.31	6.33	5.53	2.75
Std. Dev.	0.88	1.74	0.64	1.18	0.92	1.23	0.90	1.86	0.95	1.80
Sample period:	1957-2001		1949-2001		1963-2001		1965-2001		1953-2001	

NOTES

The data are obtained from *International Financial Statistics*, International Monetary Fund [CD-ROM version]. Y is the real Gross Domestic Product and B is the real bank lending. The nominal series have been deflated by consumer price index, CPI. All of these series are measured in log levels. Ln is the natural logarithms.

Source: Author's calculation.

Using time-series techniques (Granger, 1969; 1988), the present study econometrically investigates the causality relationships between bank lending growth and economic growth in the five ASEAN founding economies which have experienced a rapidly liberalization in financial sector, that is Malaysia, Indonesia, Singapore, Thailand, and the Philippines. Testable finance-growth hypothesis that can be raised here are 'Demand-following' hypothesis, that is bank lending that proxies financial development simply appears as a consequence of the development of the real sector. Finance, as it has relatively very little effect on growth that is the real sectors of the economy growth, the demand for various financial services rises and will thus be met by the financial sector. This means, as the economy becomes more developed or advanced, it increased demand for financial deepening (Darrat, et al., 1989, p.25). Second is 'Supply-leading' hypothesis where bank credit expansion precedes demand

for financing and it can have an autonomous positive incidence on growth. Darrat, et al., (1989, p.25) stated that the creation and expansion of effective market-oriented financial intermediaries was a vital pre-condition for genuine and sustained economic development in any country. An active intermediation influences macroeconomic outcomes most emphatically when countries are in earlier stages of economic development (Rousseau and Wachtel, 1998, p. 657-658). Therefore, an understanding of the causal relations between intermediation variable - bank lending and economic growth are expected to add a light for policymakers.

2. Literature Review

2.1 Review of Empirical Literature

The idea of financial intermediation – credit channel, as one of the major determinants of output growth is a recurrent idea in economics at macro-level. Among the financial intermediation variables used in existing empirical studies are demand deposits, bank loans, money balance-GDP ratio, saving-GDP ratio, investment-GDP ratio and etc., which in all ramifications constitute a means for promoting economic growth in developing countries. Odedokun (1996b), however, has argued that the best manipulate financial ratios variables to this end require knowledge of how and if the variables affect growth. In a very broad term, these variables can be described to influence growth either by changing the quantum of investible resource or by affecting the efficiency of utilization of a given quantum of resources or both. Moreover, most economists believe that monetary fluctuations lead to output fluctuations (King, 1986, p. 301). Numerous empirically based studies are recently available in examining the relationship between financial development and economic growth. Some of them are discussed below.

Lang and Nakamura (1995) have viewed that a recurring issue in monetary economics concerns the extent to which central bank influence on economic activity is due to credit channel in addition to a direct monetary channel. Their study has shown that the proportion of relatively high quality new loans does Granger-cause GDP. However, Samolyk (1994, p.263 and 265) has argued that credit variables help to predict economic activity, but do not imply that also cause economic activity, meanly a macroeconomic credit channel is complicated by the fact that it is hard to interpret whether financial flows lead to output or mirror underlying investment opportunities.

To the extent that credit flows reflect expectations about investment opportunities, local lending can help to predict expectation without effecting output. Using panel and cross-sectional approaches, Levine, Loayza and Beck (2000) examined the nature of effect of financial intermediary development on economic growth, covering 74 countries, including Indonesia, Malaysia, the Philippines and Thailand for the period 1960 to 1995. Three indicators for financial development used in their study are liquid liabilities, commercial-central bank assets, and private credit. The study has shown that exogenous components of financial intermediary development are positively associated with economic growth. A study by Odedokun (1999) has included the variables of the size of monetary sector, namely M1, M2 and private sector credit stock into Feder's sectoral production functions which cover 22 industrial and 100 developing countries for the period 1961 to 1990. The model regresses growth of total Real GDP on marginal productivity of capital in the real sector; labor force growth; growth of monetary sector output (M1, M2 and credit to private sector); and real sector's output with respect to the monetary sector output. Using credit variable, the regression estimates for both developed and developing countries (combined) showed that growth of real stock of lending was significant (t-ratio is 5.9) and its estimated coefficient is 0.062. However, for Asian developing countries, the estimated coefficient of growth of real private sector credit stock is 0.001 (t-ratio is 0.1). The study has concluded that the financial intermediation promotes economic growth in most countries (see Odedokun, 1996a and 1996b).

Applying Granger-causality method (Granger, 1969), Darrat, et al., (1989) have examined the "supply-leading" hypothesis and "demand-following" hypothesis for four angles of the Pacific Basin region, namely Hong Kong, Singapore, Taiwan, and South Korea. The annual data have been used for estimates: 1952 to 1984 for Taiwan, 1953 to 1984 for South Korea, and 1960 to 1983 for Hong Kong, and Singapore, respectively. The interested variables are financial deepening variable (ratio of M2 to GDP), real economic output, and exports, and are measured in annual percentage change. The empirical results have supported both "supply-leading" hypothesis and "demand-following" hypothesis in Singapore and Taiwan. A unidirectional causality relationship has been evidenced by using Hong Kong's data, that is financial deepening does Granger-cause economic growth. South Korean data failed to support "supply-leading" hypothesis and "demand-following" hypothesis. However, they have pointed out the use of finite sample size and the well-known caveats associated with Granger-causality tests, and so the results in their study should be interpreted with caution. On

the other hand, a concern from Darrat, et al.'s (1989) study is that the use of first differenced variables fails to consider the long run channel for causality analysis (see Granger, 1988), which is based on an error-correction model (ECM), if the nonstationary variables are cointegrated. Further, using quarterly data from 1975 to 1994, Yong and Quek (1995) have found that Singapore's economic growth 'Granger causes' financial development (proxied by first differences of M2 to GDP), indicating a support of demand-following hypothesis. Hence empirical evidence has showed that real domestic growth plays a significant role in Singapore's financial development. However, no reversed causality, that is "supply-leading" hypothesis, has been documented in their study.

Based on OLS (Ordinary Least Squares) estimates, Jao (1976) has found that money balance-GDP ratio and growth of per capita real money balances (proxy for financial intermediation variables) have strong positive relationship with economic growth based on cross-section data averaged in the period 1967 to 1972 in 44 developing and 23 industrial countries. King (1986) has presented evidence that monetary aggregates aid prediction of the future behavior of Gross National Product. The variables of past growth of demand deposits, commercial and industrial loans, other banks loans, and total bank loans have been found to 'Granger' cause the future growth of GNP (Gross National Product), except commercial and industrial loans. In addition, King and Levine (1993) have documented that financial services are importantly linked to economic growth and productivity improvements. Four financial development indicators used in analysis are ratio of liquid liabilities to GDP, deposit bank domestic credit divided by deposit bank domestic credit plus central bank domestic credit, ratio of claims on non-financial private sector to domestic credit and gross claims on the private sector to GDP. The results of regression estimates have indicated that financial indicators are robustly positively correlated with economic growth (King and Levine, 1993, p.514).

Using annual data from 1951 to 1977 and simple regression model (OLS), Wai (1980) has found that financial variables (real stock of domestic credit and flow of the credit form of the financial sector), provides a better explanation of growth (real GDP) than real investment variable in 11 of the 13 developing countries. Fritz (1984) examined the direction of causality between economic development and financial intermediation for the Philippines using standard Granger's (1969) causality test. The results have shown that study reported that financial intermediation caused economic deve-

lopment at an early stage of economic development while the direction of causation is reversed at the later stage. A study by Gupta (1986) has found that the financial intermediation variables (growth of money balance) have positive association with Indian economic growth using OLS regression estimates. However, these results might be interpreted with caution considering the possible spurious regression, if the regressed series are nonstationary and are not cointegrated (Engle and Granger, 1987). Using Granger causality technique, Tang (2001) has found that the direction of causality is run from bank credit to economic growth in India considering the result of no cointegration among the nonstationary series. Recently, Tang (2003) has revisited his work (Tang, 2001), and has only found cointegration between bank lending and real GDP after including export variable. Additionally, using various financial ratios from Malaysian commercial banks, Tang and Faoziah (2001) found cointegration between the financial ratios of commercial banks and real GDP, and the financial ratios did 'Granger-cause' economic growth in Malaysia. The ratios are capital adequacy, deposit composition, liquidity and volume of loan.

Rousseau and Wachtel (1998) have examined the links between the intensity of financial intermediation (deposit banks) and economic performance of five industrialized countries using annual data that are U.S. (1870-1929), U.K. (1880-1929), Norway (1875-1929), and Sweden (1875-1929). The financial variables used in analysis are assets of commercial banks, the combined assets of commercial banks and savings institutions, and a composite that included the assets of commercial banks, savings institutions, insurance companies, credit cooperative, and pension funds. In addition, the difference between the stock of money and the base has also been used as a measure to the extent to which banks create credit. The study has documented the following. Firstly, a long run relation (cointegration) has been confirmed among measures of financial intensity and real per capita levels of output and the monetary base. Secondly, the results of Granger causality test has suggested a leading role for the intermediation variables in real sector activity but feed back effects were largely insignificant. Thus, intermediation plays an important role in the rapid industrial transformations of these countries.

Ram (1999) has found no support for the view that financial development (the ratio of liquid liabilities to GDP) promotes economic growth based on 95 individual countries covering annual data from 1960 to 1989. However, this conclusion is from the estimates of correlation, multiple regression (OLS), and cross-country data techni-

ques. Negative correlations have been evidenced between the examined variables over 56 of 95 countries including Indonesia, Malaysia, the Philippines, and Singapore. Positive correlation has been found in Thailand, that is 0.12, but the estimated coefficient of financial variable with respect to GDP growth is -0.024 (insignificant) based on multiple regression estimates. Since correlation test give no indication about the direction of relationship (Granger, 1988, p.204), Ram's (1999) study fails to provide a robust finding. On the other hand, Xu (2000) has found strong evidence that financial development (liquid liabilities of the financial intermediary sector to GDP) is important to economic growth in 41 countries using annual data approximately, from 1960 to 1993 and VAR (Vector Autoregressive) technique. The investment variable is an important channel through which financial development affects growth. Xu (2000), however, used first differenced time series to avoid the possible problems of using nonstationary time series data.

Recently, Morris and Shan (2002) have used causality-testing procedure (Toda and Yamamoto, 1995) to investigate the relationship between financial development and economic growth using quarterly data from 19 OECD countries and China. Total credit and interest spread have been employed as indicator of financial development. Their study has showed meager evidence that financial development 'leads' economic growth, either directly or indirectly. This casts further doubt on claims that financial development is a necessary and perhaps sufficient precursor to economic growth. Toda and Yamamoto (1995, p.246), however, have warned that 'Of course, our approach is inefficient and suffers some loss of power since we intentionally over-fit VARs'. Other empirical works can be found in De Gregorio and Guidotti (1995), and Luintel and Khan (1999).

Most of the existing empirical studies discussed above have focused on the role of financial intermediation or financial development to economic growth, or the causal relations between finance-growth. Thus, the present study purports to add empirically to the existing pool of empirical literature on causality between finance and growth both in terms of similarities with and differences to the prior literature with application to five ASEAN founding nations. The participated ASEAN economies are Malaysia, Singapore, Indonesia, the Philippines, and Thailand. Following the previous empirical works, time series approach of causality has been widely used to investigate the relationship between financial development (or financial intermediation) and growth nexus, considering the correlation method gives no indication about the direction of relationship (Granger, 1988, p.204). In addition, Granger (1988, p.200) has noted that

the cause occurs before the effect. Numerous existing studies have used data in growth rate, instead of in level, meaning it did not deal with the issue of stationarity of the variables. According to Granger (1988), if a cointegrating relation does exist among a set of nonstationary variables (time series), the relevant error correction term that derived from cointegrating regression(s) must be included into standard causality equation in order to avoid the problem of misspecification. The present study has considered this issue.

In the present study, bank lending from deposit banks is used as proxy variable for financial development (Wai, 1980; Odedokun, 1999; Levine, et al., 2000; Morris and Shan, 2002). Considering the emerging Asian economies, financial intermediation is seen as one cause of their rapid growth, and these economies have favored on banks over security markets for financial intermediation and little or no public debt exists to be traded (Bosworth, 1998). In most developing countries where bank lending is important for firms' investment and working capital, credit channel is highly effective for the conduct of monetary policy, that is monetary authorities could affect the economy through directly affecting the availability of credit through credit targeting or rationing (Public Bank, 1999, p.3). Furthermore, De Gregorio and Guidotti (1995, p.434) have suggested the use of ratio of bank credit to the private sector to GDP as indicator for financial development because of its clear advantage over measures of real interest rates or monetary aggregates such as M1, M2 or M3, in that it more accurately represented the actual volume of funds channeled to the private sector. This variable is more directly linked to investment and economic growth.

2.2 An Overview of Analytical Method

Following De Gregorio and Guidotti (1995, p.434-435), a simplified aggregate production function can be used to describe the relationship between financial development and economic growth that is, $y_t = f(k_t)$, where y is output and k is stock of capital at period t . Mathieson (1980) and Kapur (1986) assumed that k , total utilized fixed and working capital, was fully financed by bank loans. Further, by totally differencing $y_t = f(k_t)$, the following equation is obtained,

$$\hat{y}_t = \frac{dk_t}{y_t} f'(k_t) = s_t \phi_t$$

where \hat{y} is rate of growth of output; s is the savings rate, dk/y ; ϕ is the marginal productivity of capital. It shows that the rate of output growth is the product of the savings rate and the marginal productivity of capital. The traditional literature on growth emphasizes the dynamic process that would lead the economy to a steady-state equilibrium in which (per capita) output growth would eventually cease. However, the new literature on endogenous growth considers a mechanism in which the marginal productivity of capital does not converge to zero as capital grows – real output to grow endogenously, even in the absence of exogenous productivity growth (De Gregorio and Guidotti, 1995, p. 434-435).

In addition, financial development has dual effect on economic growth. Firstly, the development of domestic financial markets may enhance the efficiency of capital accumulation (hence increase ϕ_t). Secondly, financial intermediation can contribute to raising the savings and, thus, the investment rate (hence, increasing s_t) (De Gregorio and Guidotti, 1995, p. 435). Hermes (1994) has documented that financial liberalization theory and the new growth theories basically assume that financial development does lead economic growth. Berthélemy and Varoudakis (1996a, p.7) stated that the recent studies had used the endogenous growth theory to show the existence of a close association between the level of financial sector development and long run growth. Luintel and Khan (1999, p. 383) documented that numerous endogenous growth models showed a two-way relationship between financial development and economic growth. Greenwood and Jovanovic's (1990) study has presented a positive two-way causality relationship between financial development and economic growth. The process of growth stimulates higher participation in financial markets thereby facilitating the creation and expansion of financial institutions – creating incentives for further financial development. On the one hand, financial institutions, by collecting and analyzing information from many potential investors, allow investment projects to be undertaken more efficiently and hence stimulate investment and growth (De Gregorio and Guidotti, 1995, p. 435). Some detailed theoretical approach of finance-growth relationship is available in Hermes (1994), and Levine (1997).

To clarify the causality relationship between growth of bank lending and economic growth, the present study deals with the issue of stationarity of the variables by employing the time series approach, Granger causality test (Granger, 1969; 1988). The testable causal relations are first, bank lending causes economic growth under "supply-leading" hypothesis; and second, the "demand-following" hypothesis that

reveals that economic growth causes bank lending. By employing the conventionally used causality test, Granger-causality approach (Granger, 1969; 1988; Engle and Granger, 1987), equations (1) and (2) are used for cointegration analysis, and equations (3) and (4) are constructed to test the causal relations between bank lending and economic growth, if a long run equilibrium relationship does exist among the examined variables in equation (1) and (2). The details of the Granger causality technique are described in the following section.

3. Data, Model Specification and Method

3.1 Data

The present study considers five ASEAN founding countries using annual data, that is Malaysia (1957-2001), Singapore (1963-2001), Indonesia (1965-2001), Thailand (1953-2001), and the Philippine (1949-2001). The use of annual data for cointegration analysis is consistent with Charemza and Deadman's (1992, p.153) recommendation that 'Annual data could be used to estimate these long run parameters thereby avoiding the need to model the seasonality, and the standard tests for cointegration applied'. The examined variables are volume of credit stock from money deposit banks (B_t) and real GDP (Y_t). The nominal series are deflated by domestic price, Consumer Price Index (1995=100). The data are obtained from *International Financial Statistics*, International Monetary Fund (CD-ROM version). Data in level form are used in this study since Odedokun (1996b, p. 130) has stated that policies should not simply aim at increasing the ratio of the stock of the monetary or credit items to GDP. Furthermore, the use of bank credit to GDP ratio variable may not give an accurate picture of bank credit behavior - an increase of bank lending to GDP ratio may be due to the decrease of GDP, but not the increase of bank credit.

Table 2 reports the summary statistics of bank lending and real GDP variables for the participated ASEAN economies. Two major characteristics can be observed here. First, skewness statistic is close to zero (less than 0.5 in absolute term) which indicates a symmetric distribution of the time series. Second, the coefficient of variation statistic suggests that significant variations exist within five ASEAN nations. Thailand has recorded the highest variation of bank lending and real GDP among participated sample countries.

Table 2: Summary Statistics for Real GDP and Bank Lending for Five ASEAN Countries

Country: Sample Period:	Malaysia 1957-2001		The Philippines 1949-2001		Singapore 1963-2001		Indonesia 1965-2001		Thailand 1953-2001	
	LnY	LnB	LnY	LnB	LnY	LnB	LnY	LnB	LnY	LnB
Mean	11.17	10.24	6.87	5.46	10.56	10.30	12.03	10.28	6.97	5.87
Median	11.34	10.42	7.03	5.71	10.63	10.55	12.19	10.22	7.02	6.01
Maximum	12.58	12.71	7.81	7.34	11.84	12.08	13.29	12.78	8.40	8.62
Minimum	9.67	6.99	5.59	3.16	8.94	7.99	10.31	6.33	5.53	2.75
Skewness	-0.009	-0.29	-0.47	-0.41	-0.19	-0.37	-0.29	-0.34	-0.01	-0.12
Std. Dev.	0.88	1.74	0.64	1.18	0.92	1.23	0.90	1.86	0.95	1.80
C.V.	7.92	16.96	9.30	21.65	8.67	11.97	7.48	18.13	13.57	30.59

NOTES:

The data are obtained from *International Financial Statistics*, International Monetary Fund [CD-ROM version]. Y is the real Gross Domestic Product and B is the real bank lending. Ln is the natural logarithms operation. All of the series are measured in log levels level. C.V. is the coefficient of variation that is the ratio of the standard deviation to the mean.

Source: Author's calculation.

Further, the plots of these series in log levels, and in first differences are reported in Appendix 1a and 1b. From Appendix 1a, a significant structural break has been observed for the Philippines in the early period of the 1980's due to the country financial sector reforms underwent since 1980 (See Demirgüç-Kunt and Levine, 1996 p.247-286). For Indonesia, changes of regime can be observed in the period 1965 to 1980 which can be related to a series of economic and financial reforms during these periods (see Ariff and Khalid, 2000, p.155-156, Table 6.2). As expected, sharp dip and sharply fluctuation in the end of sample period are observed for all five ASEAN founding nations during the East Asian financial crisis 1997-1998 (see Appendix 1a and Appendix 1b). It is apparent that no other serious breaks are presented. The series plots presented in Appendix 1b show bank lending and real GDP variables in five ASEAN nations, except Indonesia, are visually correlated among each other.

The directions of causality between bank lending growth and economic growth have been investigated using the Granger causality techniques (Granger, 1969; 1988). It is essential to identify the order of integration, $I(d)$ of each examined time series using unit root and stationarity tests. If the series are nonstationary, or $I(1)$ process, cointegration test is necessary to determine whether the variables are cointegrated or not (Engle and Granger, 1987). If a cointegrating relation is detected from a set of nonstationary time series, the relevant error correction term, EC_{t-1} that is obtained from a cointegrating equation(s) must be included into the standard causality equation to avoid the problem of misspecification (Granger, 1988). All computa-

tions in the present study have been produced by Eviews (2002a) statistical software.

3.2 Unit Root Test (Phillips and Perron, 1988)

The Phillips-Perron unit root test (Phillips and Perron, 1988) (PP, henceforth) is used to identify the series stationarity, or order of integration of each variable, $I(d)$. The PP unit root test is adopted as to be robust for the presence of autocorrelation and heteroscedasticity. The following unit root equation is estimated to test the null of a unit root,

$$\Delta \ln Y_t = a + bT + c \ln Y_{t-1} + \sum_{i=1}^k d_i \Delta \ln Y_{t-i} + e_t$$

where T is the time variable, \ln is natural logarithms. Table 2 demonstrates the results of PP unit root test. The computed test statistic of all series does not reject the null of a unit root in level at 5 per cent significance level. But the test statistic does reject the null hypothesis in first differences form. The results reveal that all of the examined series are nonstationary or first-differenced stationary, or $I(1)$ process.

Table 3: Results of Phillips-Perron (1988) Unit Root Test (PP)

Series:	Test Statistics:		Critical values:		
	LnB	LnY	1%	5%	10%
Malaysia					
Level	-0.195775	-3.035869	-4.1781	-3.5136	-3.1868
First differences	-4.955558*	-6.620032*	-3.5889	-2.9303	-2.6030
Indonesia					
Level	-1.748014	-1.51163	-4.2324	-3.5386	-3.2009
First differences	-6.166966*	-4.793354*	-3.6289	-2.9472	-2.6118
Singapore					
Level	-0.695159	-0.871378	-4.2165	-3.5312	-3.1968
First differences	-4.184064*	-3.895003*	-3.6171	-2.9422	-2.6092
Thailand					
Level	0.237599	-2.032365	-4.1584	-3.5045	-3.1816
First differences	-3.306261**	-3.965213*	-3.5745	-2.9241	-2.5997
The Philippines					
Level	-1.850646	-1.651017	-4.1420	-3.4969	-3.1772
First differences	-4.826062*	-6.053222*	-3.5625	-2.9190	-2.5970

NOTES:

The reported critical values (MacKinnon, 1991) are computed by Eviews 4.1 (2002a) software

* **, and *** denote rejecting null of a unit root at 1%, 5% and 10% based on MacKinnon (1991) critical values. The lag truncation of three is used for the estimates based on Newey-West suggestion

Source: Author's estimation

3.3 Stationarity Test (Kwiatkowski, et al, 1992)

Considering the low power of conventionally used unit root tests (Dickey-Fuller, augmented Dickey-Fuller, or PP), Kwiatkowski, et al., (1992) have proposed an alternative test that is called KPSS test, where stationarity is the null hypothesis and the existence of a unit root is the alternative. To test the null of trend-stationarity, the test statistic is computed from an auxiliary regression of Y_t upon an intercept and a time trend. If we wish to test the null of stationarity, the trend term should be omitted from the auxiliary regression. The results of KPSS test are reported in Table 4.

Table 4: Results of Kwiatkowski, et al. (1992) Stationarity Test (KPSS)

Null hypothesis:	Level Series:		First Differences Series:	
	Trend-Stationarity	Level-Stationarity	Trend-Stationarity	Level-Stationarity
Malaysia				
LnB	0.247344(4)*	0.812602(5)*	0.091902(7)	0.595164(1)**
LnY	0.050829(4)	0.812509(5)*	0.061076(6)	0.075378 (6)
Indonesia				
LnB	0.088782(4)	0.71606(5)**	0.059033(2)	0.170146(1)
LnY	0.208875(4)**	0.725895(5)**	0.204633(11)	0.454485(1)***
Singapore				
LnB	0.190485(4)**	0.745639(5)*	0.052429(2)	0.395115(2)***
LnY	0.132287(4)***	0.750625(5)*	0.082453(2)	0.242219(3)
Thailand				
LnB	0.126362(4)***	0.908428(5)*	0.116456(3)	0.343063(3)
LnY	0.05673(4)	0.905964(5)*	0.110691(2)	0.120935(2)
The Philippines				
LnB	0.167067(5)**	0.927530(5)*	0.097574(0)	0.145683(1)
LnY	0.243838(5)*	0.97171(5)*	0.119095(15)	0.501453(3)**
Critical values for the null of	Trend-stationarity:		Level-stationarity:	
*1%	0.216		0.739	
**5%	0.146		0.463	
***10%	0.119		0.347	

NOTES:

() is Bandwidth based on Newey-West using Bartlett kernel. The reported critical values are from (Kwiatkowski, et al., 1992, p. 166, Table 1). The test statistics are computed by Eviews 4.1 (2002a) software.

Source: Author's estimation.

The computed KPSS statistics do reject the null of level stationarity at 5 per cent significance level using level series, implying the alternative of a unit root is supported. Using first differenced series, the test statistics do not reject the null of trend-stationarity (or level-stationarity) at 1 per cent significance level. Overall, the results of unit root and stationarity tests both reflect that all of the participated series are nonstationary

or $I(1)$ process. In addition, from the time series plots as illustrated in Appendix 1a, we can visually observe that the examined series are nonstationary in levels.

3.4 Cointegration Analysis (Engle and Granger, 1987)

Once we confirm that the examined variables are nonstationary ($I(1)$), the next step is to find a unique long run relationship between the interested variables. Engle and Granger (1987) have documented that Ordinary Least Squares (OLS) estimate can be spurious from regressing nonstationary time series that are not cointegrated. As suggested by Granger and Newbold (1974), if the computed R squared is rather than the DW-d statistic, the estimated regression of using nonstationary series might be suffered from spurious relationship. The OLS estimator is valid if the examined nonstationary variables are cointegrated. From the overview of analytical method (sub-section 2.3), we form two cointegrating equations for testing the presence of a cointegrating relation among the volume of bank lending and real GDP, that are

$$\ln Y_t = a_0 + a_1 \ln B_t + e_t \quad (1)$$

$$\ln B_t = b_0 + b_1 \ln Y_t + u_t \quad (2)$$

where $\ln Y_t$ is natural logarithm of real GDP, $\ln B_t$ is natural logarithm of volume of bank lending, and e_t and u_t are the residuals.

According to Engle and Granger (1987), the estimated residual series from a cointegrating equation (e_t or u_t) should be stationary in level or $I(0)$ process, if a cointegrating relation does exist between the two variables ($\ln Y_t$ and $\ln B_t$). The conventionally used residual-based cointegration tests like Dickey-Fuller, augmented Dickey-Fuller and PP tests can be adopted to determine the possible cointegrating relation(s) among the examined variables. The null hypothesis has no cointegration against the alternative of cointegration. An intercept is included into the unit root equation (Davidson and MacKinnon, 1993 p.721; Verbeek, 2000, p.283). Using annual data, the results of Monte Carlo studies from Abeyasinghe and Tan (1999) have concluded that OLS (Ordinary Least Squares) might still be the best choice in small samples study for estimating a cointegrating regression comparing to another five estimation techniques. In addition, Haung (2002) found that the Engle and Granger's (1987) ADF test

lead overall to the highest and most stable powers for typical finite sample sizes.

However, an essential consideration must be taken in this exercise. That is the MacKinnon (1991) critical values as well as reported in EvIEWS (2002a) are valid only for a data series, but not for estimated values i.e. residual series. It means, the MacKinnon (1991) critical values are not appropriate for cointegration tests in the residuals of a regression (*EvIEWS 4 user's guide*, 2002b, p.332-333). Fortunately, Davidson and MacKinnon (1993) have provided a set of appropriate critical values for cointegration test, which are available in Davidson and MacKinnon (1993, p.722 Table 20.2).

3.5 Error Correction Model and Causality Analysis

Two series are cointegrated if the estimated residual series is stationary, $I(0)$ process. According to Granger (1988), the cointegrated variables in the bivariate sense must possess temporal causality in the Granger sense in at least one direction. It means if the variables are cointegrated, the use of standard Granger causality approach (Granger, 1969) is found to be inappropriate because it excludes a relevant error correction-term (EC_{t-1}) that derived from a cointegrating equation. Thus, if LnY and LnB are cointegrated, error correction model (ECM) is more appropriate for causality test. The ECM equation used in the present study is written as follows:

$$\Delta LnY_t = a_0 + \sum_{i=1}^l a_{1i} \Delta LnY_{t-i} + \sum_{i=1}^l a_{2i} \Delta LnB_{t-i} - a_3 EC_{e,t-1} + e'_t \quad (3)$$

$$\Delta LnB_t = b_0 + \sum_{i=1}^l b_{1i} \Delta LnB_{t-i} + \sum_{i=1}^l b_{2i} \Delta LnY_{t-i} - b_3 EC_{u,t-1} + u'_t \quad (4)$$

where Δ refers to first differences operator, $X_t - X_{t-1}$, $EC_{e,t-1} = LnY_{t-1} - \hat{a}_0 - \hat{a}_1 LnB_{t-1}$, and, $EC_{u,t-1} = LnB_{t-1} - \hat{b}_0 - \hat{b}_1 LnY_{t-1}$. The e'_t and u'_t are residual series. Akaike Information Criterion (AIC) has been used to obtain an optimum lag length, l . The parameters of equations (1) to (4) are estimated using OLS estimator.

Unlike standard causality approach (Granger, 1969) that examines the joint significant of the coefficients of the ΔLnY s or ΔLnB s in the right hand side, the ECM provides an additional channel for causality test (Granger, 1988). That is the independent variable (LnY or LnB) is said to 'Granger' cause the dependent variable (LnY or LnB), if the error correction term (EC_{t-1}) is statistically significant (t-statistic), despite the fact

that the sum of the coefficients of the lagged differences of $LnYs$ or $LnBs$ in the right hand side is insignificant. However, if the nonstationary series are not cointegrated, the standard Granger causality approach can be applied as equations (3) and (4) without the error correction term ($EC_{e,t-1}$ and $EC_{u,t-1}$).

4. Empirical Results

4.1 Cointegration Analysis and OLS Estimates

Table 5a and 5b illustrate the estimated parameters of cointegrating equations (1) and (2), cointegration tests, and diagnostic tests. All of the estimated coefficients are statistically significant at 1 per cent level, and in expected positive sign. The OLS regressions fail for a battery of diagnostic tests. However, a reservation has been made to interpret further the diagnostics tests since Charemza and Deadman (1992, p.124) have warned that nonstationary series is likely to finish up with a model showing promising diagnostic test statistics even in the case where there is no sense in the regression analysis. This is not a surprising results in this study as the computed adjusted R-squared is greater than the Durbin-Watson-d statistic indicating a potential of spurious regression, if the nonstationary series are not cointegrated. The estimated regressions for Malaysia, Indonesia, Singapore and the Philippine are probably spurious since the Engle-Granger's cointegration tests (DF, ADF, and PP from Tables 5a and 5b) show volume of bank lending and real GDP are not cointegrated for these countries. However, the Engle-Granger's ADF test reveals that the volume of bank lending and real GDP are cointegrated in Thailand. In addition, the estimated residuals series are plotted and are cited in Appendix 2, which provide a visual evidence of nonstationarity for the involved ASEAN nations, except Thailand. Meanwhile, the Johansen's multivariate approach (Johansen, 1991) has been applied and the results are found to be consistent with Engle and Granger's (1987) cointegration technique. The results of Johansen's multivariate test are illustrated in Appendix 3. To consider the possible of break during the Asian financial crisis 1997-98, we have restricted the sample period to 1996, and it does no change the results of cointegration tests based on Johansen's multivariate approach (see Appendix 3). The results of non-cointegration indicate a failure to support the view of endogenous growth theory that exists a close association between the level of financial sector development and long-run growth (see Berthélemy and Varoudakis, 1996a, p.7).

Table 5a: The OLS Estimated Cointegrating Equation (Dependent Variable - $\ln Y_t$)

	Malaysia	Singapore	Indonesia	Thailand	The Philippines
$\ln B_t$	0.504*	0.740*	0.475*	0.525*	0.531*
Constant	6.004*	2.935*	7.152*	3.889*	3.968*
Sample period:	1957-2001	1963-2001	1965-2001	1953-2001	1949-2001
Adjusted R ²	0.981	0.992	0.965	0.993	0.964
Durbin-Watson d	0.324	0.456	0.453	0.364	0.228
LM test:	29.48[2]*	20.463[2]*	22.12[2]*	29.293[2]*	42.37[2]*
ARCH test:	11.82[1]*	8.094[1]*	17.453[1]*	25.197[1]*	35.27[1]*
RESET test:	36.44[1]*	27.974[1]*	1.032[1]	16.066[1]*	2.99[1]**
Jarque-Bera	1.09	0.389	1.242	9.82*	6.98**
CUSUM plot:	outside	outside	outside	outside	inside
Cointegration tests:-					
Dickey-Fuller, DF	-1.725	-2.519	-2.079	-2.374	-1.805
Augmented DF, ADF	-1.595(1)	-1.752(1)	2.686(1)	-3.421(1)b	-2.916(2)
Phillip-Perron, PP	-1.689	-2.501	-2.460	-2.620	-2.302

NOTES:

*p<0.01, **p<0.05, and ***p<0.1. For cointegration test, () is augmented lags of ADF that determined by AIC and Newey-West Suggestion for PP. The cointegration test is based on the unit root equation - with constant (but no time trend) of the estimated residual series in equation (1) and (2) - Engle-Granger residual based approach (1987). The residual series (e_t or u_t) is derived from cointegrating equation (2) or (3). The asymptotic critical values for cointegration tests are -3.90, -3.34, and -3.04 for 1%, 5% and 10% significance level respectively with constant and two variables case (Davidson and MacKinnon, 1993, p. 722 Table 20.2). a, b, and c denote rejecting null of no cointegration at 1%, 5% and 10% based on Davidson and MacKinnon (1993) critical values. [] is the lag for LM, ARCH and RESET tests. The "inside" means the cumulative sum goes inside the area between the two 5% critical lines. And the "outside" means the cumulative sum goes outside the area between the two 5% critical lines.

Source: Author's estimation.

Table 5b: The OLS Estimated Cointegrating Equation (Dependent Variable - $\ln B_{it}$)

	Malaysia	Singapore	Indonesia	Thailand	The Philippines
$\ln Y_t$	1.945	1.342*	2.034*	1.89*	1.817*
Constant	-11.487	-3.862*	-14.194	-7.325*	-7.019*
Sample period:	1957-2001	1963-2001	1965-2001	1953-2001	1949-2001
Adjusted R ²	0.981	0.992	0.965	0.993	0.964
Durbin-Watson d	0.321	0.458	0.468	0.364	0.236
LM test:	29.107[2]*	20.02[2]*	22.56[2]	28.88[2]*	42.550[2]*
ARCH test:	10.646[1]*	8.555[1]*	13.586[1]	28.576[1]*	32.31[1]*
RESET test:	44.895[1]*	34.803[1]*	0.001[1]	13.506[1]*	0.066[1]
Jarque-Bera	1.09	0.31	0.894	12.6*	3.011
CUSUM plot:	inside	outside	inside	outside	inside
Cointegration tests:-					
Dickey-Fuller, DF	-1.931	-2.648	-2.097	-2.548	-1.770
Augmented DF, ADF	-1.783(1)	-1.867(1)	-3.032(1)	-3.599(1)b	-2.427(1)
Phillip-Perron, PP	-1.896	-2.625	-2.456	-2.743	2.301

NOTES:

as for TABLE 5a.

Source: Author's estimation.

For Thailand, Dynamic Ordinary Least Square, DOLS (Saikkonen, 1991) estimator has also been used to estimate its long run parameters. Estimated long run real income elasticity on real bank lending is 1.87. The real GDP is found to be inelastic with bank lending, 0.54. One possible question raised here is structural breaks that may cause instable in the estimated coefficients. However, CUSUM test (DOLS) shows that the estimated parameters are stable over the sample period under study. The DOLS equations are not reported here, but available from the author upon request. We find that the estimated elasticities (DOLS) are consistent with Johansen's multivariate test (see Appendix 3), and Engle and Granger's (OLS) residual-based approach (Table 5a and 5b).

For the non-cointegration cases, Malaysia, Singapore, Indonesia and the Philippines, first differenced series have been used instead of level series in order to avoid the problems of nonstationarity of OLS estimator. The results are cited in Appendix 4. All of the estimated parameters are statistically significant at 5 per cent level. In the short run, the growth of real GDP is inelastic with respect to bank lending growth for these ASEAN economies. The economic growth is found to be elastic to bank lending growth, except Malaysia. No serious diagnostic problems have been evidenced, except normality of residuals. We consider the structural break issue by using CUSUM stability test. The CUSUM statistics are inside the 5 per cent level of critical bounds indicating the estimated elasticities are stable over the sample period, indicating the structural breaks do not affect the estimates (see Appendix 4). The CUSUM plots are not reported here, but available from author upon request. However, we do not discuss these estimates further since this study focuses on causality analysis.

4.2 The Results of Causality Analysis

First, ECM approach has been employed to investigate the direction of causality between real GDP and volume of bank lending in Thailand since these variables are cointegrated. Two-years lag length, $l=2$ is used to minimize the AIC (Akaike Information Criterion). The equations (3) and (4) were estimated (OLS) as below:

$$\Delta \ln Y_t = 0.0312 + 0.027 \Delta \ln B_{t-1} - 0.037 \Delta \ln B_{t-2} + 0.641 \Delta \ln Y_{t-1} - 0.126 \Delta \ln Y_{t-2} - 0.338 EC_{e,t-1} \quad (5)$$

(t-ratio) (2.335)** (-0.278) (-0.325) (3.885)* (-0.678) (-2.335)**

* $p < 0.01$, ** $p < 0.05$ and *** $p < 0.1$ (t-test).

Sample period (adjusted): 1956-2001; Adjusted R^2 : 0.311; Durbin-Waston d: 1.957
 LM test [1]: 0.169 (0.681); ARCH test [1]: 0.1897 (0.663); RESET [1]: 5.37 (0.02)
 Jarque-Bera: 4.0 (0.315) () is p-value [] is lag
 CUSUM Plot: the cumulative sum goes inside the area between the two 5% critical lines.
Granger causality (Wald test – short run channel):
 F-statistic (Wald test) is 0.114 (p-value = 0.892) for the null of coefficients of $\Delta \ln B_{t-1}$ and $\Delta \ln B_{t-2}$ is zero that is "Bank lending growth does not Granger cause economic growth".

$$\Delta \ln B_t = 0.0164 + 0.373 \Delta \ln Y_{t-1} + 0.057 \Delta \ln Y_{t-2} + 0.346 \Delta \ln B_{t-1} + 0.232 \Delta \ln B_{t-2} - 0.037 EC_{u,t-1} \quad (6)$$

(t-ratio) (0.661) (1.221) (0.167) (1.919)*** (1.083) (-0.317)

* $p < 0.01$, *** $p < 0.05$ and *** $p < 0.1$ (t-test)

Sample period (adjusted): 1956-2001; Adjusted R^2 : 0.284; Durbin-Waston d: 1.907
 LM test [1]: 0.832 (0.36); ARCH test [1]: 0.397 (0.528); RESET [1]: 14.293 (0.00);
 Jarque-Bera: 2.23 (0.327)
 CUSUM Plot: the cumulative sum goes inside the area between the two 5% critical lines
Granger causality (Wald test – short run channel):
 F-statistic (Wald test) is 0.869 (p-value = 0.427) for the null of coefficients of $\Delta \ln Y_{t-1}$ and $\Delta \ln Y_{t-2}$ is zero that is "Economic Growth does not Granger cause bank lending growth".

The estimated ECM equations (5) and (6) pass a battery of diagnostics tests except RESET test for model misspecification. However, we have a justification when using ECM equation for causality test that is standard specification proposed by Engle and Granger (1987) and Granger (1988) and has widely been used in empirical exercise. A voluminous number of empirical studies has employed ECM or VAR method without further diagnostics tests that are Saltz (1999), Ward and Zurbruegg (2000), Yip and Wang (2001), and Tan (2002). Further, the CUSUM test shows that the estimated parameters for ECM equations (5) and (6) is stable over the analyzed period, indicating that the virtually observed structural breaks do not effect the estimates. The error correction term, $EC_{e,t-1}$ in ECM equation (5) is statistically significant at 5 per cent level. It reveals that the causality is in the long run, and is run from bank lending growth to economic growth, even though the coefficients of bank lending variables, $\Delta \ln B_{t-1}$ are jointly insignificant (the Granger F-statistic is 0.114). The size of the coef-

ficient, 33.8%, represents the error correction adjustment speed of economic growth towards the long run equilibrium (see Engle and Granger, 1987). The ECM (6) shows no reversed causality that is from economic growth to bank lending growth either via the error correction term or Granger F-statistic. The study further restrict the sample period to 1996 that is pre-crisis period, and the results are not that different from the test results reported with full sample period (1953-2001). The results are not reported here but available from request.

Next, we examine the direction of causality through the short run channel for Malaysia, Indonesia, Singapore and the Philippines using standard Granger causality specification (Granger, 1969) because the examined variables of these countries are found to be non-cointegrated. Lag length up to four years, and an optimum lag length based on AIC (noted as #) have been considered for VARs. The results of Wald test (F-statistic) are reported in Table 6. Further we restrict sample period to 1996 that is before the Asian financial crisis (see Table 6 the F-statistics in second row, []), and it does not change the results of causality.

Table 6: Results of Standard Granger Causality Test (Wald Test: F-statistic)

	Lag, l:			
	1#	2	3	4
Null Hypothesis: F-statistic (Wald test):				
Malaysia (full sample: 1957-2001)				
ΔLnY does not Granger-cause ΔLnB	1.17 [0.58]	0.96 [0.51]	1.17 [1.28]	0.832 [1.07]
ΔLnB does not Granger-cause ΔLnY	0.13 [0.013]	0.25 [2.33]	0.334 [1.47]	0.814 [1.12]
Indonesia (full sample: 1965-2001)				
ΔLnY does not Granger-cause ΔLnB	0.032 [0.02]	0.51 [0.85]	0.77 [0.64]	0.42 [0.25]
ΔLnB does not Granger-cause ΔLnY	3.631*** [4.3]**	0.21 [0.15]	0.15 [0.13]	0.35 [0.25]
Singapore (full sample: 1963-2001)				
ΔLnY does not Granger-cause ΔLnB	8.724* [3.34]***	5.042** [1.94]	3.139** [1.3]	4.134** [3.6]**
ΔLnB does not Granger-cause ΔLnY	0.009 [0.58]	1.79 [0.997]	1.298 [0.69]	1.097 [0.8]
The Philippines (full sample: 1949-2001)				
ΔLnY does not Granger-cause ΔLnB	0.372 [0.47]	0.192 [0.32]	0.456 [0.686]	0.906 [1.2]
ΔLnB does not Granger-cause ΔLnY	1.841 [2.78]	2.807*** [2.99]***	1.689 [2.016]	1.697 [2.029]

NOTES

*, **, and *** denote significance at 1%, 5%, and 10% level (F-statistics, Wald Test), respectively. # is optimum lag length based on AIC. Δ is the first differences operator. The reported F-statistics (Wald test) reported in first row are for the full sample period. The reported F-statistics (Wald test) in second row, [] are restricted to the sample period to 1996 (pre-crisis period).

Source: Author's estimation

Considering various lag lengths, the results reported in Table 6 shows the analytical results of Granger causality for finance-growth nexus. No causality relationship is evidenced between bank lending growth and economic growth in Malaysia. This finding is different from Tang (2000) who finds two-way causality between bank lending and economic growth. However, a reservation for Tang's (2000) study is specification error of using ECM instead of standard Granger specification. In Indonesia, even though the results have revealed that causality is run from bank lending to economic growth under one-year lag, this finding is sensitive to the different lag lengths and it is not based on an optimal lag of two years. For the Philippines, the result shows bank lending growth does Granger-cause economic growth with two-year lags specification. This finding is consistent with Fritz (1984), but the results are found to be sensitive to different lag length and the optimum lag is one year, which fail to support the above causality relationship. It can be explained by the sample period expansion in the present study. No reversed causality is found for Indonesia and the Philippines, that is from economic growth to bank credit growth. The above findings can be linked to an empirical work by Saltz (1999) about the relationship between savings and economic growth. Saltz (1999) found that level of savings was stationary ($I(0)$) and real GDP was nonstationary ($I(1)$) for Malaysia, concluding no long run relationship. In addition, Saltz (1999) found no causality relationship between savings and growth for the Philippines case. For Thailand, Saltz (1999) found real domestic growth did Granger cause savings in the long run.

A unidirectional causality (short run) running from economic growth to bank lending growth is evidenced in Singapore. This finding is insensitive to different lag length of VAR. This result supports demand-following hypothesis and is consistent with Yong and Quek's (1995) work that real domestic growth does Granger-cause financial development in Singapore. However, this finding is run contrary to Darrat, et al. (1989) that supports both demand-following hypothesis and supply-leading hypothesis. Two possible explanations can be drawn here: first, Darrat, et al. (1989) have used ratio of M2 to GDP (in annual percentage growth) as proxy for financial development, but the level of bank lending variable is being used in the present study. Second, the sample period used in Darrat, et al. (1989) is from 1960 to 1983, but the present study covers annual data from 1963 to 2001. As stated by Allen and Santomero (1998, p.1464) traditional intermediaries have declined in importance even as the sector itself had been expanding.

An interesting question can be raised here about the structural breaks. Is the structure of the banking system having a causal role in the Asian financial crisis?

According to Allen (2001, p.14) the financial structure is not that important to create financial crises. Other question is whether the source of savings matters (re-directing domestic savings versus re-directing international savings), and periods where one dominates the other, may change the results. According to Allen and Santomero (1998, p.1463), banks have existed since ancient times, taking deposits from households and making loans to economic agents requiring capital. Nevertheless, the present study has restricted the sample period to 1996 that is before the Asian financial crisis, and finds no significant changes on the findings of cointegration (see Appendix 3) and causality analysis (see Table 6). Meanwhile, the CUSUM tests of ECM (5) and (6), and OLS estimate (Appendix 4) show the estimated parameters are stable over the sample period under study. However, the present study does not further investigate these issues in detail. Perhaps, this is left for future research.

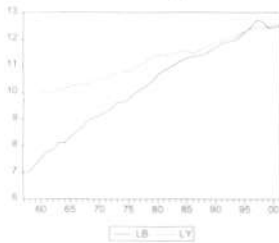
5. Concluding Remarks

This study has empirically investigated the causality relationship between bank lending and economic growth in five ASEAN founding nations, namely Malaysia, Singapore, Thailand, Indonesia and the Philippines. The empirical work here shows that the supply-leading hypothesis (bank lending causes economic growth) is supported by Thailand data, implying that rapidly growing financial development plays a significant role in accumulating economic performance. In the meantime, the demand-following hypothesis (economic growth causes bank lending) is only evidenced by Singapore. This implies that real sector activity is an important determinant of intermediary development in Singapore. Other countries, however, fail to support neither supply-leading hypothesis nor demand-following hypothesis. According to Allen and Santomero (1998) financial markets have only been important recently, and then only in a few countries, primarily the UK and the US. In addition, these findings can be explained by the export-led growth strategy that has been successfully adopted by most of the ASEAN nations. Bahmani-Oskooee and Alse (1993) have found bidirectional causality between real GDP and real export in the Philippines (in short run), Singapore and Thailand (both cases are in long and short runs). Khalafallah and Webb (2001) have found that export-led growth is a short run phenomena in Malaysia, but growth-led exports is evidenced both in long and short runs. Gleason (2002, p.2) has mentioned that Indonesian economic development is export-led.

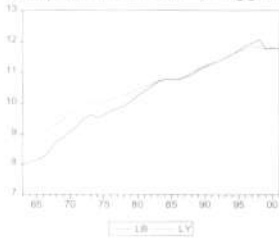
Acknowledgment

The crude draft had been presented in the 8th APFA Annual Conference "Rebuilding Our Financial Architecture", Bangkok, Thailand: July 22-25, 2001.

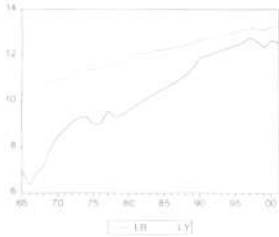
Appendix 1. Plot of Real Bank Lending (LnB) and Real GDP (LnY) 1a: Series in Log Levels



Malaysia: 1957-2001 (Ringgit, millions)

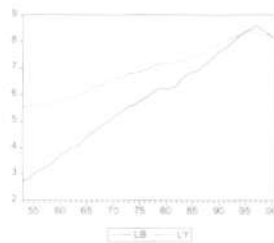


Singapore: 1963-2001 (Dollars, millions)

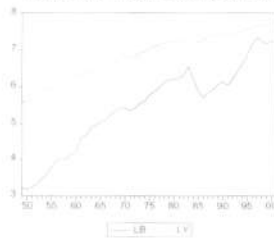


Indonesia: 1965-2001 (Rupiah, billions)

Note: LB and LY is the volume of bank lending and real GDP in log levels, respectively.

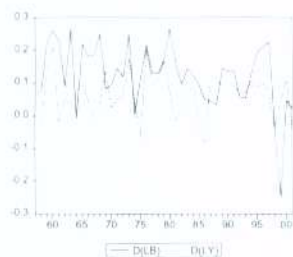


Thailand: 1953-2001 (Baht, billions)

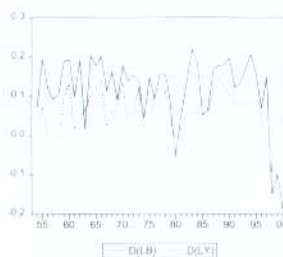


The Philippines: 1949-2001 (Pesos, billions)

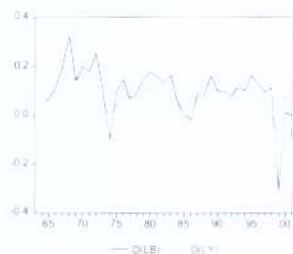
1b: Series in Log First Differences



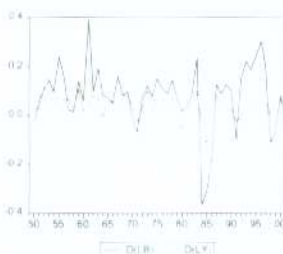
Malaysia: 1957-2001 (Ringgit Malaysia, millions)



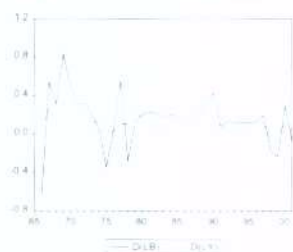
Thailand: 1953-2001 (Baht, billions)



Singapore: 1963-2001 (Singapore Dollars, millions)



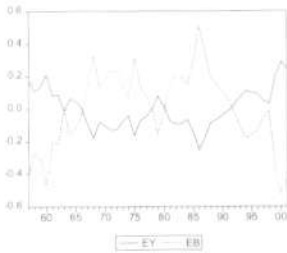
The Philippines: 1949-2001 (Pesos, billions)



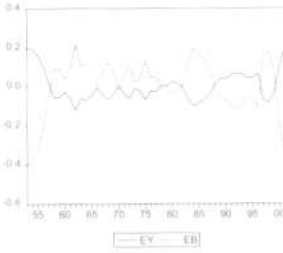
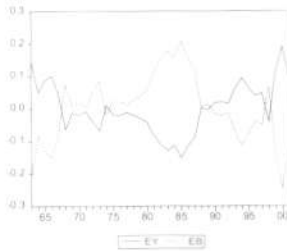
Indonesia: 1965-2001 (Rupiah, billions)

Note: $D(LY)$ is the first differenced of log real GDP, and $D(LB)$ is the first differenced of log real bank lending.

Appendix 2. Plot of Residual Series for Estimated Equation (1) and (2) - ASEAN

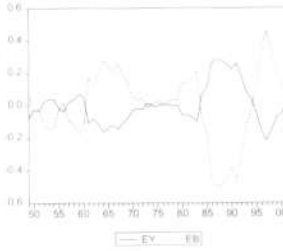
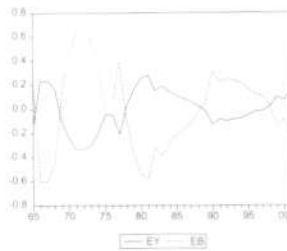


Malaysia: 1957-2001



Thailand: 1953-2001

Singapore: 1963-2001



The Philippines: 1949-2001

Indonesia: 1965-2001

Note: EY is the residual series for equation 1 (Dependent variable: $\ln Y$), and EB is the residual series for equation 2 (Dependent variable: $\ln B$) using OLS estimator.

Appendix 3. The Johansen's Multivariate Test for Cointegration

The purpose of performing the Johansen's multivariate approach (Johansen, 1991) for cointegration test is to compare the consistency with Engle-Granger's (1987) residual-based approach. Since Johansen test is well documented in the empirical literature, we do not discuss the details of its estimation in this section. The test is computed by using Eviews (2002a) statistical software, and the results are reported in Table A1.

Table A1:

Series: LnY and LnB	Likelihood Ratio (Trace-statistic)	5 % Critical Value:	Hypothesized No. of CE(s)
Thailand (2)			
Period: 1953-2001	21.364	16.797	None *
Period: 1953-1996	22.426	16.913	None *
Malaysia (1)			
Period: 1957-2001	11.267	16.134	None
Period: 1957-1996	15.790	16.221	None
Singapore (1)			
Period: 1963-2001	13.070	16.242	None
Period: 1963-1996	7.758	16.373	None
Philippines (1)			
Period: 1949-2001	12.294	16.011	None
Period: 1949-1996	10.937	16.080	None
Indonesia (2)			
Period: 1965-2001	13.933	17.278	None
Period: 1965-1996	9.402	17.611	None

NOTES:

* denotes rejection of the null hypothesis of none cointegrating equation against the alternative of at most one cointegrating equation at 5% significance level. The reported critical values are originally obtained from Osterwald-Lenum (1992) and are corrected for small sample bias using a scaling factor proposed in Cheung and Lai (1993, p. 317), $T/(T-nk)$ where T is sample size, n is number of variables, k is lag length. The test assumption is linear deterministic trend in the data. The number in () is optimum lag order of VAR(d) which is selected to minimum the AIC. CE(s) is the cointegrating vector(s).

Source: Author's estimation.

The results of Johansen's multivariate test reveal that a cointegrating relation does exist between real GDP and real bank credit in Thailand. However, this is not the case for other ASEAN founding nations; Malaysia, Singapore, Indonesia and the Philippines. The above findings are consistent with the Engle-Granger residual-based approach (Engle and Granger, 1987), and also with the period restriction before the Asian financial crisis 1997-1998. The estimated long run relations for Thailand based

on Johansen's method are $LnB_t = -6.92 + 1.839LnY_t + u_t$ and $LnY_t = -3.763 + 0.544LnB_t + e_t$ for the sample period under study, 1953-2001.

Appendix 4. OLS Estimates of Stationary Series (in First Differences)

The equation (1) and (2) have been re-estimated for Malaysia, Singapore, Indonesia, and the Philippines using first differenced (detrended) series since the nonstationary series of volume of bank lending and real GDP variables of these countries are not cointegrated. The estimated coefficient can be defined as short run elasticity. The results of OLS estimate are reported below:

Table A1: The OLS Estimates Equation (1) (Dependent Variable: $-\Delta LnY_t$)

	Malaysia	Singapore	Indonesia	Philippines
ΔLnB_t	0.218**	0.428*	0.105*	0.184*
Constant	0.037**	0.029*	0.066*	0.028*
Sample period:	1957-2001	1963-2001	1965-2001	1949-2001
Adjusted R ²	0.082	0.492	0.188	0.317
Durbin-Watson d	2.043	1.815	1.31	1.88
LM test:	5.36[3]	2.182[2]	4.84[2]***	0.772[2]
ARCH test:	1.43[1]	0.006[1]	1.26[1]	0.11[1]
RESET test:	1.34[1]	0.286[1]	0.342[1]	7.04[4]
Jarque-Bera	1.17	9.81*	2.03	2.02
CUSUM plot:	inside	inside	inside	inside

Table A2: The OLS Estimates of Equation (2) (Dependent Variable: $-\Delta LnB_t$)

	Malaysia	Singapore	Indonesia	Philippines
ΔLnY_t	0.475**	1.18*	2.018*	1.79*
Constant	0.09*	0.014	-0.01	0.0012
Sample period:	1957-2001	1963-2001	1965-2001	1949-2001
Adjusted R ²	0.082	0.492	0.188	0.317
Durbin-Watson d	1.576	2.05	1.29	1.428
LM test:	2.012[2]	1.89[1]	1.62[2]	4.914[3]
ARCH test:	0.292[1]	1.95[1]	0.187[1]	0.067[1]
RESET test:	0.74[1]	0.02[1]	0.464[1]	3.62[2]
Jarque-Bera	36.58*	9.06**	11.5*	7.04**
CUSUM plot:	inside	inside	inside	inside

NOTES:

Δ is the first differences operator. * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.1$. [] is the lag for LM, ARCH and RESET tests. The "inside" means the cumulative sum goes inside the area between the two 5% critical lines.

Source: Author's estimation.

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Abstract

The concern of this paper is to investigate the direction of causality relationship between bank lending and economic growth for the five ASEAN founding economies, namely, Malaysia, Singapore, Indonesia, Thailand and the Philippines. The study has adopted time series approach, Granger causality test to examine the demand-following hypothesis (economic growth causes bank lending), and supply-leading hypothesis (bank lending causes economic growth). The empirical results show that the supply-leading hypothesis is supported by Thailand data, and the demand-following hypothesis is evidenced by Singapore. Other countries (Malaysia, Indonesia, and the Philippines) fail to support neither supply-leading hypothesis nor demand-following hypothesis.

JEL Classification: C51, O11, O57

Keywords: ASEAN; bank lending; causality; cointegration; economic growth

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