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Financial development and economic growth: the cases of Thailand, Malaysia, and the Philippines

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Abstract: This study investigates relationship between financial development and economic growth in Thailand, Malaysia, and the Philippines from 1974–2011. Panel cointegration approach and vector error correction model are employed to find a long-term relationship between financial development and economic growth in these three countries. When considering overall financial development in a panel data, panel cointegration estimation shows a positive long-term relationship between overall financial development and growth. Subsequently, financial development is divided into three constituent parts of the banking system, equity market, and private bond market. Positive relationships between economic growth and development in the banking sector and bond market are found in the long-run, whereas the stock market is indicated to be insignificantly related to growth. Furthermore, overall financial development is shown to be positively correlated with its own growth in the long-term in Thailand and Malaysia's economies. However, insignificant negative correlation is found in the Philippines.

Keywords: economic growth; financial development; panel cointegration; vector error correction models; VECM; Malaysia; Thailand; Philippines.

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1 Introduction

Financial development is generally defined as a process that marks an improvement in quantity, quality, and efficiency of financial intermediary services. Levine (1997) stated that a financial system can facilitate investment and foster economic growth through five functions:

1 production of information about possible investments

2 mobilisation and pooling of savings, followed by their allocation as capital to investors

3 monitoring of firms and application of corporate governance after the provision of finance

4 fostering of trade and diversification for reducing risk

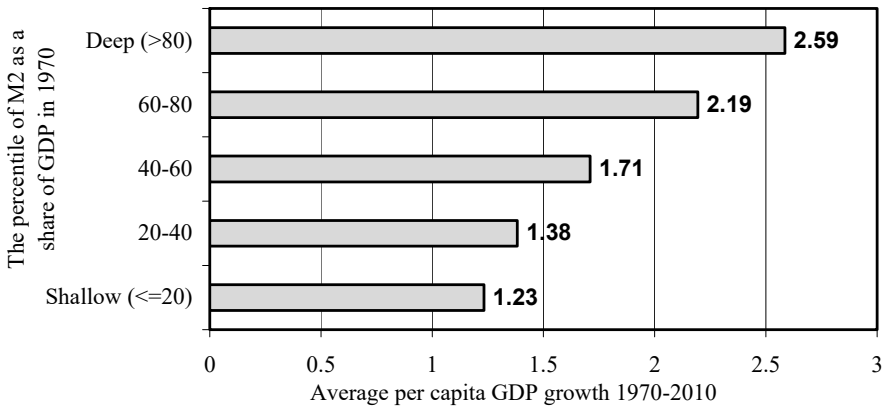
5 simplification of the exchange of goods and services through payment services.

Thus, financial development is the improvement of any of these functions.

A well-developed financial sector can improve the efficiency of allocation of capital resources and also promote savings. Financial development could expand investors' opportunities and increase resource allocation to productive sectors. Financial development can spur economic growth through two channels: capital accumulation and technological innovation. As a result of the growth of an economy, the demand for financial services rises. Therefore, economic development can also in turn foster development in the financial system.

Many studies state the existence of positive correlation between financial development and economic growth. Figure 1 depicts the charting of mean GDP growth rate over the period 1970–2010 of countries grouped by initial financial depth, which uses the money supply M2 as a share of GDP as its indicator. This chart clearly shows that the countries with higher initial financial depth have higher average growth of GDP per capita. However, this evidence is not enough to confirm the existence of correlation between finance and growth.

Figure 1 Mean GDP growth rate 1970–2010 of country groups sorted by 1970 financial depth



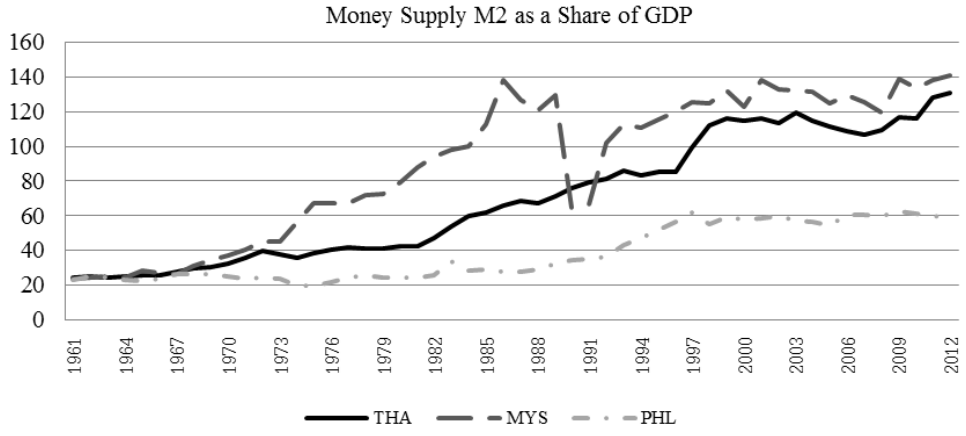
Source: WDI, Author's calculation

Although Figure 1 signals the existence of a potential relationship between financial development and growth, it is possible that finance and growths are not related to each other, but that there exists a factor which affects both of them in the same direction. Accordingly there is a question that arises from this figure that whether financial development is truly correlated with economic growth in the case of Thailand, Malaysia, and the Philippines.

The relationship between financial development and growth in Thailand, Malaysia, and the Philippines is an interesting issue. From 1961–2012, the real per capita GDP growth was positive for Thailand, Malaysia, and the Philippines, while the change in growth in these three countries was quite similar but not identical. Overall, Thailand had the highest average GDP per capita growth at 4.37%, followed by Malaysia at 3.83%. The lowest mean GDP per capita growth, at the rate of 1.46%, belonged to the Philippines' economy. Nevertheless, the high average per capita GDP growth of Thailand dates from before the 1997–crisis period. After the Asian financial crisis, the Malaysian and Philippine economies achieved higher average growth than Thai economy.

One of the possible factors generating the differences in these countries' growth is the difference in the degree of their financial development. In Figure 2, the development of the financial sector in Thailand, Malaysia, and the Philippines is displayed by the use of money supply M2 as a share of GDP, which represents size of the banking system. Obviously, Malaysia's size of financial sector relative to GDP shown has been higher than Thailand's since 1973. Furthermore, both figures show that the Philippines' banking system is the worst relative to the other countries studied.

Figure 2 Financial developments in Thailand, Malaysia, and Philippines during 1961–2012



Source: WDI

In light of this, the current study investigates the presence of links between financial development and economic growth in the economies of Thailand, Malaysia, and the Philippines. Since the major goals of most developing countries are to increase the rate of output growth, it is necessary to find whether improvement in the financial sector is a prerequisite for higher economic growth in Thailand, Malaysia, and the Philippines. If so, it is therefore possible that a well-developed financial sector is essential for an economy, in addition to physical capital accumulation, labour and technology.

2 Analytical framework

The financial system has emerged as a result of the presence of transaction costs and asymmetric information in lending-borrowing activities (Vijitnopparat, 2007). It is costly for lenders to search for potential borrowers and acquire knowledge about their investment projects as well as for borrowers to find agents who are willing to lend their savings. Financial intermediaries' main activities are matching potential lenders and borrowers, gathering information about investment projects, and monitoring loans. Thus, financial intermediaries help individuals to reduce risk and cost of transaction and information.

Many empirical studies have discovered a positive relationship between finance and growth but the direction of causality is still arguable. Two possible causalities between financial development and economic growth were stated by Patrick (1966): the demand following and the supply leading view.

Firstly, the 'demand-following' approach stated that the development of the real sector generates a greater demand for financial services. The more rapid growth of the real sector leads to a greater demand for external funds since most firms have to borrow money from financial intermediaries for business's financial expansion. Secondly, the 'supply-leading' financial development argued that financial development promotes growth because the availability of financial services stimulates demand for these services from new entrepreneurs. Finance allows entrepreneurs to take on attractive investment opportunities whose costs exceed their current income. Thus, a well-functioning financial system is essential for the real economy to take advantage of such new investment opportunities. Furthermore, financial intermediaries have an important role in pooling and transferring savings from individuals and slow-growing industries to investment in fast-growing industries which is capable of promoting growth.

McKinnon (1973) and Shaw (1973) strongly suggested that better functioning financial systems lead to more vigorous economic growth. McKinnon (1973) considered an outside money model in which all firms are confined to self-finance. Firms need to accumulate sufficient savings in the form of monetary assets to finance investment projects. Thus, money and capital are viewed as complementary assets where money serves as the channel for capital formation. Instead, Shaw (1973) proposed the debt-intermediation view based on an inside money view. He stressed the importance of interest rate on savings. With an excess supply of credit, financial intermediaries promote investment and raise output growth via borrowing and lending.

Generally, we would expect to see a bi-directional causality between financial development and economic growth, known as a feedback hypothesis. The two-way causality implies that the well-developed financial system could promote economic expansion which will in turn create demand on financial services. Patrick (1966) hypothesised that financial development leads growth at the early stage of economic development, but that causality runs from growth to finance at the later stage. Furthermore, in general economy one industry may be encouraged financially on the supply-leading basis, and consequently shifts to the demand-following stage after development, while another industry still remains in the supply-leading phase.

On the other hand, it is possible that there is no Granger causality between finance and growth if funds are provided to non-productive activities only. The reasons behind this situation are inefficiency in the banking system and political interference. Under

these circumstances, savings are not transformed into new investment and do not affect economic growth.

Singh (1997) claimed that financial development may not be beneficial for the growth of developing countries due to the following reasons. Firstly, the volatility and arbitrariness of the stock market pricing process under developing countries conditions make for inefficient investment allocation. Second, the interactions between the stock and currency markets in the wake of unfavourable economic shocks may exacerbate economic instability and reduce long-term growth. Third, stock market development is likely to undermine the existing group-banking system in developing countries.

Further studies stated the importance of financial sector law and regulation on financial development and then economic growth. Levine's (1997) study investigated the connection between the legal environment and financial development which might later affect economic growth. Levine stated that countries with legal systems that protect creditors and effectively enforce contracts tend to have better financial intermediaries than countries with legal systems that block creditors from gaining access to their claims or ineffectively enforce contracts. In addition, good accounting standards that simplify the interpretability and comparability of information across corporations can promote economic growth.

3 Literature review

Many theoretical and empirical studies into the existence of the interaction between financial development and economic growth are in agreement about the positive correlation between them. Some research found the causality from finance to growth, for example, McKinnon (1973), King and Levine (1993) and Christopoulos and Tsionas (2004). On the other hand, some argued that the direction of the relationship is from growth to finance. This direction of the correlation is supported by Gurley and Shaw (1967), Goldsmith (1969), etc. Other economists supported the theory of two-way causality such as Demetriades and Hussein (1996), Luintel and Khan (1999), Shan et al. (2001) and Hassan et al. (2011).

There have been various proxies used to reflect development in the financial sector. The traditional practices (e.g., Goldsmith, 1969; McKinnon, 1973) adopted the size of the formal financial intermediary sector to economic activity as a proxy of financial development. Shaw (1973) stated the changes in the system of finance with a term financial deepening, which reflects the share of money supply in GDP. Vuranok (2009) argued that the ratio of M2 money supply to GDP is the best measure of financial deepening since M2 covers money in circulation and demand deposits, which are liquid.

Yet the financial deepening indicator is not enough to capture all aspects of financial development. Other proxies are used for the measurement of financial development. Christopoulos and Tsionas (2004) used the ratio of total bank deposits liabilities to GDP as a proxy for financial depth. Caporale et al. (2009) used four different proxies to capture the variety of different channels through which financial development can affect growth:

1 the ratio of credit to the private sector to GDP used as a measure of banking development

2 the stock market capitalisation to GDP ratio referred the size of the financial sector

3 liquid liabilities to GDP (LLGDP) ratio used as a measure of financial depth

4 the interest rate margin used to measure the efficiency of the sector.

Another indicator of financial development which should be included is rules and regulations. Vijitnopparat (2007) considered financial sector regulation in three aspects: changes in financial acts, capital adequacy requirements, and implementation of financial liberalisation. His results showed that rules and regulations could have an impact on financial development as well as economic growth. Moreover, Rathinam and Raja (2010) used the index of procedural law and enforcement, the index of financial repression, and the index of property rights protection as the indicators for law and regulation.

Hassan et al. (2011) said that early research on this topic (e.g., Goldsmith, 1969; King and Levine, 2003) often used cross-country analysis to study the relationship. However, the conclusions from this analysis are sensitive to the selected sample countries, estimation methods, data frequency, function form of the relationship, and proxy measures.

Many recent studies used time-series analysis to identify the relationship between financial development and economic growth such as Shan et al. (2001) and Vuranok (2009). Most of these studies estimated either vector autoregressive (VAR) models or vector error correction models (VECM). Afterwards, they used the Granger causality test and the Johansen cointegration approach to determine the direction of this relationship and the existence of a long-term relationship respectively.

Using only cross-country analysis to estimate the relationship, the results may have a spurious problem arising from non-stationarity (there is no direct causal connection between variables, but the regression shows a highly significant correlation), while using only time-series data, results may be unreliable due to the short time spans of the datasets. A methodology that is suggested is panel cointegration. Given the short span of time-series data, the power of individual unit root tests is distorted, as well as the power of the Johansen test for cointegration. Hence, the most efficient way to analyse is by using panel-based unit root and cointegration tests. This method has often been used in recent studies such as Christopoulos and Tsionas (2004), Al-Awad and Harb (2005), Kiran et al. (2009) and Bangake and Eggoh (2011).

Vijitnopparat (2007) examined the existence of relationship between finance and growth in Thailand. This study added rule and regulation effect into the model. He used annual data from the IFS and Bank of Thailand's annual report over the period 1966–2005. VECM was adopted. The empirical results indicated bi-directional causality in both the short- and long-run when rule and regulation effect was included, but a bi-directional causality was found only in the long-run when rule and regulation effect was ignored. Ang and McKibbin (2007) investigated the direction of the relationship in Malaysia using time-series data during the period of 1960–2001. They adopted principle component analysis (PCA) to combine three financial development indicators, which were logarithm of liquid liabilities (M3) to nominal GDP, logarithm of commercial bank assets to commercial banks assets plus central bank assets, and logarithm of domestic credit to private sectors divided by nominal GDP. Their results showed that no short-run causality was observed. However, there was evidence of output growth causing financial development in the long-run, but not the opposite.

Furthermore, Zhang (2003) examined the relationship of eight countries in East Asia, including Malaysia, the Philippines and Thailand, over the period 1960–1999. He took data from the 1987 and 1999 issues of the IFS yearbook. The generalised least square

(GLS) technique, which can transform original data with the first-order serial correlation coefficient, was used to analyse individual countries with time-series data. The evidence from this study showed the opposite result to other studies. Zhang found a negative but insignificant effect of financial development on economic growth for the Philippines and Thailand, while a significant negative effect was found in the case of Malaysia.

4 Methodology

4.1 Data and proxies

The relationship between financial development and economic growth in Thailand, Malaysia, and the Philippines is examined in this study using annual data from the period 1973–2011, which covers the periods of financial liberalisation and financial crises in these three countries. Logarithm of real GDP per capita (LNGDPPC) is used to measure economic growth. The base year is 2005. I divide development in financial systems into three parts:

1 in financial intermediaries

2 in the stock market

3 in the private bond market.

As for the first part, I adopt three indicators

As for the first part, I adopt three indicators to capture development in financial intermediaries. The first proxy is domestic credit to the private sector as a percentage of GDP (DCPS). The second one is money supply M2 as a share of GDP (M2). The last indicator is LLGDP ratio. In addition, I use another three proxies to reflect development in the stock market:

1 stock market capitalisation as a percentage of GDP (CAP)

2 total value of the shares traded in the stock market divided by GDP (STR)

3 stock market turnover ratio (TURN).

For development in the bond market, I employ private bond market capitalisation as a percentage of GDP (PRBOND) as a proxy.

I build three aggregate indexes for each country's data by employing the PCA approach. The first one combines the three proxies of the evolutions in the banking system, named BANK. The second index merges three measures for the development in equity market called STOCK. Finally, I integrate the three of them into one indicator in order to measure overall financial development, called FD, also using the PCA approach.

To measure the degree of financial sector law and regulation, I use the financial reform index (FINDEX) to capture the effect of shift in financial rule and regulation. This index was introduced by Abiad et al. (2008). It covers seven dimensions of financial reform which consist of credit controls, interest rate controls, entry barriers measures, banking supervision, privatisation, international capital flows, and security market.

I add the control variables that might affect economic growth into the model. I capture the effect of financial crises by including two sets of dummies. The first one is a dummy for Asian financial crisis during 1997–1998 (ACRISIS) and a dummy reflects the

effect of global financial crisis in 2008–2009 (GCRISIS). Another set of dummies for crises consists of two dummies for the effects of Asian and global financial crises as well but they cover the impact during 1997–2011 and 2008–2011, respectively, instead. Furthermore, I control for macroeconomic factor by choosing either gross capital formation as a share of GDP (CAPITAL) or labour productivity (LABORP).

All data series except FINDEX, LLGDP, PRBOND and LABORP are drawn from the World Bank's World Development Indicators (WDI) 2012 database. The FINDEX series is taken from Abiad et al.'s (2008) study in IMF website. Meanwhile, a share of liquid liabilities to GDP and bond market variable are come from the financial development and structure dataset. Besides, LABORP is taken from The Conference Board Total Economy Database January 2014.

4.2 Panel cointegration

Due to only 39 observations for each individual, the time-series analysis may not be reliable. The power of individual unit root tests and the Johansen test for cointegration are distorted because of the short span of data. Thus, I apply a panel cointegration method to investigate the presence of the relationship between financial development and economic growth in a panel of Thailand, Malaysia, and the Philippines.

4.2.1 Panel unit root test

The panel unit root test provides dramatic improvements in power over separate unit root tests for each individual. I verify the order of integration of each variable by using two panel unit root tests. The first one was proposed by Levin et al. (2002) called the LLC test. The second test was introduced by Im et al. (1997, 2003) called the IPS test.

The LLC test is based on a regression t-statistic, while the IPS test is based on ADF statistics averaged across cross-sections. Suppose the Augmented Dickey-Fuller (ADF) regression as follows:

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t-j} + \alpha_i d_{it} + \varepsilon_{it}$$

for $i = 1,\ldots, N$ and $t = 1,\ldots,T$. d_{it} are the deterministic components. The error ε_{it} are assumed to be independent across the units of sample.

A major assumption of the LLC test is that ρ_i are identical across the panel. In other words, this test crucially depends upon the independence assumption across cross-sections. The null hypothesis of the LLC test is H_0: $\rho = 0$ against the alternative H_1: $\rho = \rho_i < 0$ for all $i = 1,.., N$. The LLC test allows the lag order p to vary across individuals. However, the LLC strongly requires a balanced panel.

The IPS test is not as restrictive as the LLC test since it permits for heterogeneous coefficients. The null hypothesis for this test is H_0: $\rho_i = 0$ for all i and the alternative is H_1: $\rho_i < 0$ for $i = 1, 2,..., N_1$ and $\rho_i = 0$ for $i = N_1 + 1,..., N$, where N is the units of cross-sectional data. The alternative hypothesis implies that the test allows only some of the individual series to have unit roots. The IPS test statistic is

$$t_{IPS} = \sqrt{N}\frac{(\bar{t}_{N,T} - \mu)}{\sigma} \rightarrow N(0,1)$$

where $\bar{t}_{N,T} = \frac{1}{N}\sum_{i=1}^{N} t_{i,T}(p_i, \beta_i)$ is the average of the computed ADF statistics for individual countries included in the model. The μ and σ^2 need to be obtained by Monte Carlo simulation. An experiment shows that the small sample performance of the $\bar{t}$ test is reasonably satisfactory and generally better than the LLC test.

4.2.2 Panel cointegration test

In the presence of integration of order one in all variables, Pedroni's panel cointegration tests are employed to find the existence of a long-run relationship as more powerful tests than those obtained by applying time-series cointegration tests. Pedroni (1995, 1999) proposed four test statistics called panel cointegration statistics which are pooled within-dimension-based statistics. Moreover, Pedroni (2000) introduced the other three statistics called group-mean panel cointegration statistics which are between-dimension panel statistics. Pedroni's panel cointegration test statistics are as the following:

1 pooled within-dimension-based statistics

a panel *v*-statistic:

$$Z_v = \left(\sum_{i=1}^{N}\sum_{i=1}^{T} \hat{L}_{11i}^{-2}\hat{e}_{it-1}^{2}\right)^{-1}$$

b panel ρ-statistic:

$$Z_\rho = \left(\sum_{i=1}^{N}\sum_{i=1}^{T} \hat{L}_{11i}^{-2}\hat{e}_{it-1}^{2}\right)^{-1}\sum_{i=1}^{N}\sum_{i=1}^{T}\hat{L}_{11i}(\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

c panel non-parametric (*PP*) t-statistic:

$$Z_{PP} = \left(\sigma^2\sum_{i=1}^{N}\sum_{i=1}^{T} \hat{L}_{11i}^{-2}\hat{e}_{it-1}^{2}\right)^{-1/2}\sum_{i=1}^{N}\sum_{i=1}^{T}\hat{L}_{11i}^{-2}(\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

d panel parametric (ADF) t-statistic:

$$Z_t = \left(\hat{S}_i^{*2}\sum_{i=1}^{N}\sum_{i=1}^{T} \hat{L}_{11i}^{-2}\hat{e}_{it-1}^{*2}\right)^{-1/2}\sum_{i=1}^{N}\sum_{i=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{it-1}^{*}\Delta\hat{e}_{it}^{*}$$

2 between-dimension panel statistics

a group ρ-statistic:

$$\tilde{Z}_\rho = \sum_{i=1}^{N}\left(\sum_{i=1}^{T}\hat{e}_{it-1}^{2}\right)^{-1}\sum_{i=1}^{T}(\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

b group non-parametric (*PP*) t-statistic:

$$\tilde{Z}_{PP} = \sum_{i=1}^{N}\left(\sigma^2\sum_{i=1}^{T}\hat{e}_{it-1}^{2}\right)^{-\frac{1}{2}}\sum_{i=1}^{T}(\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

c group parametric (ADF) t-statistic:

$$\tilde{Z}_t = \sum_{i=1}^{N}\left(\sum_{i=1}^{T}\hat{S}_i^{*2}\hat{e}_{it-1}^{*2}\right)^{-1/2}\sum_{i=1}^{T}\hat{e}_{it-1}^{*}\Delta\hat{e}_{it}^{*}$$

where $\hat{L}_1$ is used to adjust for autocorrelation in the panel parametric model, $\hat{\sigma}^2$ is the pooled long-run variance for the non-parametric model. $\hat{\sigma}_i^2$ and S_i^* are the long-term and contemporaneous variances for individual *i*. $\hat{\lambda}_i = \dfrac{1}{2(\hat{\sigma}_i^2 - S_i^2)}$, $\hat{e}_{it}$ and $\hat{e}_{it}^*$ are the estimated residuals form the parametric and non-parametric models, respectively. After a proper standardisation, all Pedroni test statistics converge to a standard normal distribution under the null hypothesis.

Starke (2010) claimed based on Pedroni (1997, 2004) that by using Monte Carlo simulations, in samples with time-dimensions larger than 100, all seven of Pedroni's test statistics do fairly well and are stable. However, out of the seven statistics, the group parametric ADF statistic generally performs the best in a small sample, followed by the panel-ADF statistic. Furthermore, when dealing with very small samples, of the five non-parametric statistics, when the group-ρ statistic rejects the null hypothesis then one can be relatively confident of the conclusion, while the panel-ν statistic is most useful in large samples but has the lowest small sample power.

4.2.3 Fully modified ordinary least squares

I estimate the long-term relationship by using the fully-modified ordinary least squares (FMOLS) approach suggested by Pedroni (2000, 2001) for a panel data. FMOLS is able to facilitate heterogeneity across individual members of the panel. It allows for the selective pooling of long run information contained in the panel while permitting the short-term dynamics and fixed effects to be heterogeneous among different members of the panel.

Consider the following cointegrated system for a panel of $i = 1,..., N$ members

$$Y_{it} = \alpha_i + \beta X_{it} + \mu_{it}$$

$$X_{it} = X_{it-1} + \varepsilon_{it}$$

where the vector error process $\xi_{it} = (\mu_{it}, \varepsilon_{it})'$ is stationary with asymptotic covariance matrix Ω_i. $\Omega_i = \begin{bmatrix} \Omega_{11i} & \Omega_{21i}' \\ \Omega_{21i} & \Omega_{22i} \end{bmatrix}$, where Ω_{11i} is the scalar long run variance of the residual μ_{it}, Ω_{22i} is the $m \times m$ long run covariance among the ε_{it}, and Ω_{21i} is a $m \times 1$ vector that gives the long run covariance between μ_{it} and ε_{it}. $E[\xi_{it}, \xi_{jt}]$ is assumed to be zero for all $i \neq j$, which implies the individual processes are independent cross sectionally. A panel FMOLS estimator for the coefficient β is given as follows

$$\hat{\beta}_{FM} - \beta = \left(\sum_{i=1}^{N}\hat{L}_{22i}^{-2}\sum_{i=1}^{T}\left(X_{it} - \bar{X}_i\right)^2\right)^{-1}\sum_{i=1}^{N}\hat{L}_{11i}^{-1}\hat{L}_{22i}^{-1}\left(\sum_{i=1}^{N}\left(X_{it} - \bar{X}_i\right)\mu_{it}^{*} - T\hat{\tau}_i\right)$$

where $\mu_{it}^{*} = \mu_{it} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}\Delta X_{it}$ and $\hat{\tau}_i = \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}(\hat{L}_{22i} + \hat{\Omega}_{21i}^{0})$, N denotes cross-sectional dimension, T is time series dimension, L_{11i}, L_{21i}, and L_{22i} are the elements of L_i which is the lower triangular matrix of Ω_i, Ω_i^0 is the contemporaneous covariance, and Γ_i is a weighted sum of autocovariances.

4.3 Time-series analysis

In order to find the existence and direction of the correlation between financial development and economic growth in each country, the time-series analysis is adopted. I employed VECM framework to find and estimate the relationship between finance and growth.

4.3.1 Individual unit root test

I examine the order of integration of each variable by using Phillips-Perron (*PP*) tests (Phillips and Perron, 1988) and ADF unit root tests (Dickey and Fuller, 1979).

Assume the regression be as follows

$$\Delta Y_t = Y_0 + \alpha t + \phi Y_{t-1} + \sum \phi_i Y_{t-1} + \mu_t$$

where $\Delta Y_t = Y_t - Y_{t-1}$, Y_t denotes dependent variable, Y_0 is constant term, t represents trend variable, i is a positive integral number which is higher than one and μ_t is stochastic disturbance term.

The null hypothesis for the test is H_0: $\phi = 0$ which implies Y_t is non-stationary, whereas the alternative is H_1: $\phi \neq 0$ which means Y_t is not non-stationary. Testing both of the unit root tests by using econometric programmes gives the McKinnon critical values which is left-tailed critical value. Thus, if computed test-statistic is lower than the McKinnon critical values at the conventional significance level (or the absolute value of test-statistic is higher than the critical value), the null hypothesis is rejected. We cannot accept that the series is non-stationary, so that series is stationary. If $Y_t \sim I(d)$ or Y_t is integrated of order d, then $\Delta^d Y_t \sim I(0)$ or the difference operator d times leads to a process with no unit roots.

4.3.2 Johansen cointegration test

I investigate the existence of a long run relationship between economic growth and financial development by using Johansen cointegration test. If at least one cointegration between these variables is detected, there is the potential Granger causality in either direction.

Let $\Delta Y_t = \beta_0 + \beta Y_{t-1} + \sum \beta_i \Delta Y_{t-1} + \mu_t$ be VECM, where Y_t is a vector of dependent variables. The Johansen cointegration test examines the presence of long-run relationship between variables by verifying the value of rank (β). If rank (β) equals to zero, it implies no cointegration between variables. On the other hand, if rank (β) $\geq$ 1, at least one cointegration is detected. Johansen proposed two major test statistics; trace statistic (λ_{trace}) and max statistic (λ_{max}). The null hypotheses of both tests are slightly different. For trace test, the null hypothesis is rank (β) $\leq r$ and the alternative is rank (β) $> r$. While, the null

hypothesis for max statistic is rank (β) = r and the alternative is rank (β) = r + 1. Thus, r cointegrations are detected when the null hypothesis of rank (β) ≤ r or rank (β) = r cannot be rejected.

4.3.3 Vector error correction model

Sani and Soytas (2006) stated that when variables are cointegrated, a VECM should be estimated rather than a vector autoregression (VAR). Thus, I estimate a VEC model to examine both dynamic short- and long-run relationships. The VEC model is form as following:

$$\Delta Y_t = \beta_0 + \beta Y_{t-1} + \sum \beta_i \Delta Y_{t-1} + \mu_t$$

where Δ denotes first difference, Y_t is a $n \times 1$ vector of dependent variables, $i = 1,..., p - i$, p denotes the number of lag, and u_t is stochastic disturbance term. The optimal lag lengths are determined by information criterion (IC).

I transform above equation as follows:

$$\Delta Y_t = b_0 + \alpha CE_{t-1} + \sum b_i \Delta Y_{t-1} + v_i$$

where CE_t represents error correction term at time t which is derived by normalising the cointegrating vectors, b_i is $n \times n$ matrix of coefficients, and v_t is stochastic disturbance term. The $n \times r$ matrix α is known as the speed of adjustment parameter, where r is the number of cointegration. A larger α implies a faster convergence towards the long-run equilibrium when there are short-run deviations from its equilibrium. Cointegration equation (CE) shows the long-run relationship, while $\Sigma b_i \Delta Y_{t-i}$ term explains the short-run dynamics.

4.3.4 Multivariate causality test

I investigate the direction of the short- and long-run relationships among variables using the test based on the VECM framework. An F-test or a Wald χ^2 test on the joint significance of the lagged explanatory variables indicates the short-term causal effects in the sense that the dependent variable responds only to short-term shocks to the stochastic environment. The weak exogeneity test uses the statistical significance of the lagged error correction terms to investigate for long-run Granger causality. The null hypothesis of causality test is no Granger causality and the alternative is the existence of causality.

5 Empirical results

After using PCA to create new variables, there are two sets of endogenous variables:

1 LNGDPPC and FD

2 LNGDPPC, BANK, STOCK, and PRBOND.

The first one captures relationship between financial development in the whole sector and growth, while the second set disaggregates financial development into three parts: the banking system, stock market and private bond market. For overall financial

development, the private bond market is allocated the highest weight in Thailand and Malaysia, followed by the banking system and the stock market, respectively. On the other hand, the Philippine bond market has the least impact, and financial intermediaries are the most influential factor. Exogenous variables are FINDEX, ACRISIS, GCRISIS, ACRISIS2, GCRISIS2, CAPITAL, and LABORP.

5.1 Panel cointegration results

The LLC and IPS panel unit root tests are used to verify whether data series is stationary. The number of lags in the series is restricted to no more than two and is chosen by minimum Akaike information criterion (AIC) for ADF regression. The results of both panel unit root tests indicate that every data series is non-stationary but they become stationary after first-differencing. Therefore, there is strong evidence that this is a non-stationary panel.

In regards to non-stationary data, I employ the panel cointegration test proposed by Pedroni (1995, 1999) to examine the presence of long-term relationship. I include an individual intercept in all test equations but no linear time trend is added. Furthermore, the number of lags is one for both models.

One out of seven statistics states that LNGDPPC depends on FD. Only panel parametric (ADF) t-statistic shows a rejection of the null hypothesis at 10% significance level. In addition, five statistics show LNGDPPC leads to FD. Thus, the evidence supports the existence of a relationship between overall financial development and economic growth in a panel of Thailand, Malaysia, and the Philippines. Furthermore, the panel cointegration tests also report the presence of cointegration between economic growth and development in the banking sector, stock and private bond markets.

FMOLS is adopted to estimate the long-run equilibria of the relationship. I employ an unweighted version of pooled panel FMOLS estimators. I consider two sets of endogenous variables with same the deterministic regressors: FINDEX, ACRISIS, GCRISIS, ACRISIS2, GCRISIS2, and CAPITAL. A constant is included in the cointegrating equation but no time trend is added. The lag-order in regression is fixed at 1-lag.

The first model examines financial development in the whole sector by applying FD. The FMOLS estimators of this model are demonstrated in Table 1. A positive correlation between LNGDPPC and FD is clearly shown at 1% significance level. Therefore, overall financial development may be beneficial to these countries' economic growth or vice versa.

Table 1 Fully-modified OLS with LNGDPPC and FD

Dependent var.: LNGDPPC		
Independent var.	*Coefficient*	*S.E.*
FD	0.0027***	0.0007

Note: The signs *** denotes significantly at 1% level of significance.

In the second model, I disaggregate overall financial development or FD into three indicators that are BANK, STOCK, and PRBOND. The panel cointegration estimators are demonstrated in Table 2. All coefficients of financial development indicators are positively related to GDP per capita, but that only BANK and PRBOND's effects are

significant. The insignificance of STOCK might come from that high volatility of stock markets in these three countries.

Table 2 Fully-modified OLS with LNGDPPC, BANK, STOCK, PRBOND

(a) Dependent var.: LNGDPPC		
Independent var.	*Coefficient*	*S.E.*
BANK	0.0055***	0.0011
STOCK	–0.0004	0.0006
PRBOND	0.0073**	0.0029
(b) Dependent var.: BANK		
Independent var.	*Coefficient*	*S.E.*
LNGDPPC	75.773***	16.167
STOCK	0.133*	0.068
PRBOND	–1.274***	0.334
(c) Dependent var.: STOCK		
Independent var.	*Coefficient*	*S.E.*
LNGDPPC	–30.446	34.149
BANK	0.441*	0.263
PRBOND	3.070***	0.559

Note: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively.

When considering the interactions between the banking system, stock market and bond market, developments in the banking industry and bond market are negatively correlated to each other. This result supports the view of the substitution between market finance and bank loans. Nevertheless, financial intermediaries and equity markets have a positive impact on each other although the relationship is not significant. This implies stock and bank loans are complementary finance for firms. Lastly, corporate bond markets and equity markets are also positively related. This is reasonable because stocks and bonds are generally financial instruments that serve complimentary purposes.

5.2 Time-series analysis results

In order to examine the stationarity of series, two individual unit root tests are employed: ADF and Phillips and Perron tests. The results found that all endogenous variables, LNGDPPC, BANK, STOCK, and PRBOND, are stationary after first differencing for all countries. In other words, they are integrated of order one. Moreover, all exogenous variables, FINDEX, CAPITAL and LABORP, are also integrated of order one for countries.

Since all of these endogenous variables are non-stationary, I need to verify that each set of endogenous variables is truly correlated by using the Johansen cointegration test. However, the number of observations is only 38 observations after adjustments for time-series analysis, so the lag-order for each model is one-lag for all models except the one for the Philippines' model. When LNGDPPC and FD are endogenous, lag length is

two for the Philippines. Even though this might not be optimum lag for each model, it would be better to preserve some degree of freedom.

The test shows that cointegration between LNGDPPC and FD significantly exists after including a set of dummies, D1 and D2, as endogenous variables. D1 and D2 are dummies for data availability. The availability of stock data, which started in 1990 for all counties, is indicated by D1. D2 represents the bond market's data, which became available since 1990 for Thailand and Malaysia, and since 1996 for the Philippines. When BANK, STOCK, and PRBOND are used as endogenous variables instead of FD, the test detects one cointegration between three financial development indicators and growth for each country.

I then estimate the relationships between finance and growth in each country by applying VECM. After testing for the best model for each country, the exogenous variables included in Thailand's model are FINDEX, ACRISIS2, GCRISIS2, and LABORP. Meanwhile, Malaysia's model contains FINDEX, ACRISIS, GCRISIS, ACRISIS2, GCRISIS2, and LABORP as exogenous variables. As for the Philippines, the model consists of FINDEX, ACRISIS2, GCRISIS2, and CAPITAL.

When considering overall financial development, the number of lags is one in Thailand's and Malaysia's models, while the lag length of the Philippines' model is two-lag. The cointegrating equation and the coefficients of a short-run relationship are displayed in Tables 3 and 4, respectively. In Table 3, financial development apparently has a positive and significant impact on economic growth in the long-run in Thailand and Malaysia. Conversely, a negative effect of finance is found in the case of the Philippines, but it is insignificant. However, the regression of the Philippine model without any exogenous variables indicates a positive and significant coefficient of FD in the cointegrating equation. This implies that all exogenous variables included cannot capture economic development in the Philippines.

Table 3 Cointegrating equation of the model with LNGDPPC and FD

CointEq1	*LNGDPPC*	*FD*	*Constant*
Thailand	1	0.012***	6.187
Malaysia	1	0.0051***	7.510
Philippines	1	–0.0056	7.214

Note: The signs *** denotes significantly at 1% level of significance.

The results in Table 4 show that the Asian financial crisis negatively affected Thai economic growth at a 5% level of significance, while the global financial crisis had a positive and insignificant impact. On the other hand, the Malaysian economy was affected by the global financial crisis with short-term negative effect and long-term positive impact, while the effect of the 1997-crisis on growth was negative and insignificant in both the short-and long-run. No significant coefficient of financial crises is detected in the Philippine model. Macroeconomic factor, represented by either CAPITAL or LABORP, is found to be essential to economic development for all three countries. However, financial development in both Malaysia and the Philippines is significantly devastated by the 1997-financial crisis in the long-run. Furthermore, financial rule and regulation (FINDEX) do not show any significant effect on both growth and finance in all countries.

Table 4 VECM with LNGDPPC and FD

	(a) Thailand		*(b) Malaysia*			*(c) Philippines*	
	D(LNGDPPC)	*D(FD)*	*D(LNGDPPC)*	*D(FD)*		*D(LNGDPPC)*	*D(FD)*
CointEq1	–0.015	46.536***	–0.038	125.696***	CointEq1	–0.0025	40.475*
	(0.039)	(14.591)	(0.034)	(31.738)		(0.075)	(21.504)
D(LNGDPPC(–1))	0.139	–42.811	–0.033	–131.608	D(LNGDPPC(–1))	0.427**	–16.872
	(0.127)	(47.494)	(0.105)	(99.598)		(0.171)	(49.122)
D(FD(–1))	0.0004	0.300	–0.00008	0.144	D(LNGDPPC(–2))	–0.087	12.347
	(0.0005)	(0.186)	(0.00019)	(0.175)		(0.158)	(45.248)
Constant	0.025**	1.357	0.014	34.070***	D(FD(–1))	0.0006	–0.458*
	(0.010)	(3.751)	(0.0088)	(8.350)		(0.0008)	(0.242)
D(FINDEX)	0.041	33.996	0.059	–24.950	D(FD(–2))	–0.0008	–0.204
	(0.093)	(35.069)	(0.058)	(54.422)		(0.0008)	(0.228)
ACRISIS	-	-	–0.016	3.562	Constant	0.004	8.746**
	-	-	(0.021)	(20.027)		(0.013)	(3.72)
GCRISIS	-	-	–0.046**	–5.045	D(FINDEX)	–0.046	8.951
	-	-	(0.021)	(19.901)		(0.102)	(29.377)
ACRISIS2	–0.023**	1.602	–0.008	–53.940***	ACRISIS2	0.013	–15.609**
	(0.012)	(4.328)	(0.015)	(14.411)		(0.024)	(6.950)
GCRISIS2	0.0037	–3.398	0.046**	–25.054	GCRISIS2	–0.0063	–6.894
	(0.017)	(6.433)	(0.018)	(17.281)		(0.021)	(5.968)
D(LABORP)	0.00006***	0.0068	0.00006***	–0.0046	D(CAPITAL)	0.0048***	0.680
	(0.00001)	(0.0047)	(0.00001)	(0.008)		(0.0018)	(0.508)

Note: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively.

A causal relationship is detected by using a multivariate causality test based on the VECM framework. The results of causality test in Table 5 strongly report that the development of the economy causes a shift in the financial sector in the long-run, but not vice versa for all countries. The detected causalities in Thailand and Malaysia are significant at a 99% confidence level, while the causality in Philippines is found at a 10% level of significance. In summary, the results support the hypothesis of a supply-leading view. This hypothesis means development in the real sector generates remarkably demand for financial services. On the other hand, financial development does not, in turn, provide significant support to the economy in those countries.

Table 5 Causality test for LNGDPPC and FD

	Short-run	*Long-run*	*Direction causality*
(a) Thailand			
H_0: $\Delta FD \nrightarrow \Delta G$	0.80	–0.37	No causality
H_0: $\Delta G \nrightarrow \Delta FD$	–0.90	3.19***	$\Delta G \nrightarrow \Delta FD$ in LR
(b) Malaysia			
H_0: $\Delta FD \nrightarrow \Delta G$	–0.43	–1.14	No causality
H_0: $\Delta G \nrightarrow \Delta FD$	–1.32	3.96***	$\Delta G \nrightarrow \Delta FD$ in LR
(c) Philippines			
H_0: $\Delta FD \nrightarrow \Delta G$	3.01	–0.03	No causality
H_0: $\Delta G \nrightarrow \Delta FD$	0.13	1.88*	$\Delta G \nrightarrow \Delta FD$ in LR

Note: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively.

Afterwards, I again separate FD into the three indicators BANK, STOCK, and PRBOND and re-estimate model with same exogenous variables. The cointegrating equations are shown in Table 6. The coefficients of these models are reported in Table 7 and the alphabet (a), (b), and (c) indicate the Thai, Malaysian, and Philippine models, respectively.

Table 6 Cointegrating equation with LNGDPPC, BANK, STOCK, PRBOND

CointEq1	*LNGDPPC*	*BANK*	*STOCK*	*PRBOND*	*Constant*
Thailand	1	0.0533***	0.1075***	–0.9818***	4.8159
Malaysia	1	0.0081***	0.0033***	–0.0164***	7.5135
Philippines	1	0.0169***	–0.013***	0.3784***	6.4512

Note: the signs *** denotes significantly at 1% level of significance.

According to Table 6, in the cases of Thailand and Malaysia, the results suggest that developments in financial intermediaries and the stock market have a positive correlation with GDP per capita in the long-run. Meanwhile, both bond markets are negatively related to per capita GDP. These two countries experience similar long-term effects with different magnitudes. The coefficients in the Thai model are obviously higher than in the Malaysian one. On the other side, developments in the Philippine banking sector and bond market are positively correlated with GDP per person in the long-run, while a negative long-term relationship between development in the equity market and GDP per capita is detected instead.

Table 7 VECM with LNGDPPC, BANK, STOCK, and PRBOND

	D(LNGDPPC)	*D(BANK)*	*D(STOCK)*	*D(PRBOND)*
(a) Thailand				
CointEq1	–0.0039	0.2352	6.5940***	–0.5077***
	(0.0035)	(0.4448)	(1.5587)	(0.1655)
D(LNGDPPC(–1))	–0.0273	63.7344***	9.5831	–10.2671
	(0.1325)	(16.6637)	(58.3964)	(6.2010)
D(BANK(–1))	–0.0036***	0.6773***	1.3889**	–0.0733
	(0.0014)	(0.1742)	(0.6104)	(0.0648)
	(0.00036)	(0.0456)	(0.1599)	(0.0170)
D(PRBOND(–1))	0.00203	–0.4583	–3.7442**	0.3133*
	(0.0039)	(0.4862)	(1.7040)	(0.1809)
Constant	0.0417***	–0.4057	–0.7777	0.6263
	(0.0103)	(1.2899)	(4.5202)	(0.48)
D(FINDEX)	0.065	–26.4441**	74.3975*	8.1011*
	(0.085)	(10.6879)	(37.4548)	(3.9772)
ACRISIS2	–0.0287**	–0.3634	–10.3482*	0.9291*
	(0.0120)	(1.5078)	(5.2840)	(0.5611)
GCRISIS2	0.0111	2.5099	–10.3606	0.1057
	(0.0159)	(2.0018)	(7.0151)	(0.7449)
D(LABORP)	0.000051***	–0.0029*	0.0128**	–0.0011*
	(0.000012)	(0.0015)	(0.0053)	(0.0006)
(b) Malaysia				
CointEq1	–0.0128	51.5952***	87.7895**	–4.5001
	(0.0277)	(11.6728)	(36.5554)	(6.6653)
D(LNGDPPC(–1))	–0.0052	–135.005**	–137.0459	41.9484
	(0.1529)	(64.3977)	(201.672)	(36.7719)
D(BANK(–1))	0.00016	–0.2400	0.9551	0.0248
	(0.00045)	(0.1886)	(0.5906)	(0.1077)
D(STOCK(–1))	0.000002	0.0550	–0.1475	–0.0362
	(0.00014)	(0.0578)	(0.1809)	(0.0330)
D(PRBOND(–1))	0.00081	–1.9590***	–1.2562	0.3017
	(0.0014)	(0.5992)	(1.8766)	(0.3422)
Constant	0.0139	30.9132***	40.1783	–1.9829
	(0.0164)	(6.9012)	(21.6123)	(3.9407)
D(FINDEX)	0.0705	0.6385	30.5275	–7.0397
	(0.0636)	(26.7735)	(83.8457)	(15.288)
ACRISIS	–0.0166	36.5086***	–22.4295	–3.7195
	(0.0281)	(11.8215)	(37.0212)	(6.7503)

Note: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively.

Table 7 VECM with LNGDPPC, BANK, STOCK, and PRBOND (continued)

	D(LNGDPPC)	*D(BANK)*	*D(STOCK)*	*D(PRBOND)*
GCRISIS	–0.0392*	–3.3177	–23.2024	–1.6030
	(0.0233)	(9.8104)	(30.723)	(5.6019)
ACRISIS2	–0.0104	–47.0563***	–70.3943**	4.8581
	(0.0246)	(10.3769)	(32.4972)	(5.9254)
GCRISIS2	0.0441*	–26.9672**	–51.6976	0.3856
	(0.0236)	(9.9328)	(31.1063)	(5.6718)
D(LABORP)	0.000052***	–0.0009	0.0048	–0.00024
	(0.000011)	(0.0045)	(0.0142)	(0.0026)
(c) Philippines				
CointEq1	–0.0453	19.4281***	–27.0174	–0.0864
	(0.0575)	(5.1871)	(19.3040)	(0.1798)
D(LNGDPPC(–1))	0.3750***	–2.6239	–10.0024	0.0016
	(0.1418)	(12.7918)	(47.6053)	(0.4435)
D(BANK(–1))	–0.00032	–0.1554	0.0522	0.0032
	(0.0019)	(0.1703)	(0.6338)	(0.0059)
D(STOCK(–1))	0.0013	–0.1010**	–0.1729	–0.0014
	(0.0008)	(0.0736)	(0.2741)	(0.0026)
D(PRBOND(–1))	–0.0215	13.9800	10.6846	0.1392
	(0.0799)	(7.2037)	(26.8088)	(0.2497)
Constant	0.0053	0.2343	4.1282*	0.0303
	(0.0068)	(0.6114)	(2.2753)	(0.0212)
D(FINDEX)	–0.0487	–1.8058	18.4191	–0.4851
	(0.1046)	(9.4334)	(35.1066)	(0.3270)
ACRISIS2	0.0094	0.7722	–9.9813*	0.0220
	(0.0155)	(1.3954)	(5.1931)	(0.0484)
GCRISIS2	–0.0123	1.0494	2.8698	–0.0814
	(0.017)	(1.5345)	(5.7107)	(0.0532)
D(CAPITAL)	0.0054***	0.2579*	0.0357	0.0017
	(0.0016)	(0.1397)	(0.52)	(0.0048)

Note: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively.

It is obvious that the Philippine stock market is less-developed compared to that of Thailand and Malaysia. High volatility in the Philippine equity market might devastate its own economic growth. Besides, the negative relationship between the bond market and GDP per capita in Thailand and Malaysia is an indication of the problems related to bond markets in ASEAN countries. Private bond markets in those countries are developing quickly, particularly after the outbreak of the global financial crisis. This boom in bond markets seems to occur in part because of a bubble-driven illusion. Therefore, it will be interesting to see whether the development of a corporate bond market will cause problems in future.

Moreover, the results show that financial intermediaries are positively related to per capita GDP for all countries. This implies the strength of banking sector in these countries, which is the most essential part of the financial sector in most developing countries.

The results also report that the Philippines has the fastest speed of adjustment with 4.53%, while Malaysia is second quickest with 1.28% and Thailand is slowest with 0.39%. The impact of both financial crises on either economic growth or financial development is clearly displayed in every model. Unfortunately, financial rule and regulation is significant only for Thailand's financial development indicators, whereas the shift in financial law has little effect on financial and economic development for Malaysia and the Philippines.

In addition, the causality test's results are reported in Table 8. Financial development has no impact on economic growth in the cases of Malaysia and the Philippines. However, only short-term causality from development in financial intermediaries to economic growth is detected in Thailand. On the other hand, causality runs from growth to financial development in all cases of Thailand. Economic development has an effect on the banking system in the short-term, and on the stock and bond markets in the long-run. In the case of Malaysia, economic growth Granger causes financial intermediaries in both short- and long-term and there is also long-run causality from growth to stock market. Meanwhile, economic development has a long-run impact on the banking sector in the Philippines.

Table 8 Causality test for LNGDPPC, BANK, STOCK, PRBOND

	Short-run	*Long-run*	*Direction causality*
Thailand			
H_0: $\Delta BA \nrightarrow \Delta G$	–2.62***	–1.11	$\Delta BA \nrightarrow \Delta G$ in SR
H_0: $\Delta S \nrightarrow \Delta G$	1.26	–1.11	No causality
H_0: $\Delta BO \nrightarrow \Delta G$	0.53	–1.11	No causality
H_0: $\Delta G \nrightarrow \Delta BA$	3.82***	0.53	$\Delta G \nrightarrow \Delta BA$ in SR
H_0: $\Delta S \nrightarrow \Delta BA$	0.64	0.53	No causality
H_0: $\Delta BO \nrightarrow \Delta BA$	–0.94	0.53	No causality
H_0: $\Delta G \nrightarrow \Delta S$	0.16	4.23***	$\Delta G \nrightarrow \Delta S$ in LR
H_0: $\Delta BA \nrightarrow \Delta S$	2.28**	4.23***	$\Delta BA \nrightarrow \Delta S$ in SR and LR
H_0: $\Delta BO \nrightarrow \Delta S$	–2.20**	4.23***	$\Delta BO \nrightarrow \Delta S$ in SR and LR
H_0: $\Delta G \nrightarrow \Delta BO$	–1.66	–3.07***	$\Delta G \nrightarrow \Delta BO$ in LR
H_0: $\Delta BA \nrightarrow \Delta BO$	–1.13	–3.07***	$\Delta BA \nrightarrow \Delta BO$ in LR
H_0: $\Delta S \nrightarrow \Delta BO$	–0.03	–3.07***	$\Delta S \nrightarrow \Delta BO$ in LR

Notes: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively. G, BA, S, and BO are abbreviated from LNGDPPC, BANK, STOCK, and PRBOND, respectively.

Table 8 Causality test for LNGDPPC, BANK, STOCK, PRBOND (continued)

	Short-run	*Long-run*	*Direction causality*
Malaysia			
H_0: ΔBA ↛ ΔG	0.35	–0.46	No causality
H_0: ΔS ↛ ΔG	0.02	–0.46	No causality
H_0: ΔBO ↛ ΔG	0.57	–0.46	No causality
H_0: ΔG ↛ ΔBA	–2.10**	4.42***	ΔG ↛ ΔBA in SR and LR
H_0: ΔS ↛ ΔBA	0.95	4.42***	ΔS ↛ ΔBA in LR
H_0: ΔBO ↛ ΔBA	–3.27***	4.42***	ΔBO ↛ ΔBA in SR and LR
H_0: ΔG ↛ ΔS	–0.68	2.40**	ΔG ↛ ΔS in LR
H_0: ΔBA ↛ ΔS	1.62	2.40**	ΔBA ↛ ΔS in LR
H_0: ΔBO ↛ ΔS	–0.67	2.4016**	ΔBO ↛ ΔS in LR
H_0: ΔG ↛ ΔBO	1.14	–0.68	No causality
H_0: ΔBA ↛ ΔBO	0.23	–0.68	No causality
H_0: ΔS ↛ ΔBO	–1.10	–0.68	No causality
Philippines			
H_0: ΔBA ↛ ΔG	–0.17	–0.79	No causality
H_0: ΔS ↛ ΔG	1.53	–0.79	No causality
H_0: ΔBO ↛ ΔG	–0.27	–0.79	No causality
H_0: ΔG ↛ ΔBA	–0.21	3.75***	ΔG ↛ ΔBA in LR
H_0: ΔS ↛ ΔBA	–1.37	3.75***	ΔS ↛ ΔBA in LR
H_0: ΔBO ↛ ΔBA	1.94*	3.75***	ΔBO ↛ ΔBA in SR and LR
H_0: ΔG ↛ ΔS	–0.21	–1.40	No causality
H_0: ΔBA ↛ ΔS	0.08	–1.40	No causality
H_0: ΔBO ↛ ΔS	0.40	–1.40	No causality
H_0: ΔG ↛ ΔBO	0.004	–0.48	No causality
H_0: ΔBA ↛ ΔBO	0.55	–0.48	No causality
H_0: ΔS ↛ ΔBO	–0.56	–0.48	No causality

Notes: ***, **, * indicate significantly at 1%, 5%, and 10% level of significance, respectively. G, BA, S, and BO are abbreviated from LNGDPPC, BANK, STOCK, and PRBOND, respectively.

Furthermore, since I capture three dimensions of financial development: in financial intermediaries, the equity market, and the bond market, the results also report interaction between developments in those markets. In the case of Thailand, the development of its banking system leads to development in its stock market in both the short-and long-term as well as in bond markets in the long-run. Moreover, there exists both short- and long-term causalities from equity market to bond market and, in turn, long-run causality runs from bond market to stock market. For the Malaysian economy, the stock market has a long-run impact on financial intermediaries and vice versa. Malaysia's bond market also affects its banking system in both short- and long-term as well as stock market in the long-run. In the Philippines, the bond market Granger causes the banking sector in the

both short- and long run and the stock equity market also leads financial intermediaries in the long-term.

6 Conclusions and policy implications

There has been research on relationship between financial development and economic growth for decades but this topic is still an ongoing debate in economic development. An agreeable conclusion has not been discovered, partly because of the differences in countries' specifications. This study also examines the existence of that relationship in Thailand, Malaysia, and the Philippines during the period 1974–2011. A panel cointegration test and estimation proposed by Pedroni are used to find and estimate a long-term relationship in the panel data. Furthermore, VECM is adopted to examine a relationship in the time-series data. Not only do I consider the financial development in the whole sector, I also divide the effect of financial development into three parts: the banking sector, stock market and private bond market.

When GDP per capita and overall financial development are endogenous variables, panel cointegration estimation, FMOLS, indicates a positive long-run relationship between overall financial development and economic growth. Afterwards, I divide financial development into the banking system, equity market, and corporate bond market. FMOLS estimators report that development in the banking sector and bond markets are positively correlated with economic growth in the long-run. At the same time, the correlation between the stock market and economic development is not significant. This is probably a result of the high volatility of the stock markets in these three countries.

Likewise, I examine the relationship in each country by using time-series data. Growth and overall financial development are positively correlated in the long-run in Thailand and Malaysia. However, insignificant negative correlation is found in the Philippines. I also divide financial development into the banking system, equity market, and corporate bond market. The Thai and Malaysian financial intermediaries and equity market are positively correlated with growth in the long-run, whereas the bond market is negatively related to GDP per capita. In the case of the Philippines, there is a negative long-term relationship between the stock market and per capita GDP instead but the rest are positively correlated with growth.

The findings obviously show that the banking industry has dominated the financial sector in Thailand, Malaysia, and the Philippines for a long time. Commercial banks were launched in these countries before capital markets and it has become the first option for funds for many households and firms. Thus, governments should support financial intermediaries to act normally in order to promote investment.

However, stocks and corporate bonds are used as alternative sources of finance. Although capital markets are still smaller than the banking sector, policymakers should encourage both stocks and bonds in order for risk diversification. If funds come only from banks and financial institutions, the system is put at risk when shocks in the banking industry occur. However, laws and regulations for equity and private bond markets should be a concern, particularly the stock market. The equity market is hard to control since this market is easily affected by other factors such as the foreign stock markets and political factors. Furthermore, the corporate bond market still lacks specific rules and regulations.

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