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The causality between financial development and economic growth: case of Asian economies

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Abstract

Abstract This paper investigates the long run relationship between financial development and economic growth for 16 Asian economies with different levels of income using of the system method, which is considered the most efficient manner. In addition, I employ Park's CCR test to estimate cointegrating vectors and run ordinary ECM as well as SURECM. Based on the results of Granger causality test in system method, I found strong evidence that causality exists between the financial development and economic growth, evidence that China has a huge impact on Asian economy, and a system method is superior to traditional regression methods. The question might give further guidance as to whether a well-developed financial sector is a necessary condition for a higher growth rates for developing countries and provide an important policy implication for countries that have financial sectors that are comparatively underdeveloped.

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1. Introduction

The purposes of this paper are to investigate the relationship between financial development and economic growth and to study the effectiveness of financial development on economic growth for 16 Asian economies by using a system approach. In conducting this study, Park's (1992) Canonical Cointegrating Regression (CCR), Seemingly Unrelated Regression Error Correction Model (SURECM) and Granger (1969) causality tests in a system method are used as empirical evidence. The study presents further evidence concerning the debate over whether financial development leads economic growth in a Granger causality sense among high-income, middle-income, and low-income countries from Asian regions. The main contribution of this study is to examine the long-run dynamics and causality relationship between financial development and economic growth in multivariate SURECM system setting for selected countries. SURECM and Granger causality tests provide further evidence on the relationship between financial development and economic growth, because the system method in this study accounts for cross equation correlations among countries and utilizes information in the variance-covariance matrix of residual to improve the efficiency of statistical estimates. The empirical results of this study clearly support the hypothesis that bidirectional relationships exist between financial development and economic growth.

Based on the results of a Granger causality test in system method, I found: 1) strong evidence that causality exists between financial development and economic growth, more specifically, direction of causality is bidirectional in most cases; 2) a tendency of reverse causality running from growth to finance when broad money is used as financial proxy, pointing to the important role of formal bank intermediation for economic growth; 3) cases of one-way causality, such as positive and reverse causality are more prominent for middle- to low-income countries; 4) an evidence that China has a huge impact on the Asian economy and, more precisely, it has a significant impact on developing economies, such as middle- and low-income countries, and 5) that system method used with CCR analysis are superior to traditional regression methods. These results are consistent with the conclusions of Demetriades and Luintel (1996), Arestis and Demetriades (1997), and Shan, Morris, and Sun (2001). The main findings of this study show little evidence that financial development is a necessary and sufficient precondition to economic growth.

The remained of the paper is organized as follows: Section 2 discusses the literature review. Section 3 describes the data, model and methodology used to conduct this study. Section 4 discusses empirical results, and Section 5 discusses summary and conclusion.

2. Review of Literature

This topic has been comprehensively studied in theoretical and empirical literature. The theoretical foundation of this relationship can be dated back to the work of Shumpeter (1911) and later Goldsmith (1969), McKinnon (1973), and Shaw (1973). Economists have held controversial opinions regarding the role of a financial system in economic growth, primarily three main opposing theoretical views. Joseph Shumpeter argues that "well-functioning banks spur technological innovation by identifying and funding those entrepreneurs with the best chances of successfully implementing innovative products and production processes." An important part of his discussion is that financial intermediaries make technological innovation and economic development possible. McKinnon and Shaw argue that a more liberalized financial system will induce savings and investment, which in return promotes economic growth. The "Goldsmith-McKinnon-Shaw" hypothesis claims that financial liberalization in the form of an appropriate rate of return on real cash balances is a moving force in promoting economic growth.

The endogenous growth literature also talks about the importance of financial development for long-run economic growth through the impact of financial sector services on capital accumulation and technological innovation. Economists such as Robinson (1952), Kuznets (1955) and Lucas (1988) argue that the role of the financial sector is overstated or that financial development follows expansion of the real sectors of the economy. Lucas expressed that the role of financial development is "over-stressed." Endogenous growth theorists view that causality runs from growth to financial development.

Recent theorists argue that there is a two-way relationship between financial development and economic growth. Among them, Greenwood and Jovanovic (1990) discuss a model in which both the financial sector and economic growth are endogenously determined. The model shows a bidirectional causal relationship between financial development and economic growth.

Most of the recent literature examined the causality between financial development and economic growth from the empirical perspective. Shan and Morris (2002) investigated the relationship between financial development and economic growth for 19 countries belonging to the Organisation for Economic Co-operation and Development (OECD) and China. The empirical evidence gives little support to the hypothesis that financial development "leads" economic growth and supports the conclusions of Arestis and Demetriades (1997) and Demetriades and Hussein (1996) that the link between financial development and economic growth may be country specific and might be affected by differences in industrial structures, cultures of the selected countries, and other institutional factors. They suggested that financial development is not a necessary and sufficient precondition to economic growth.

Patrick (1966) discusses supply-leading and demand-following as two alternative hypothesis of the possible causal relationship between financial development and economic growth in developing countries. He also suggests the stages of development hypothesis, which says that the direction of causality between financial development and economic growth changes during the stages of development. He notes the possibility of bidirectional causality between financial development and economic growth at this stage.

King and Levine (1993a) examined a cross section of 80 countries and concluded that "financial services stimulate economic growth by increasing the rate of capital accumulation and by improving the efficiency with which economies use that capital."

Demetriades and Hussein (1996) performed the causality tests for 16 developing countries and found bidirectional causality in eight countries and reverse causality in eight countries. They concluded that "causality patterns vary across countries and, therefore, highlights the dangers of statistical inference based on cross-section country studies that implicitly treat different countries as homogeneous entities." Levine (1997), Levine (1998), and Levine and Zervos (1998) employed a cross-sectional modeling framework, and the empirical results of these studies supported the hypothesis that financial development leads to economic growth.

Luintel and Khan (1999) studied the long-run relationship between financial development and economic growth by employing a multivariate VAR method using the data of ten developing countries. They found evidence of only bidirectional causality for all countries, which was distinct from all previous studies.

Al-Yousif (2002) examined the nature and direction of causality between financial development and economic growth using both time-series and panel data from 30 developing countries for the period of 1970-1999. His findings strongly support the view that financial development and economic growth are "mutually causal," or there is bidirectional causality. The empirical results of Al-Yousif's paper were in line with other empirical studies that "the

relationship between financial development and economic growth cannot be generalized across countries because economic policies are country specific, and their success depends on, among other things, the efficiency of the institutions implementing them." These results all show there is no agreement on the role of financial development in the process of economic growth.

Christopoulos and Tsionas (2004) examined the long-run relationship between financial development and economic growth by using a panel unit root test and panel cointegration analysis for 10 developing countries. The results suggest that there is strong evidence of long-run causality from financial development to growth and no evidence of bidirectional causality between financial deepening and output, signifying that the effect is necessary long run in nature. Thus, they have concluded that "policies aiming at improving financial markets will have a delayed effect on growth, but this effect is significant."

3. Methodology

The main objective of this study is to investigate the causal relationship between financial development and economic growth using time series data for the 16 Asian economies with high-, middle-, and low-income levels of Australia, Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, and Thailand over the period of 1980-2010. From 1980 through 2010 is the time of development of financial institutions and financial liberalization in many Asian countries. This period can also be characterized as that of rapid economic growth of the Asian tigers, output expansion, money growth, trade and investment increase, technological advances, and globalization. Even though countries in this study are from the same geographic region, the pattern of economic growth and financial development appear to differ over time and across countries. The data set of selected Asian countries represents the homogeneity of countries within the region and heterogeneity of cross-countries and income groups. The data frequency used in this study is annual. All the data are obtained from the World Bank World Development Indicators 2011 (WDI) database except the data on broad money, which was obtained from International Monetary Fund International Finance Statistics (2011).

The selection of variables in this model is based on the theoretical as well as empirical framework of previous studies. For economic development, the natural logarithm of real GDP (LY) is used to measure economic growth. Levine and Zervos (1998) and Arestis, Demetriades, and Luintel (2001) suggested that even though both banks and stock markets could promote the economic growth, the effects of banks are far more significant. Also 11 of the 16 countries in this study are considered as low- and middle-income countries based on World Bank definition. Specifically, 5 countries in this sample are low-income countries with a very low level of stock market development. Therefore, time series data on stock market is very limited due to level of financial sector development. Following this conclusion and given the countries examined, a bank-based measure of financial development is suitable in this study rather than stock market-based financial measures. There is not a single empirical definition of bank-based financial development (Beck, Demirguc-Kunt, and Levine (2009)). Following King and Levine (1993a), Levine and Zervos (1998), Beck, Demirguc-Kunt, and Levine (2009), and the standard literature, the ratio of M2 to GDP (BM) is used to measure the broad money in the economy, which is the sum of currency, demand, and interest bearing liabilities of banks and other financial intermediaries divided by GDP. This is a very popular and widely used indicator to measure the size of financial intermediation. A higher ratio of M2 to GDP indicates a higher intensity of the banking system and financial intermediation.

It's clear that factors other than financial development have an impact on economic growth. Three other variables used to control for other factors associated with economic growth are the ratio of trade to GDP (TY), which measures the size of real sector and trade policy; the ratio of government final consumption expenditures to GDP (GOVY), which measures the weight of fiscal policy; and inflation rate (CPI) measured by CPI, which measures price (in)stability in the economy.

To investigate long-run relationship between economic growth and financial development, the following model is used:

$$LY_{it} = a_0 + a_1 \boldsymbol{BM_{it}} + b_1 TY_{it} + b_2 GOVY_{it} + b_4 CPI_{it} + e_{it}, \quad (1)$$

where LY_{it} is a natural logarithm of real GDP in country *i* and year *t*, BM_{it} is the ratio of broad money to GDP, TY_{it} is the ratio of total trade to GDP, $GOVY_{it}$ is the ratio of government spending to GDP, CPI_{it} is the inflation measured by consumer price index, and e_{it} is an error term.

It's essential to test if variables have the tendency to return to the long-term trend following a shock (stationary) or if the variables follow a random walk (containing unit root). It's well known that if the variables follow a random walk after any shock, the regression result between variables is spurious, and series don't have a finite variance. As a result, OLS will not produce consistent estimates. To test for stationarity in this study, the Augmented Dickey-Fuller (ADF) test was performed.

When time series variables are non-stationary, it is important to see if there is a certain common trend between those non-stationary series. If two non-stationary series $X_t \sim I(1)$ and $Y_t \sim$ "(1)" have a linear relationship such that $Z_t = Y_t - \gamma X_t$ and $Z_t \sim I(0)$, (Zt is stationary), then these two series are deemed cointegrated. In this study, we used Park's CCR to test for a long-run relationship by computing cointegrating vectors. The main advantage of using Park's CCR test is that this test not only shows the number of cointegrating vectors but also the presence of deterministic and stochastic cointegrating terms.

Based on results of Park's CCR test for cointegration, an error correction model (ECM) can be performed. ECM specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships and still allows for short-run adjustment dynamics. Using ECM allows the discovery of Granger Causality relation. The cointegrating factor Z_t, can be estimated if the value of α_1 is known by estimating $Z_t = Y_t - \hat{\alpha} x_t$. ECM estimates the potential short-run and long-run effects of these two variables on each other:

$$x_t - x_{t-1} = a_0 + a_1 \hat{Z}_{t-1} + \sum_{i=1}^{m} b_i \left(y_{t-i} - y_{t-i-1}\right) + \sum_{j=1}^{m} c_j \left(x_{t-j} + x_{t-j-1}\right) + \varepsilon_t, \quad (2)$$

$$y_t - y_{t-1} = \alpha_0 + \alpha_1 \hat{Z}_{t-1} + \sum_{i=1}^{m} \phi_i \left(y_{t-i} - y_{t-i-1}\right) + \sum_{j=1}^{m} \theta_j \left(x_{t-j} + x_{t-j-1}\right) + \mu_t. \quad (3)$$

The ECM equations of "(2)" and "(3)" decompose the dynamic adjustments of the dependent variables X into two components: 1) a long-term component given by cointegrating term $\alpha_1 \hat{Z}_{t-1}$, or error correction term, and 2) short-term components given by the summation terms on the right hand side of the equations. Based on the equations "(2)" and "(3)", variables y_t and x_t are cointegrated and exhibit the long-term co-movements when at least one of the coefficients α_1 or a_1 is different from zero. The short-run relation between y_t and x_t is given by coefficients b_i and φ_i. One basis of causality tests is that if b_i's are not all zero and φ_i all zero, then *x* is causing *y* in the short-run. However, if both coefficients are different from zero, then feedback exists and the two variables affect each other in the short-run.

Seemingly unrelated ECM (SURECM) was then run using the error correction term $\hat{Z}_t$, which can be estimated using the cointegration vector from Park's CCR. Contemporaneous errors result in seemingly unrelated models, which may be correlated across the system of equation. As Zellner (1962) suggested, a single model may contain a number of linear equations. In such a model, it is often unrealistic to expect that the equation errors would be uncorrelated. A set of equations that has contemporaneous cross-equation error correlation (i.e. the error terms in the regression equations are correlated) is called a seemingly unrelated regression (SUR) system. At first look, the equations seem unrelated, but the equations are related through the correlation in the errors.

Correlation and cointegration do not necessarily imply the causality in any meaningful sense of the word. In this study regular, a VAR based Granger (1969) causality test and a Granger causality test based on SURECM in system method were employed to compare the results of a regular Granger test to those of a system method. The Granger method is employed to question whether x_t causes y_t and to determine how much of the current value of y_t can be explained by past values of y_t. Then it can be determined whether adding lagged values of x_t can improve the explanation of y_t. Rejection of null hypothesis implies that current and past lagged values of x_t help predict the current values of y_t.

4. Empirical Results

In most of the cases, we fail to reject the null hypothesis that contains a unit root. ADF test results confirm that almost all variables are non-stationary at 5% significance level, and they are stationary after first differencing. We run Park's CCR to test for long-run dynamics and for the presence of deterministic or stochastic cointegrating terms and estimate the cointegrating vector for every single variable for each country. In order to run Park's CCR, we adopted Masao Ogaki's Gauss code for Park's CCR and modified it for the given data set and model specifications. The results of the CCR test are provided in Table 1 and show that all countries exhibit the presence of stochastic cointegrating term except Nepal and Papua New Guinea, which could be explained by quality of data set available for these two countries. Thus, we can conclude that almost all countries in our model exhibit the presence of cointegration, either its deterministic or stochastic cointegrating term. In addition to presence of cointegrating term, the magnitude and the signs of cointegrating vectors are consistent with the economic theories and expectations.

The results of ordinary ECM and SURECM are reported in Table 2 and show that only India has a cointegrating relationship between financial development and economic growth. However, the results of the non-restrictive SURECM show that there are nine countries out of 16 that have statistically significant point estimates of speed of adjustment coefficient $\hat{\lambda}_0$, and we reject the null hypothesis in the restrictive SURECM model. We run the sensitivity analysis by running SURECM without China, which shows a slight reduction in the number of countries with statistically significant coefficients and fairly similar results for the restrictive model.

A Granger causality test based on an ordinary VAR and a Granger causality test based on SURECM methods are employed to test for contemporaneous causality and find the direction of causality. The results of the VAR based Granger causality tests are reported in Table 3.

The VAR based Granger causality test results indicate the evidence of no causality in six countries, positive causality running from finance to growth in five countries, reverse causality running from growth to finance in one country, and bidirectional causality in four countries. These results however are in sharp contrast to those of King and Levine (1993a) and Rajan and Zingales (1998), who applied cross sectional approach and concluded that "financial

development is a necessary precursor of economic growth". Based on the VAR based Granger causality test results, we can conclude that: 1) the pattern of causality between financial development and economic growth may be country specific; and 2) the direction of causality might be different due to the econometric methods selected to examine the causality itself. Our empirical evidence of the VAR based Granger causality test is consistent with previous literature, where the VAR method was employed and contradicts the findings of studies where cross sectional or panel data approach were used.

The SURECM based Granger causality test results are reported in Tables 3 and 4, which contain Granger causality test results for different income groups as well as results with/without China. Numerous and interesting empirical evidence is shown in the SURECM based Granger causality test results, and the results vary with the inclusion/exclusion of China and income group levels. The Granger causality test shows that ten countries out of 16 have bidirectional causality, and six countries have reverse causality. Test results for the high-income group demonstrate three countries with bidirectional causality, one country with reverse and one country with positive causalities. Half of the middle-income country group exhibits bidirectional causality, two countries with reverse and one country with positive causalities. The low-income sub-group also contains similar results to the middle-income group: three countries have bidirectional causality and the remaining two countries have reverse causality.

The three words, "made in China," have been widely seen over the last decade. The results of the Granger causality test with and without China highlight the important role and impact of China in the region. Granger causality test results for all countries without China show that now only six countries have bidirectional causality relationship, seven countries have reverse and one country has positive causalities, and Thailand does not have any causality relationship between finance and economic growth. This effect is more significant among developing countries, especially for middle income countries. Four out of five countries in the middle-income sub-group do not have any causality relationship between financial development and economic growth after excluding China. This evidence clearly demonstrates the importance of the Chinese economy in the region; more precisely China is important and integral part of the Asian economy, a major trading partner, an investor, and the largest producer.

5. Summary and Conclusion

The main purpose of this study is to investigate the long-run dynamics and the direction of causality between financial development and economic growth for 16 Asian economies with different levels of income using the system method, which is considered the most efficient manner. Based on the results of the Granger causality test via the system method, I found: 1) strong evidence that causality exists between financial development and economic growth, more specifically, the direction of causality is bidirectional in most cases; 2) a tendency of reverse causality running from growth to finance when BM is used as a financial proxy, pointing to the important role of formal bank intermediation in economic growth; 4) cases of one-way causality, such as positive and reverse causality are more prominent for middle- to low-income countries; and 5) evidence that China has a huge impact on the Asian economy, and more precisely, it has a significant impact on developing economies, such as middle- and low-income countries. These results are consistent with earlier literature in that the direction of causality may be country specific. However, it does not support King and Levine's (1993a) conclusion that finance is a leading sector to economic growth. The findings clearly demonstrate that the directions of causality vary across countries and emphasize that the system method is superior to the single equation approach. The question might give some further guidance as to whether a well-

developed financial sector is a necessary condition for higher growth rates in developing countries and provide an important policy implication both for OECD countries as well as for countries that have financial sectors that are comparatively underdeveloped.

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Table I. Park's CCR test results

LY =f(BM, TY, GOVY, CPI)

	β [(a)]						
	BM	TY	GOVY	CPI	H(0,1)[(b)]	H(1,2)[(b)]	H(1,3)[(b)]
AUSTRALIA	-0.215	0.221	-0.159	0.077	1.830	19.913	22.849
	(0.008)	(0.004)	(0.004)	(0.001)	(0.176)	(0.000)	(0.000)
BANGLADESH	-0.040	0.034	0.044	-0.045	108.457	0.041	5.058
	(0.044)	(0.016)	(0.011)	(0.014)	(0.000)	(0.840)	(0.080)
CHINA	-0.118	0.014	-0.039	0.085	9.454	0.002	1.602
	(0.054)	(0.009)	(0.028)	(0.036)	(0.002)	(0.964)	(0.449)
INDIA	0.571	0.030	-0.045	0.087	2.804	0.283	5.310
	(0.062)	(0.004)	(0.001)	(0.002)	(0.094)	(0.595)	(0.070)
INDONESIA	0.095	-0.044	0.045	0.000	6.605	2.263	2.441
	(0.014)	(0.006)	(0.006)	(0.001)	(0.010)	(0.132)	(0.295)
JAPAN	0.022	0.006	0.011	-0.047	0.097	0.011	10.937
	(0.022)	(0.000)	(0.001)	(0.010)	(0.755)	(0.915)	(0.004)
KOREA	0.264	-0.006	0.089	-0.031	0.376	0.457	13.246
	(0.040)	(0.003)	(0.014)	(0.010)	(0.540)	(0.499)	(0.001)
MALAYSIA	-0.235	-0.047	0.018	0.003	0.314	1.988	26.309
	(0.088)	(0.012)	(0.001)	(0.001)	(0.575)	(0.159)	(0.000)
NEPAL	-0.062	0.017	0.035	-0.012	0.819	2.212	2.988
	(0.061)	(0.012)	(0.003)	(0.002)	(0.366)	(0.137)	(0.224)
NEW ZEALAND	-0.002	0.019	0.006	0.004	28.045	1.422	1.592
	(0.008)	(0.004)	(0.001)	(0.001)	(0.000)	(0.233)	(0.451)
PAKISTAN	0.419	0.004	-0.059	-0.062	6.029	0.037	0.109
	(0.066)	(0.014)	(0.013)	(0.008)	(0.014)	(0.847)	(0.947)
PAPUA N.G.	-0.112	0.003	0.002	-0.045	0.070	0.020	3.619
	(0.028)	(0.001)	(0.006)	(0.009)	(0.791)	(0.887)	(0.164)
PHILLIPPINES	-0.063	0.009	0.043	-0.004	0.078	0.711	34.250
	(0.014)	(0.003)	(0.002)	(0.001)	(0.780)	(0.399)	(0.000)
SINGAPORE	-0.137	0.022	0.043	-0.006	0.352	5.307	6.348
	(0.011)	(0.003)	(0.001)	(0.000)	(0.553)	(0.021)	(0.042)
SRI LANKA	0.088	0.006	0.073	0.024	42.702	0.001	0.054
	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.974)	(0.974)
THAILAND	-0.192	-0.015	-0.011	0.033	0.494	1.655	10.463
	(0.017)	(0.005)	(0.003)	(0.003)	(0.482)	(0.198)	(0.005)

LY: log of GDP; BM: broad money/GDP; TY: trade/GDP;

GOVY: government expenditure/GDP; CPI: inflation measured by CPI.

For column (a): numbers in paranthesis are st.errors, for (b): numbers in paranthesis are p-values.

The H(0, 1) statistic tests the determininstic cointegrating restriction and

the H(1, q) statistic tests stochastic cointegration.

Table II. ECM and SURECM Results
LY = f(BM, TY, GOVY, CPI)

countries	Regular ECM:	λ: SURECM: a) all	b) high income	c) middle income	d) low income	e) all w/o China	f) middle income w/o China
Australia	0.002	0.002	0.001			0.002	
	(0.002)	(0.001)	(0.001)			(0.001)	
Bangladesh	0.011	0.015			0.008	0.014	
	(0.005)	(0.003)			(0.003)	(0.002)	
China	0.001	0.001		0.001			
	(0.001)	(0.000)		(0.001)			
India	-0.003 **	-0.002 **			-0.004 ***	-0.003 ***	
	(0.001)	(0.001)			(0.001)	(0.001)	
Indonesia	0.015	0.022		0.033		0.018	0.016
	(0.011)	(0.006)		(0.008)		(0.004)	(0.006)
Japan	0.008	-0.015 ***	0.006			-0.02 ***	
	(0.006)	(0.004)	(0.006)			(0.004)	
Korea	0.004	0.005	0.003			0.006	
	(0.002)	(0.001)	(0.002)			(0.001)	
Malaysia	-0.000	-0.002 ***		-0.002 ***		-0.002 ***	-0.000
	(0.000)	(0.001)		(0.001)		(0.001)	(0.000)
Nepal	0.001	-0.015 ***			-0.012 ***	-0.015 ***	
	(0.005)	(0.002)			(0.003)	(0.002)	
New Zealand	0.017	-0.051 *	0.014			-0.041 *	
	(0.019)	(0.016)	(0.013)			(0.014)	
Pakistan	0.002	-0.005 ***			-0.002	-0.004 **	
	(0.003)	(0.002)			(0.003)	(0.002)	
PNG	-0.003	-0.028 **			-0.013	-0.013	
	(0.014)	(0.013)			(0.020)	(0.011)	
Phillippines	0.002	0.002		0.012		0.000	0.006
	(0.003)	(0.003)		(0.004)		(0.002)	(0.003)
Singapore	-0.002	-0.007 ***	-0.003 *			-0.002	
	(0.002)	(0.002)	(0.002)			(0.002)	
Sri Lanka	0.004	0.007		-0.021		0.021	-0.009
	(0.009)	(0.013)		(0.019)		(0.010)	(0.012)
Thailand	-0.001	-0.004 *		-0.003		-0.003 *	-0.001
	(0.001)	(0.002)		(0.003)		(0.002)	(0.001)
with restrictions		-0.001 **	-0.001	-0.001 ***	-0.004 ***	-0.001 ***	-0.001
		(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
chi2		200.690	41.940	196.300	23.200	255.710	11.035
p-value		(0.000)	(0.999)	(0.000)	(0.000)	(0.000)	(0.023)

Note: * , ** and *** denote the significance at the 10%, 5%, and 1 % levels respectively.
Numbers in the paranthesis represent standard errors.

Table III. Granger Causality Test
LY= f(BM, TY, GOVY, CPI)
Granger Causality Test for all countries

	Standard Granger Causality Test					SURECM based Granger Causality Test				
country	Finance to growth		Growth to finance		Two/one-way	Finance to growth		Growth to finance		Two/one-way
	$\chi 2$ -stat	p-value	$\chi 2$ -stat	p-value		$\chi 2$ -stat	p-value	$\chi 2$ -stat	p-value	
AUSTRALIA	0.000	0.000	0.064	0.800	One-way	537.790	0.000	1.760	0.416	One-way
BANGLADESH	0.003	0.956	3.184	0.074	One-way	26.560	0.000	15.670	0.000	Two-way
CHINA	17.162	0.000	5.560	0.062	Two-way	54.120	0.000	16.430	0.000	Two-way
INDIA	8.158	0.017	5.622	0.060	Two-way	47.830	0.000	8.450	0.015	Two-way
INDONESIA	0.230	0.632	0.287	0.592	None	2.260	0.132	29.180	0.000	One-way
JAPAN	0.000	0.000	11.513	0.001	Two-way	33.260	0.000	61.000	0.000	Two-way
KOREA	0.123	0.940	0.565	0.452	None	10.210	0.006	50.810	0.000	Two-way
MALAYSIA	1.066	0.587	0.231	0.891	None	21.780	0.000	60.070	0.000	Two-way
NEPAL	6.545	0.038	0.830	0.362	One-way	22.940	0.000	12.150	0.002	Two-way
NEW ZEALAND	11.648	0.003	4.366	0.113	One-way	87.050	0.000	14.870	0.001	Two-way
PAKISTAN	0.000	0.000	3.016	0.082	Two-way	14.790	0.000	7.180	0.007	Two-way
PAPUA N.G.	1.651	0.199	0.060	0.806	None	82.790	0.000	0.010	0.918	One-way
PHILLIPPINES	7.502	0.006	0.222	0.637	One-way	0.720	0.396	12.230	0.000	One-way
SINGAPORE	4.670	0.031	0.892	0.345	One-way	20.710	0.000	0.280	0.598	One-way
SRI LANKA	0.302	0.583	0.070	0.791	None	6.820	0.009	6.560	0.010	Two-way
THAILAND	0.002	0.961	0.00097	0.975	None	0.220	0.642	22.060	0.000	One-way

Table IV. Granger Causality Test with/without China

LY= f(BM, TY, GOVY, CPI)

Granger Causality Test in system setting for all countries (w/o China)

country	Finance to growth		Growth to finance		Two/one-way
	χ2 -stat	p-value	χ2 -stat	p-value	
AUSTRALIA	334.660	0.000	4.780	0.092	Two-way
BANGLADESH	1.580	0.209	7.760	0.005	One-way
INDIA	9.850	0.007	7.570	0.023	Two-way
INDONESIA	2.790	0.095	16.930	0.000	Two-way
JAPAN	3.330	0.189	18.490	0.000	One-way
KOREA	3.540	0.711	58.150	0.000	One-way
MALAYSIA	0.010	0.996	27.980	0.000	One-way
NEPAL	21.250	0.000	42.430	0.000	Two-way
NEW ZEALAND	49.080	0.000	5.040	0.080	Two-way
PAKISTAN	0.490	0.483	20.010	0.000	One-way
PAPUA N.G.	26.340	0.000	0.250	0.618	One-way
PHILLIPPINES	0.170	0.682	10.050	0.002	One-way
SINGAPORE	7.310	0.007	0.100	0.752	One-way
SRI LANKA	13.230	0.000	7.890	0.005	Two-way
THAILAND	1.510	0.219	2.030	0.154	None

Granger Causality Test in system setting for high-income countries

country	Finance to growth		Growth to finance		Two/one-way
	χ2 -stat	p-value	χ2 -stat	p-value	
AUSTRALIA	40.970	0.000	48.880	0.000	Two-way
JAPAN	5.610	0.061	2.700	0.258	One-way
KOREA	1.500	0.473	12.410	0.020	One-way
NEW ZEALAND	27.680	0.000	19.330	0.000	Two-way
SINGAPORE	19.350	0.000	34.150	0.000	Two-way

Granger Causality Test in system setting for middle-income countries

country	Finance to growth		Growth to finance		Two/one-way
	χ2 -stat	p-value	χ2 -stat	p-value	
CHINA	34.730	0.000	24.270	0.000	Two-way
INDONESIA	59.570	0.000	1.040	0.309	One-way
MALAYSIA	7.890	0.019	15.550	0.000	Two-way
PHILLIPPINES	0.980	0.323	4.590	0.032	One-way
SRI LANKA	0.570	0.452	4.620	0.032	One-way
THAILAND	5.700	0.017	10.720	0.001	Two-way

Granger Causality Test in system setting for middle-income countries (w/o China)

country	nce to growth		Growth to finance		Two/one-way
	χ2 -stat	p-value	χ2 -stat	p-value	
INDONESIA	0.230	0.632	1.070	0.301	None
MALAYSIA	1.090	0.581	2.130	0.346	None
PHILLIPPINES	10.970	0.001	12.780	0.000	Two-way
SRI LANKA	1.390	0.238	0.210	0.649	None
THAILAND	0.070	0.794	0.030	0.861	None

Granger Causality Test in system setting for low-income countries

country	Finance to growth		Growth to finance		Two/one-way
	χ2 -stat	p-value	χ2 -stat	p-value	
BANGLADESH	0.020	0.889	11.820	0.001	One-way
INDIA	16.680	0.000	17.120	0.000	Two-way
NEPAL	16.700	0.000	6.130	0.047	Two-way
PAKISTAN	0.340	0.563	4.030	0.045	One-way
PAPUA N.G.	6.960	0.008	8.990	0.003	Two-way