

FINANCIAL DEEPENING AND ECONOMIC GROWTH: EVIDENCE FROM ASIAN ECONOMIES

John Thornton

International Monetary Fund and University of Wales, Bangor

1. Introduction

An important debate in development economics has centered on the role of financial factors in economic growth.¹ For Asian countries in particular, the focus of this debate has been on the role of unrepressed financial markets in mobilizing savings, allocating investment, and fostering economic growth. In their seminal work, McKinnon (1973) and Shaw (1973) argue that a "repressed" financial system (i.e. one in which governments tax and otherwise distort their domestic capital markets) interferes in a number of ways with development. For example, savings vehicles are underdeveloped, the return on savings is negative or unstable, financial intermediaries who collect the savings do not allocate them efficiently among competing users, and firms are discouraged from investing because poor financial policies reduce returns or make them excessively unstable. Remedying financial repression by liberalizing the financial system permits financial deepening and promotes growth. In a later study, McKinnon (1991) argues that "...a high or rising M3/GNP ratio indicates a large real flow of domestic loanable funds for new investments" and that "...a higher rate of financial growth and rising M3/GNP ratios are positively correlated with higher growth in real gross domestic product (p. 14)." A similar argument is also advanced by the World Bank (1989) which suggests that "...in its own right...greater financial depth also contributes to [economic] growth by improving the productivity of investment... Provided that intermediaries are good at selecting viable projects, greater intermediation will ensure that the better investments are financed and will thereby increase the average productivity of investment (p. 31)."

The McKinnon-Shaw approach typically assumes that the official banking system is more efficient at allocating investible funds than is the curb market in which moneylenders intermediate between savers and investors. In addition, it is assumed that households substitute out of unproductive tangible assets (inflation hedges) when the financial system is liberalized, thereby raising the total real supply of credit, the quantity and quality of investment, and the rate of economic growth. In contrast, the neo-structuralists view the curb markets as "often competitive and agile (Taylor 1983, p. 92)" and the official banking system as encumbered with reserve requirements which constitute a leakage in the process of financial intermediation. In addition, the neo-structuralists argue that in

1. For a more complete survey of the issues involved see Fry (1989), Dornbusch and Reynoso (1989), and Thornton (1991).

the process of financial deepening households substitute mainly out of curb market loans — i.e. financial deepening results mainly at the expense of direct lending in the curb market. As such, they conclude that, in practice, financial deepening is likely to reduce the total real supply of credit available, the quantity of investment, and the rate of economic growth. Thus according to Buffie (1984) "...once we allow for repercussions in the curb market, financial liberalization becomes a perilous undertaking (p. 320)."

A third possibility has been as put forward by Patrick (1966) who argued that financial deepening was important for growth but that its importance changed as growth proceeded. Thus "...as the process of real growth occurs, the supply leading impetus [of financial deepening] gradually becomes less important, and the demand following financial response becomes dominant (p. 64)."

There are then at least three plausible hypotheses about the role of financial deepening in economic growth, each of which assumes some form of long-run relationship between the two phenomena.

The few empirical studies that relate directly financial deepening and economic growth (e.g. Jao 1976, Jung 1986, Lanyi and Saracoglu 1983, Patrick 1966) have generally relied on reduced form models connecting the growth rates of real output and financial deepening variables. However, to ensure confidence in causality, the time series properties of the variables must be examined since these determine the shape taken by the statistical tests. Accordingly, in this paper financial deepening and economic growth variables for selected Asian economies are subjected first to cointegration analysis to test for long-run or equilibrium relationships among the variables. In the absence of such a relationship, the analysis is then conducted in terms of Granger causality tests.

The relationship between financial deepening and economic growth is examined for a number of Asian countries for which suitable data are available. In empirical work, McKinnon and other economists have generally proxied financial deepening by the ratio of some broad measure of the money supply to GNP or GDP, depending upon data availability. It is arguable that since broad money supply measures include currency in the hands of the public, which is not intermediated by banks, results from using money supply variables in financial deepening ratios could be biased in favor of the McKinnon-Shaw approach. Accordingly, results from two measures of financial deepening are presented here: the ratio of the broad money supply (currency plus demand, time and savings deposits) to nominal GDP (BM/Y); and the ratio of total deposits (i.e. broad money supply excluding currency) to nominal GDP (D/Y). Real output (Y/P) is measured by

real GDP in 1985 prices. All series are annual averages taken from the International Monetary Fund's data tape. Summary information on the relevant series for each country are presented in Table 1.

2. Integration and Cointegration

Researchers often carry out empirical analysis in terms of first differences of variables under the assumption that the (log) levels of the variables are nonstationary.

However, Engel and Granger (1987) argue that this approach disregards potentially important equilibrium relationships among the levels of the series to which the hypotheses of economic theory usually apply. Following their approach, if a set of variables are stationary in their first differences (i.e. integrated of order one or $I[1]$ in their terminology) but do not cointegrate, then the only valid relationship that can exist between them is in terms of their first differences. If, however, they do cointegrate, then the modeled relationship should be estimated in levels. That is, modeling in first differences is the appropriate approach only when the variables are both nonstationary and do not cointegrate.

The common practice to determine whether a time series has a unit root is to use the Augmented Dickey-Fuller (ADF) test.² For a time series X , the ADF test is usually formulated by equation (1) as follows:

$$\Delta X_t = \alpha_0 + \alpha_1 T + \alpha_2 X_{t-1} + \sum_{i=1}^{\Omega} \beta_i \Delta X_{t-i} + \epsilon_t \quad (1)$$

where Δ is the first-difference operator, T is a linear time trend and ϵ is a stationary random error. The null hypothesis is that X_t contains a unit root against the alternative that it is stationary around a deterministic trend.

The results of the ADF test for the financial deepening ratios and real GDP are reported in Table 2 for the level and the first difference of each variable. The test statistics indicate that all the series have unit roots with the exception of those Malaysia where stationarity appears to be reached in the level of the series.³ For the series for which

2. For an informative discussion of unit roots see Dickey, Bell, and Miller (1986).

3. Pakistan was included in the original estimates but as stationarity for the real GDP series was not reached after first differencing it was dropped from further consideration.

a unit root has been confirmed the question is whether there exists some long-run equilibrium relation between financial deepening and economic growth. To determine this the following so-called cointegrating regressions are estimated:

$$\log(Y/P) = \beta_0 + \beta_1 \log(BM/Y) + \mu_t \quad (2)$$

$$\log(Y/P) = \delta_0 + \delta_1 \log(D/Y) + e_t \quad (3)$$

where μ and e denote the OLS residuals. A test of the null hypothesis of no cointegration (against the alternative of cointegration) can be based on testing for a unit root in the regression residuals $\hat{\mu}$ and \hat{e} . For example, under the null hypothesis of no cointegration, $\hat{\mu}$ and \hat{e} will be integrated of order 1.

This time the asymptotic Dickey-Fuller critical values are incorrect when testing for a unit root in the (estimated) regression residuals $\hat{\mu}$ and \hat{e} . In particular, in finite samples, these estimates will appear more stationary than their true values and the Dickey-Fuller critical values will be numerically too small, finding cointegration too often. However, Engle and Yoo (1987, Table 2) report simulated critical values which take into account the number of variables in the cointegrating regression. The results reported in Table 3 suggest that real GDP and financial deepening (as measured here) do not cointegrate in any of the countries studied, and thus suggest that there is no long-run equilibrium relationship between the variables.

3. Testing for Granger Causality

Although there is strong evidence that financial deepening and real GDP are nonstationary and do not cointegrate, it is still possible to test for Granger causality using the growth rates of the series. The following autoregressive time series model is used to test for Granger-causality between financial deepening and economic growth:

$$\begin{aligned} \Delta \log(Y/P)_t = & \alpha_0 + \sum_{i=1}^{\wedge} \alpha_i \Delta \log(Y/P)_{t-i} \\ & + \sum_{i=1}^{\wedge} \beta_i \Delta \log(BM/Y)_{t-i} + \mu_t \end{aligned} \quad (4)$$

$$\Delta \log(Y/P)_t = \Phi_0 + \sum_{i=1}^{\Lambda} \Phi_i \Delta \log(Y/P)_{t-i} + \sum_{i=1}^{\Lambda} \Omega_i \Delta \log(D/Y)_{t-i} + e_t \quad (5)$$

where all variables are as previously defined. To implement the Granger causality test, F-statistics are calculated under the null hypotheses that the coefficients of the lagged values of the financial deepening variables (BM/Y) and (D/Y) are jointly insignificant (i.e. all $\beta_i, \Omega_i = 0$). If the null hypothesis cannot be rejected then the possibility that financial deepening Granger-causes economic growth cannot be rejected. The question of causality is not the only issue at hand, however, as the sign of the effect is also important. Given a finding that financial deepening causes growth, the sign of the effect can be checked by using the F-test of whether the sum of the financial deepening coefficients is positive or negative. Statistical support for a positive effect indicates support for the McKinnon-Shaw approach; while a negative effect would support the structuralist view.

If the dependent and independent variables in equations (4) and (5) are reversed then the opposite hypothesis that economic growth determines financial deepening can be tested in the same way. In this case, if the null hypothesis cannot be rejected then the possibility that economic growth Granger-causes financial deepening (the Patrick hypothesis) cannot be rejected.

A common approach in Granger tests is to choose arbitrarily lag lengths for β_i , and Ω_i in equations (4) and (5). However, since results from Granger tests are sensitive to the selection of lag length the minimum final prediction error (FPE) criterion suggested by Akaike (1969), and tested extensively with regard to model selection by Hsiao (1981) and Thornton and Batten (1985), is used to determine the length of the lags.

Table 4 reports the FPE lags, the F-statistics, and the sign of the effect from the Granger causality tests. The F-statistic reported relate to the hypothesis indicated in the table at the head of each column. An asterisk (for the 5 percent level) and the symbol # (for the 10 percent level) indicate the cases where the test provides statistically significant support for the null hypothesis.

Three sets of results are possible. First, Granger causality might be unidirectional (and positive or negative), that is, either from financial deepening to economic growth or vice

versa, in which case the null hypothesis will be rejected in one direction only. Second, financial deepening and economic growth might be determined contemporaneously, in which case the null hypothesis will be rejected in both directions. Finally, there might be feedback effects between financial deepening and economic growth, in which case the null hypothesis will be accepted in both directions.⁴

The results suggest that for two of the countries (India and Singapore), financial deepening and economic growth appear to be determined contemporaneously; i.e., the null hypothesis is rejected in both directions. Unidirectional and positive causality running from financial deepening to economic growth is supported at the 5 percent level of significance in the cases of the Philippines, and at the 10 percent level in the cases of Nepal and Thailand. The structuralist position is not supported in any of the cases; i.e., there is no indication of a negative unidirectional causality from financial deepening to growth. Unidirectional and positive causality from economic growth to financial deepening is indicated at the 5 percent level in the cases of Myanmar and Korea, at the 10 percent level in the case of Sri Lanka, although only when currency is included in the definition of financial deepening. Finally, there appear to be feedback effects between financial deepening and economic growth in Malaysia.

4. Conclusions

An important debate in development economics has been the role of unrepressed financial markets in mobilizing savings, allocating investment and fostering economic growth. One issue in the debate has been the extent to which financial deepening has contributed directly to economic growth. In addressing this issue for selected Asian countries this paper has made use of cointegration analysis and Granger causality tests.

The results do not support a long-run equilibrium relationship between financial deepening and economic growth in that the times series do not appear to be cointegrated. There are at least two possible explanations for this. One relates to the appropriate definition of financial deepening. For example, in a "mature" financial system in the "long-run"

4. An *a priori* case for expecting feedback effects is that a standard demand function for broad money has an income elasticity greater than 1, implying that per capita income growth affects both the rate of growth in the real per capita money stock, and the ratio of broad money to GDP.

the broad money supply may not be positively or negatively related to real output; rather, the important part of the capital market becomes direct trading in primary securities (equities, commercial bills, and bonds). Unfortunately for this explanation, few of the countries considered in this study can be classified as financially mature by the end of the sample period, and none of them can be so considered over the sample period as a whole. A second relates to the use of the cointegration approach itself. The fact that the approach depends on the achievement of stationarity in the time series might mean that it simply misses the most important part of the financial repression argument. For example, if the economy moves from becoming financially repressed through a period of high financial growth relative to GDP, this could be associated with either a higher output growth or reduction in output. Whatever the impact, it need not continue once stationarity conditions apply.

The Granger causality results suggest that in the short-run financial deepening may make some but not much difference to economic growth: positive unidirectional causality from deepening to economic growth was found in only three of the nine cases. This might reflect the absence from the estimates of an additional independent factor that jointly influences both variables. For example, Fry (1988) puts particular stress on the importance of increases in real interest rates in raising savings and increasing the efficiency of investment. Alternatively, financial factors might be important only episodically, as argued by Dornbusch and Reynoso (1989), for example, when financial instability becomes a dominant force in the economy, or when asset returns are significantly negative.

Table 1

FINANCIAL DEEPENING AND ECONOMIC GROWTH IN SELECTED ASIAN ECONOMIES
(Average annual percentage rates of growth)

Country	(BM/Y)	(D/Y)	(Y/P)
India (1960-90)	0.5	1.2	4.3
Korea (1952-90)	5.0	7.7	7.5
Malaysia (1955-90)	2.4	4.2	6.5
Myanmar (1951-89)	3.1	2.0	3.8
Nepal (1961-90)	7.2	10.3	2.9
Philippines (1951-90)	2.0	3.1	4.8
Singapore (1963-90)	2.6	3.5	8.5
Sri Lanka (1951-90)	0.8	1.3	3.9
Thailand (1951-90)	3.4	6.5	7.1

Source: International Monetary Fund data tape.

Notes: Years in parentheses indicate sample period for each country; (BM/Y) is the ratio of the broad money supply (currency plus demand, time and savings deposits) to nominal GDP; (D/Y) is the ratio of total deposits (broad money supply less currency) to nominal GDP; (Y/P) is real GDP in 1985 prices.

Table 2

UNIT ROOT TESTS

	(i) Level			(ii) Differences		
	(BM/Y)	(D/Y)	(Y/P)	(BM/Y)	(D/Y)	(Y/P)
India	-2.5668	-2.5653	-0.9793	-4.4071*	-4.0727*	-5.2310*
Korea	-2.4766	-1.6823	-2.5559	-4.3634*	-4.5363*	-3.2427*
Malaysia	-3.2263*	-3.2673*	-3.9341*
Myanmar	-2.9057	-2.5475	-1.6777	-4.2941*	-4.0555*	-4.0119*
Nepal	-2.5668	-0.7259	-1.2565	-6.3086*	-6.4195*	-6.3946*
Philippines	-2.1376	-2.2944	-1.7044	-4.6785*	-4.6048*	-2.9482*
Singapore	-0.8235	-1.1023	-1.7423	-4.0212*	-3.4365*	-2.9976*
Sri Lanka	-1.9480	-2.0333	-1.8513	-3.6267*	-3.5526*	-4.7991*
Thailand	-1.0119	-1.4059	-2.1901	-4.7458*	-3.6895*	-3.9005*

Note: An asterisk denotes significance at the 5 percent level.

The critical values of the ADF statistic are from Fuller (1976, Table 8.5.2).

Table 3

THE CALCULATED ADF TEST STATISTICS FOR $\hat{\mu}$ AND $\hat{\theta}$ FROM COINTEGRATION REGRESSIONS (2) AND (3)

Country	$\hat{\mu}$	$\hat{\theta}$
India	-1.5573	-1.8017
Korea	-1.2804	-0.6696
Myanmar	-1.2306	-2.0347
Nepal	-1.4729	-0.6494
Singapore	-1.7353	-1.4449
Sri Lanka	-0.6913	-1.1406
Thailand	-1.6959	-0.8049

The asymptotic critical values at a 1, 5 and 10 percent significance level for a two variable set of 50 observations are -4.32, -3.67, and -3.28, respectively (see Engel and Yoo, 1987, Table 2).

Table 4

CAUSALITY TEST RESULTS

Financial deepening causes growth				Growth causes financial deepening			
(i) (BM/Y)		(ii) (D/Y)		(i) (BM/Y)		(ii) (D/Y)	
FPE lags	F-test	FPE lags	F-test	FPE lags	F-test	FPE lags	F-test
India	5,1 3.4187	5,2 1.6355	1,3 2.1233	1,3 2.1233	1,3 1.8118		
Korea	3,1 0.5914	3,1 0.4999	2,5 2.8823	2,5 2.8823	6,5 2.8679*(+)		
Malaysia	6,1 1.5451	6,1 4.9150*(+)	6,1 7.3531*(+)	6,1 7.3531*(+)	2,1 3.3818*(+)		
Myanmar	6,1 3.6910	1,1 0.9779	1,4 2.2819	1,4 2.2819	3,1 5.7777*(+)		
Nepal	2,1 0.5498	2,3 2.5158#(+)	4,1 0.5487	4,1 0.5487	4,1 1.1673		
Philippines	1,2 5.7246*(+)	1,2 5.4419*	2,1 0.4547	2,1 0.4547	4,1 2.2830		
Singapore	1,2 1.3876	1,1 2.1007	2,4 2.5070	2,4 2.5070	1,2 0.0756		
Sri Lanka	1,1 0.4880	1,1 0.4275	3,3 3.3524*(+)	3,3 3.3524*(+)	6,3 1.7776		
Thailand	6,6 2.0878	6,6 2.1815#(+)	1,1 0.9625	1,1 0.9625	1,1 0.5846		

Notes: (+) or (-) = sign of the sum of the coefficients of the independent variable if it is significant at the 10 percent level or higher.

Significant at the 10 percent level.

* Significant at the 5 percent level.

References

- Akaike, H., 1969, Fitting Autoregressive Models for Prediction, *Annals of the Institute of Statistical Mathematics* 21, 243-247.
- Buffie, E.F., 1984, Financial Repression, the New Structuralists, and Stabilization Policy in Semi-industrialized Economies, *Journal of Development Economics* 14, 305-322.
- Dickey, D.A., W.R. Bell, and R.B. Miller, 1986, Unit roots in Time Series Models: Tests and Implications, *The American Statistician* 40, 12-26.
- Dornbusch, R. and A. Reynoso, 1989, Financial Factors in Economic Development, *American Economic Review* 79, 204-209.
- Engel, R.F. and Granger, C.W., 1987, Cointegration and Error Correction: Representation, Estimation and Testing, *Econometrica* 55, 251-276.
- Engel, R.F. and Yoo, B.S., 1987, Forecasting and Testing in Cointegrated Systems, *Journal of Econometrics* 35, 143-159.
- Fry, M.J., Financial Development: Theories and Recent Experience, *Oxford Review of Economic Policy* 5, 13-28.
- Fry, M.J., 1988, *Money, Interest, and Banking in Economic Development* (Johns Hopkins University Press, Baltimore).
- Fuller, W.A., 1976, *Introduction to Statistical Time Series* (John Wiley and Sons, New York).
- Hsiao, C., 1981, Autoregressive Modelling and Money - Income Causality Detection, *Journal of Monetary Economics* 7, 85-106.
- Jao, Y.C., 1976, Financial Deepening and Economic Growth: A Cross-section Analysis, *Malayan Economic Review* 21, 47-58.
- Jung, W.S., 1986, Financial Development and Economic Growth: International Evidence, *Economic Development and Cultural Change* 34, 333-46.
- Lanyi A., and Saracoglu, R., 1983, Interest Rate Policies in Developing Countries, *Occasional Paper 22* (International Monetary Fund, Washington D.C.).
- McKinnon, R.I., 1991, *The Order of Economic Liberalization: Financial Control in the Transition to a Market Economy* (Johns Hopkins University Press, Baltimore).
- McKinnon, R.I., 1973, *Money and Capital In Economic Development* (The Brookings Institution, Washington D.C.).
- Patrick, H.T., 1966, Financial Development and Economic Growth in Underdeveloped Countries, *Economic Development and Cultural Change* 14, 64.
- Shaw, E.S., 1973, *Financial Deepening in Economic Development* (Oxford University Press, New York).
- Taylor, L., 1983, *Structuralist Macroeconomics: Applicable Models for the Third World* (Basic Books, New York).
- Thornton, J., 1991, The Financial Repression Paradigm: A Survey of Empirical Research, *Savings and Development* 15, 5-17.
- Thornton, Daniel, L. and Dallas S. Batten, "Lag-Length Selection and Tests of Granger Causality between Money and Income," *Journal of Money, Credit and Banking* 17, 164-178.
- van Wijnbergen, S., 1983, Credit Policy, Inflation and Growth in a Financially Repressed Economy, *Journal of Development Economics* 13, 45-65.
- World Bank, 1989, *World Development Report* (Oxford University Press, New York).
-

Abstract

This paper applies cointegration analysis and the Granger causality technique to data for selected Asian economies in an attempt to distinguish between competing hypotheses regarding the role of financial deepening in economic growth. The cointegration analysis does not detect evidence of a long-run or equilibrium relationship between financial deepening and real GDP, while the Granger causality results suggest that in many cases financial deepening does not make much difference to the rate of economic growth in the short-run.

