

Finance-growth nexus in economic development

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Finance-Growth Nexus in Economic Development

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Abstract

The cause and effect relationship between financial development and economic growth is a controversial one. Economic theories do not yield a specification of an estimable equation or a well defined causality pattern for economic growth and the stage of financial development. The empirical evidences are also far from conclusive. This thesis takes a time series and a panel approach to investigate whether the intensity of financial intermediation promoted investment, efficiency and output in 20 economies at various income levels over the period 1965 to 2004. The methodologies involved are vector error correction models (VECMs); vector autoregressive models (VARs), variance decomposition, static and dynamic panel estimation methods. The growth variables used are real GDP per capita, real gross fixed capital formation per capita and total factor productivity. The financial variables used are disaggregated, consisting of bank loans to private sector per capita, stock market capitalization per capita, insurance companies asset per capita and also foreign direct investment per capita. Two instruments for financial development, interest rate spread and stock market turnover value per capita, are also used to test the causal relationship with growth in the panel data analysis. The results indicate the following: (1) Development of bank credit market and stock market may act as a driving force behind investment and output in many economies; (2) Evidence of a role for financial factors in efficiency enhancement is weaker; (3) Low and middle income economies tend to depend on stock market development for growth while high income economies are more dependent on bank credit market for growth; (4) Foreign direct investment is important to explain the economic growth of low income economies but not high income economies. The findings also support the factor

accumulation channel instead of the efficiency channel as the primary mechanism through which the financial sector influenced macroeconomic outcomes in these economies. It further confirms that finance matters in development over the long term but financial markets may need suitable regulations in order to perform the growth enhancing role efficiently.

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List of Abbreviations

BANK – Commercial bank credit to private sector per capita

BC – Bi-directional causality

F – Finance variable

FDI – Foreign direct investment

G – Growth variable

GDP – Real GDP per capita

GFCF – Real gross fixed capital formation per capita

INSUR – Insurance companies' assets per capita

LR – Long run

SPRD – Interest rate spread

SR – Short run

STOCK – Stock market capitalization per capita

TFP – Total factor productivity

TNOV – Stock market turnover value

Chapter 1: Introduction

1.1 Preamble

The importance of the financial system in economic growth can be reflected by the discussion in the entire issue of World Bank (1989). The financial system refers to the system that governs the operation of financial markets, such as credit market, stock market and insurance market, among others. The quality, quantity and efficiency of the financial services provided by these markets can contribute significantly to the economic growth, which is usually measured by the real GDP of the economy. Financial services make it cheaper and less risky to trade goods and services and to borrow and lend. Without them an economy would be confined to self-sufficiency or barter, which would inhibit the specialization in production upon which modern economies depend. Separating the timing of consumption from production would be possible only by first storing goods. The size of production units would be limited by the producers' own capacity to save. Incomes would be lower, and complex industrial economies would not exist. An efficient financial market is the key to investment and hence to growth. Well functioned financial markets provide resources saved from consumption to productive uses and in this process raise the income of savers and borrowers.

This perception expressed in the World Bank (1989) is in line with Schumpeter's (1911) version of the role of financial development in economic growth. However, this is not a unanimous view among economists. For instance, Robinson (1952) perceives that it is financial development that leads to economic growth. Lucas (1988) does not consider financial development as important while Patrick (1966) explores the possibility of

changes in the direction of causality along the process of economic development and suggests a bi-directional causality.

The empirical works done by researchers are also far from conclusive. Researchers have explored the use of different financial development indicators, economic growth indicators and use different methodology to study the relationship between financial development and economic growth. While some have discovered evidence to support the proposition that financial development leads to economic growth, others have collated evidence to show reverse causation or bi-directional causality. The reasons for this conflict could be due to the complex nature between financial development and economic growth such that the same relationship may not exist among economies, especially between the more developed economies and less developed economies. The existing works may have used too restrictive financial and growth indicators such that they could not exhibit the link between financial development and economic growth, or the methodologies may not be appropriate in this type of study.

1.2 An Overview of Finance and Growth Theories

The theoretical work on financial development and economic growth can be broadly separated into five groups. The first group believes that development in the financial sector leads to economic development. The second group believes that financial development merely follows the development of the economies. The third group holds the view that financial development and economic growth runs both ways. The fourth group believes that financial development may retard growth and thus financial

repression is beneficial to economic development. Finally, the fifth group believes that financial development is not important at all in the process of economic development. All these views are feasible theoretically and this chapter surveys some of the important discoveries in the theoretical models linking financial development and economic growth.

1.2.1 Financial Development Leads to Economic Growth

This group believes that financial development is essential before economic development can take place. Patrick (1966) describes this as the supply leading hypothesis which normally occurs at the beginning of economic development. The origin of this group can be traced to Schumpeter (1911). He argues that the services provided by financial intermediaries, such as mobilizing savings, evaluating projects, managing risk, monitoring managers and facilitating transactions are essential for technological innovation and economic development. More recently, Levine (1997) integrates this idea and emphasizes that market imperfections results in high information costs and transaction costs, create incentives for the emergence of financial markets and institutions. The financial systems perform functions such as facilitate the trading, hedging, diversifying, and pooling of risk; allocate resources; monitor managers and exert corporate control; mobilize savings and facilitate the exchange of goods and services. Through these services, the financial systems result in capital accumulation and technological innovation and hence eventually these lead to economic growth.

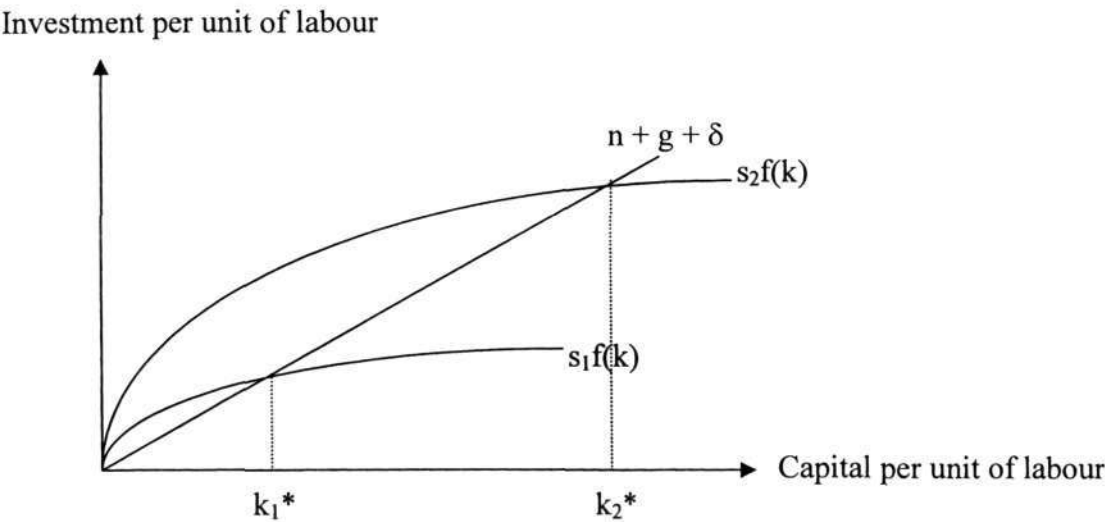
The supply leading hypothesis has developed into three different schools. They are the financial structuralist school, the financial repressionist school and the endogenous growth model school.

1.2.1.1 Financial Structuralist School

The financial structuralist school believes that the quantity of financial variables and its composition affect economic development. Financial deepening or development is an essential ingredient of the process of capital accumulation as reflected in savings and investment ratios and their productivity. This in turn contributes to economic growth. Differences in the quantity and quality of services provided by financial institutions could partly explain why countries grew at different rates. Thus their main argument is that the development of financial intermediation encourages savings, and higher savings lead to more capital and higher economic growth. Such a position can be traced to the writings of Gurley and Shaw (1955). They stress the great difference in financial systems in developed and developing countries. In sharp contrast to the developing countries, the industrialized countries possess sophisticated and elaborate systems of financial institutions which facilitate intermediation between savers and investors. The role of financial intermediaries in improving resource allocation is an important determinant of different levels of per capita income. There is a positive relationship between the degree of financial sophistication and the level of per capita income. Goldsmith (1969) further confirms this relationship in a study involving 35 countries.

Solow (1956) proposes a growth model that directly link up the financial sector and economic growth. He considers a production function at time period t which is defined as $y(t) = f(k(t))$, where y is output per labour and k is capital per labour. Output is divided between consumption and investment. The fraction of output devoted to investment is the saving rate, s . One unit of output devoted yield one unit of new capital. But the existing capital depreciates at a rate δ . It is assumed that labour grows at a constant rate n and knowledge grows at a constant rate g . The growth rate of capital stock per labour is given by the expression $sf(k(t)) - (n + g + \delta)k(t)$. The equilibrium of the economy occurs when the condition $sf(k) = (n + g + \delta)k$ is satisfied. This is expressed in Figure 1 below, showing that with a given initial saving rate s_1 , the product of s_1 and $f(k)$ is a curve while $n + g + \delta$ is a linear function of k . The equilibrium k is denoted as k_1^* and the equilibrium output as $y = f(k_1^*)$.

Figure 1: Solow Growth Model



The role of financial intermediary is to influence the saving rate, s . With the development of the financial sector, saving is encouraged and s increases from s_1 to s_2 .

This will bring about an augmentation of the curve from $s_1f(k)$ to $s_2f(k)$ and a permanent increase in the equilibrium k_1^* to k_2^* . Although there is no effect on the economy growth rate at the steady state, the output per labour increases to a higher level.

1.2.1.2 Financial Repressionist School

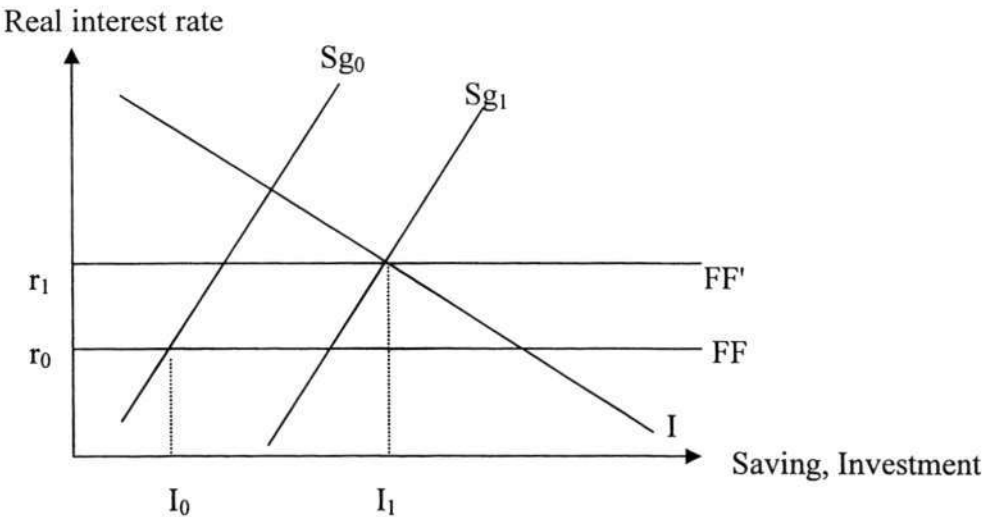
The main idea of the financial repressionist school is that financial repression in the form of below-equilibrium real interest rate tends to retard growth. To promote growth it is necessary to liberalize the financial sector in the form of a "realistic" real interest rate. McKinnon (1973) and Shaw (1973) are the first two economists to establish a formal framework to examine the effect of financial repression in economic development. This framework is referred to as McKinnon-Shaw hypothesis. In this framework, financial deepening is best facilitated by a competitive financial system in which interest rates are market-determined and in which there is an absence of administratively driven selective credit allocation. They emphasize the negative effect of financial repression and advocate financial liberalization to promote economic growth. Their view is that financial repression results in interest rates that are held below market-clearing rates, segmentation of the financial system into regulated and unregulated segments, disintermediation in the regulated segment, scarcity of saving and investment and low capital productivity. Their theoretical framework presumed that the direction of causation runs from financial development to economic development and not vice versa.

In Figure 2, saving Sg_0 at a rate of economic growth g_0 is a positive function of the real interest rate while investment I , is a negative function of the real interest rate. The line

FF represents financial repression, consists of an administratively fixed nominal interest rate that holds the real interest rate r_0 below its equilibrium level. Actual investment is limited to I_0 , i.e. the amount of saving at the real interest rate r_0 .

Raising the interest rate ceiling from r_0 to r_1 increase saving and investment. Raising the interest rate ceiling also deters entrepreneurs from undertaking all those low-yielding investment projects with return less than r_1 . Hence the average return or efficiency of aggregate investment increases. The rate of economic growth rises in this process and shifts the saving function to Sg_1 .

Figure 2: The McKinnon-Shaw Hypothesis



One major set back of this hypothesis is that the effects of changes in real interest rates on savings are ambiguous. There are the income and substitution effects and depending on their relative strengths, the net effect can go either way. The financial repressionist school merely asserts that the positive substitution effect dominates the negative income effect in developing countries, without providing any new theoretical insights.

1.2.1.3 Endogenous Growth Model School

Ever since the introduction of endogenous growth model, debate on the causality between finance and growth has been very active. The endogenous growth model shows that finance not just has only level effects, but also growth effects. There can be self-sustaining growth without exogenous technical progress and that growth rate can be related to preferences, technology, income distribution and institutional arrangements.

The concept of the role of financial institution in the endogenous growth model is well summarized by Fry (1995). He considers an ideal environment with a complete set of financial markets that offer prices for insurance cover against all forms and types of uncertainty. In principle, everyone would be able to borrow and lend unlimited amounts at the market interest rate. The market interest rate would ensure optimal allocation of income between saving and consumption, and also optimal allocation of investment funds across all potential investment projects. But in real life, information about all possible future states of the world is not freely available. Thus financial markets fail to provide insurance against all possible future states of the world and hence borrowing opportunities are not unlimited. In addition, monitoring projects could be too costly for the borrower and lender to reach a mutually beneficial agreement. Some high-yielding project may not be exploited. Financial institutions thus become important in a world of positive information, transaction, and monitoring costs.

There are two types of endogenous growth model. One type employs a standard costly state verification model originally developed by Townsend (1983) and subsequently

extended by Diamond (1984). The framework is usually in an overlapping generation model with production and capital accumulation. Individuals need to allocate their total earnings between currency and capital. In the absence of banks, individuals may be forced to liquidate their capital prematurely under unforeseen circumstances. But by exploiting the law of large numbers, banks ensure that they never have to liquidate capital prematurely. Hence banks avoid the uncertainty which leads to resource misallocation by individuals. By ensuring that capital is never wasted, financial intermediation may produce higher capital/labour ratios and higher rates of economic growth.

The second type of endogenous growth model finds other ways in which intermediaries can stimulate endogenous growth. This could take the form of financial intermediaries pooling funds and acquiring information that enables them to allocate capital to its highest value used, so raising the average return to capital. The other form is to evaluate perspective entrepreneurs and financing the most promising one. As the literature in this area is vast, we focus on one model by Pagano (1993) and briefly mention the others.

Pagano (1993) proposes an endogenous growth model to capture the potential effects of financial development on economic growth. The model considers aggregate output Y as a linear function of aggregate capital stock K in the form $Y_t = AK_t$ where A represents the efficiency of capital. Following Romer's (1989) framework, it is assumed that there are N firms in a competitive economy with external economies. Each firm faces a technology with constant returns to scale but productivity is an increasing function of the aggregate capital stock. Thus each firm's output is expressed as $y_t = Bk_t^\alpha$, where y_t is

firm specific output, k_t is firm specific capital stock and B is a parameter but responds to the average capital stock according to $B = Ak_t^{1-\alpha}$. The aggregate output is defined as $Y_t = Ny_t$. Consider a stationary population and the economy produces a single good that can be invested or consumed. If invested, it depreciates at the rate of δ per period. Gross investment is represented as $I_t = K_{t+1} - (1-\delta)K_t$

In a closed economy with no government, capital market equilibrium requires that the gross saving S_t is equal to gross investment I_t . However, a proportion of the flow of savings $(1-\phi)$ is lost in the process of financial intermediaries. This could go to bank as the spread between lending and borrowing rates, and to securities brokers and dealers as commissions and fees. Thus the capital market equilibrium is given by $\phi S_t = I_t$. The growth rate at time $t+1$ is written as $g_{t+1} = (Y_{t+1} - Y_t)/Y_t = (AK_{t+1} - AK_t)/AK_t = (K_{t+1} - K_t)/K_t$. Since $K_{t+1} = I_t + K_t - \delta K_t$, the growth rate is obtained as $g_{t+1} = (I_t - \delta K_t)/K_t = I_t/K_t - \delta$. Since $K_t = Y_t/A$, we can write $g_{t+1} = AI_t/Y_t - \delta = A\phi S_t/Y_t - \delta = A\phi s_t - \delta$. Thus, this equation relates financial sector with economic growth. At steady state, the equation is written as $g = A\phi s - \delta$, where A is the social marginal productivity of capital, ϕ is the proportion of saving funnelled to investment, s is the gross saving rate (i.e. the total saving relative to total output) and δ is the capital depreciation rate.

The financial intermediation can affect economic growth by three methods. The first method is to raise ϕ . Financial intermediaries provide the service of funnelling savings to firms. In this process resources are absorbed so that for each dollar saved by households, only a portion ϕ is invested. Financial development may result in lesser resources wasted

to provide the service so that ϕ is higher and the growth rate g can increase. The second method is to increase A . Financial intermediation allocates funds to those projects where the marginal product of capital is highest, thereby increases the productivity of capital and promotes growth. The third method is to increase s but the sign of this relationship is ambiguous. The effect of saving rates on economic development can be positive or negative depending on risk sharing, household borrowing and interest rate effects. The other endogenous growth models and their important findings are briefly summarized in Table 1 on the next page.

Table 1: Endogenous Growth Model

Author (Year)	Finance-growth relationship
Bencivenga and Smith (1991)	Financial intermediaries permit risk averse savers to hold deposits, prevent unnecessary liquidation of investment and shift savings toward capital accumulation. But financial intermediaries also provide liquidity and hence may reduce economic growth by reducing savings.
Levine (1991)	Stock market accelerates growth by facilitating the ability to trade ownership of firms without disrupting the productive processes occurring within firms and allowing agents to diversify portfolios.
Boyd and Smith (1992)	Financial intermediaries have locational comparative advantage in information acquisition; can reduce credit rationing and inefficient interest rate differentials and promoting efficient investment and economic development.
Levine (1992)	Financial institutions facilitate the holding of diversified portfolios that eliminate productivity risk and liquidity risk, and increase the resources for firm investment. By conducting research activities, financial intermediaries also reduce the investor's cost and improve the information content of investment decisions.
Saint-Paul (1992)	Financial market allows division of labour by permitting agents to hedge by holding a diversified portfolio. With more specialization, agents can choose more specialized and more productive technologies. Stock market can encourage investment by enabling individuals to diversify idiosyncratic risk of individual projects
Roubini and Sala-i-Martin (1992)	Financial development increases real interest rate, reduces money demand, reduces steady state inflation rate and thus increases economic growth rate
King and Levine (1993)	Financial systems evaluate prospective entrepreneurs; mobilize savings to finance the most promising productivity-enhancing activities and improve the probability of successful innovation which accelerate economic growth.

1.2.2 Financial Development following Economic Growth

The second group believes that financial development is passively following the economic growth. The origin of this group can be traced to Robinson (1952) who declares that “where enterprise leads finance follows.” According to this view, economic development creates demand for particular types of financial arrangements, and the financial system responds automatically to these demands.

Patrick (1966) describes this view as the “demand-following” role of financial development, which occurs at the more advanced stages of development. In this view, financial development is the handmaiden of economic development, reacting passively to the demand for new financial services by a growing economy. The development in the financial sector is facilitated by the growth in the real sector of the economy. As the economy grows, it needs a wider variety of financial services and a growing number of institutions to provide these services. A scarcity of financial institutions and services reflects a low demand for these services. Since financial intermediation helps transferring resources from the slow-growing sectors to the fast growing sectors of the economy, the need for financial intermediation depends also on the variance in growth rates among different sectors of the economy.

The work of Friedman and Schwartz (1963) on the demand for money also supports this theory. The Quantity Theory of Money can be expressed in the equation $MV = PY$, where M is the nominal money supply, V the velocity of circulation, P the price level and Y the real GDP. Since PY is the nominal GDP, the ratio of money stock to nominal GDP

(M/PY), which is a standard measure of financial development, is also the inverse of the velocity of circulation ($1/V$). A positive association between the level of financial development and real GDP may simply reflect an income elasticity of the demand for money with respect to income which is greater than unity. When real GDP increases, people will demand more money for transaction purposes. The more than proportional increase in demand for money (with respect to income increase) results in a downward trend in the velocity of circulation. Thus the direction of causation would run from real GDP to financial development, through the demand for money.

Boyd and Smith (1996) develop a model to illustrate the role of debt and equity changes over time and with the level of development, so as to capture the evolution of financial markets in the growth process. Their model considers two period overlapping generations and investors can make use of two technologies to produce capital. One technology yields a high expected return, but is subjected to an information friction. The other yields a lower expected return, but has the advantage of full public observability. Investors must make a decision regarding how heavy they will use each technology. This decision is partly determined by the relative price between capital and the resources used in state verification. Investment in the unobservable-return technology tends to associate with the use of debt finance, while the use of observable-return technology is associated with equity. As an economy develops, the relative cost of monitoring also rises. Due to the higher perceived cost of state verification, the volume of equity market activity must increase. This is because as an economy develops, capital producers are more actively using the observable-return technology in an effort to reduce the expected costs of state

verification. This means less use will be made of the unobservable-return, and more use will be made of the observable-return technology. Thus the ratio of equity finance will rise as an economy develops. But debt and equity remain complementary sources for the financing of capital investment.

1.2.3 Bi-directional Causality for Financial Development and Economic growth

Patrick (1966) originates the idea of the possibility of financial development causes economic growth which in turn causes further financial development, and hence the relationship between financial development and economic growth is bi-directional causality. He postulates that in the early stages of development, financial expansion, through the creation of financial institutions and the supply of their financial assets promotes economic growth, thus playing a supply-leading role in economic development. In more advanced stages of development, demand for a greater variety of financial assets to better accommodate the needs of both savers and investors leads to the creation of new financial institutions and a greater array of financial assets. In the demand following stage, the financial system develops in response to the demand to financial services. Thus Patrick reaches the conclusion that causation runs from financial to economic development in the early stage of development, supporting the supply-leading relationship. But on the later stage of development the causation is a demand-following relationship.

While Patrick's model highlights the possibility of bi-directional causality between finance and economic development, there is a determined time period where causality is

unidirectional. But in other theoretical framework there is no such clear cut time period and that the bi-directional causality may occur concurrently. One such example is the work done by Greenwood and Jovanovic (1990). They emphasize that financial intermediation promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides the means to implement costly financial structures. Thus growth and financial structure were inextricably linked. Another example is by Berthelemy and Varoudakis (1996) who show that growth in the real sector causes the financial market to expand, thereby increasing banking competition and efficiency. In return, the development of the banking sector raises the net yield on savings and enhances capital accumulation and growth. Thus causality between financial development and growth runs both ways. Still one more example is provided by Greenwood and Smith (1997) who stress that production of goods require supporting the market to form. The costs of market formation will typically require that market development follows some period of economic development. However, once the market is formed, it enhances growth by promoting the location of capital to its highest return uses, alter the composition of savings and foster specialization. Their main argument is that financial markets play a central role in economic development and that economic development leads to the formation of new markets.

1.2.4 Financial Repression Causes Economic Growth

In contrast to the Financial Repressionist School, there is another school which favours financial repression in economic growth. Economists in this school, such as Wijnbergen (1983) and Buffie (1984), contend that financial development can hinder growth by

reducing available credit to domestic firms. This situation arises from the presence of informal curb markets. As the formal financial system develops, households are seen to substitute out of curb-market loans, thus reducing the total real supply of domestic credit. The reduction in the supply of credit can lead to a credit crunch, thereby lowering investment and slowing production and growth.

This view of financial development reducing saving and thereby growth is also reflected in the endogenous growth model by Bencivenga and Smith (1991) and Pagano (1993), as well as the overlapping generation model by Jappelli and Pagano (1992). As capital markets develop, households gain better insurance against endowment shocks and better diversification of rate-of-return risk. The development of capital markets reduces the need for precautionary saving. This fall in the saving rate lowers the growth rate, providing one instance which financial development can retard growth. Financial development also results in consumer credit becoming more readily and cheaply available. This liberalization of the consumer credit or mortgage market leads to a reduction in saving and growth, providing another instance of financial development tending to reduce growth. Financial development also narrows the wedge between the interest rate paid by firms and that received by households. A low interest rate may depress saving, resulting in a low saving rate and a low growth rate.

The advantages of a repressed financial system are elaborated in Wade (1988). First, a credit-based system permits faster investment in developing country conditions than would be possible if investment is dependent on the growth of firms' own profits or on

the slow development of the securities market. Second, productive investment will be less affected by speculative stock market activities. Third, a credit based system tends to avoid a bias towards short-term profitability that often appears to be associated with a stock market system. Finally, a state-dominated financial system provides the government with the necessary political clout to implement its industrial strategy.

Lee (1992) integrates these arguments further and provides an "internal capital market hypothesis" to show that a repressed financial system can actually facilitate rapid economic growth. In this framework, the financial systems are divided into two main systems, the capital-market-based system and the credit-based system. In the capital-market based system, securities are the main sources of long term business finance. In the credit-based system, firms rely heavily on credit to finance investment, as the capital market is weak. If banks are the main suppliers of credit, firms are heavily dependent on banks. But if banks themselves are dependent on government, then firms become heavily dependent on the government. The government may control the allocation of credit and financial repression may become the norm. This leads to a state controlled, credit-based financial system. When information asymmetries between borrowers and lenders are high and pervasive, they can be a potent source of market failure. Under such circumstances, reliance on the "internal capital market" can resolve market failure by reducing or eliminating the incidence of information asymmetries. The state-dominated credit-based system operates as an "internal capital market" and the state will be able to cultivate a long-term and close relationship with borrowing firms. The atmosphere of

trust and co-operation created as a result of this close relationship allows lender monitoring to be carried out effectively and efficiently.

In fact, Stiglitz (1989) has emphasized the central role that information asymmetries play in the market failure of financial systems. Banks may not have perfect information about credit-worthiness of borrowers. Moral hazard and adverse selection problems could emerge. Borrowers have an incentive to assume more risky projects when the cost of credit increases; the banks' reliable clients may be replaced by less solvent debtors because the former are indistinguishable from the latter. The interest rate may rise to an excessive level to cover default risk. Thus reliant on a strong-willed government may overcome the inadequacies of private capital markets.

1.2.5 Financial Development is Unimportant in Economic Growth

Some economists just do not believe that the finance-growth relationship is important. One of the representatives in this group is Lucas (1988) who asserted that 'I believe that the importance of financial matters is very badly over-stressed in popular and even much professional discussion and so am not inclined to be apologetic for going to the other extreme'. A collection of essays on development economics including three Nobel Laureates in the book *Pioneers in Development* by Meier and Seers (1984) does not even mention finance. Stern's (1989) review of development economics does not discuss the financial system, even in a section that lists omitted topics. In their view, there will be no causal relationship between financial development and economic growth in whichever direction.

1.3 Objective and Outline of the Thesis

This objective of this thesis is to explore the linkage between financial development and economic growth in an empirical manner. To achieve this objective, a variety of financial development indicators and economic growth indicators are used. The financial development indicators include commercial bank loans, stock market capitalization, insurance companies' assets, foreign direct investment and also instruments like interest rate spread and stock market turnover value. The economic growth indicators include real GDP per capita, real gross fixed capital formation per capita and also an indicator for total factor productivity (TFP). The study also explores various econometric methods to establish the relationship between financial development and economic growth, such as the Granger causality Test, vector Error Correction Model, variance decomposition, instrumental variable method and also static and dynamic panel data analysis.

The discussion in the previous section shows that the theoretical relationship between finance development and economic growth can be ambiguous. Although the financial sector provides many valuable services in the allocation of resources to facilitate economic growth, it is also possible that financial development only occurs after the economy has reached a certain level which demands more sophisticated financial services. Disentangling this two-way causality is not an easy task. Finally, the presence of market failure due to asymmetric information in the financial market may advocate financial repression to achieve economic growth. None of the theoretical models can convincingly describe the relationship between financial development and economic growth. This chapter surveys the theoretical linkage between finance and growth

Chapter 2 provides a literature survey of the various empirical evidences between financial sector development and economic growth. Most of the literatures surveyed consider the banking funds market as the only financial market and study the relationship between indicators of banking funds and economic growth. This chapter aim to be more complete by also including a discussion of disaggregated financial markets, such as stock market, bonds market and the insurance market.

Chapter 3 discusses the data and methodology used in this research. The data used are time series data from 20 economies at various stage of economic development. There are three growth indicators, namely real GDP per capita, real gross fixed capital formation per capita and total factor productivity. As for financial development indicators, they include commercial bank loans, stock market capitalization, insurance companies' assets, foreign direct investment, interest rate spread and stock market turnover value. Since the relationship between financial development and economic growth is likely to be a long term one, the data used is annual data spanning from 1965 to 2004. In some countries the data are not available for the full 40 years and the time spans are reduced accordingly.

Chapter 4 explores the issues of financial development and economic growth in Singapore by focusing on three financial markets, bank credit market, stock market and insurance market. The development of bank credit market is indicated by the commercial banks' credit to the private sector per capita. The development of the stock market is indicated by the stock market capitalization per capita. This study also uses insurance

companies' assets per capita as an indicator for insurance market development. Each of the three growth variables are used in the analysis with the three financial indicators.

Chapter 5 explores the issues of financial development and economic growth in three financial markets of 19 economies at various stage of economic development. They include Australia, Italy, Japan, United Kingdom and United States of America which are high income economies, Hong Kong, Singapore, South Korea and Taiwan which are newly industrialized economies, Brazil, China, Philippines, Malaysia, Thailand and Turkey which are middle income economies and Bangladesh, India, Indonesia, Pakistan and Sri Lanka which are low income economies.

Chapter 6 explores the issue of globalization in the financial context and addresses the importance of foreign capital on the domestic economy. For economies that are open to foreign capital, the inflow of capital can supplement domestic savings to finance investment. However, there are two main types of capital inflow. One is the foreign direct investment which is mainly for long term capital investment. The other is the foreign portfolio investment which is for either short term investment or speculative purposes. This study focuses on the long term relationship between financial development and economic growth and hence it uses foreign direct investment (FDI) received by economies to indicate foreign capital.

Chapter 7 analyzes the finance-growth nexus in a panel data framework and considers two instruments for the development of the bank credit market and the stock market.

Panel data are data involving several economies over a certain time period and analysis of panel data has the advantages of estimating economies of similar characteristics together over time to increase the efficiency of the estimators and also enable the researcher to overcome the problem of static growth path of economies in cross sectional studies. Since it is possible for financial development to cause economic growth or economic growth to cause financial development, the existence of feedback between finance development and economic growth means it is necessary to use suitable instruments for financial development that are exogenous to economic growth. Two instruments, the interest rate spread and the stock market turnover value, are used in the panel data study.

Chapter 8 provides a summary of results from the research; highlights the contributions of the thesis and also suggests directions for future research in this area. The important discoveries of this thesis are that the direction of causality is dependent on the economic growth and financial development indicators used and also on the level of development of the economies. In general financial development is important to economic growth in all the economies considered.

Chapter 2: Literature Review

2.1 Introduction

This chapter presents a survey of literature regarding the empirical aspects of financial development and economic development, with emphasis on the causality between finance and growth. From the previous chapter, we already know that based on the theory alone, nothing conclusive can be reached. It is possible that financial development causes economic development, as propounded by Schumpeter (1911), or financial development merely follows economic development, as stressed by Robinson (1956); or the direction of causality may change along the process of economic development. The issue is essentially an empirical one.

The empirical evidence, based on logical grounds, can be classified into four groups. The first group is based on the correlation coefficient between financial development proxy and economic development proxy. The second group of empirical evidence is based on analyzing cross sectional data for many different countries. The third group is the study of causality using time series analysis, mainly applying the Granger Causality test to specific countries. This includes time series regression, vector autoregression (VAR), vector error correction model (VECM) and also the use of impulse responses function and vector decomposition. The fourth group combines both time series and cross sectional data to become panel data in the analysis. This method has become increasing popular with researchers in applied work. This evidence is discussed as follows.

2.2 Empirical Evidence Based on Correlation Analysis

A positive correlation between growth and indicators of financial development was first documented by Goldsmith (1969), followed by McKinnon (1973) and Shaw (1973) and then by the endogenous growth literature. This approach has received considerable empirical support from various cross-country studies.

The earliest evidence in this area is contributed by Goldsmith (1969). He uses the value of financial intermediary assets divided by GNP to gauge financial development, under the assumption that the size of the financial system is positively correlated with the provision and quality of financial services. Based on data from 35 countries between 1860 and 1963, he observed a rough parallelism between economic and financial development if periods of several decades are considered. The implication is that the direction of causation was from economic to financial development, irrespective of the stage of economic development.

More conclusive evidence is provided by King and Levine (1993a, 1993b). They propose four indicators of financial development and four growth indicators to study the relationship between finance and growth. The four financial indicators are (1) currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries divided by GDP, (2) the ratio of bank credit divided by bank credit plus central bank domestic assets, (3) the ratio of credit allocated to private enterprises to total domestic credit (excluding credit to banks) and (4) credit to private enterprises divided by

GDP. The four growth indicators are: (1) the average rate of real per capita GDP growth, (2) the average rate of growth in the capital stock per person, (3) total productivity growth and (4) the ratio of gross national investment divided by GDP.

The data used in their study are obtained from 80 countries and averaged over the 1960-1989 period. Simple correlation coefficients between the four financial indicators and each of the growth indicators are computed. The results show that each financial indicator is positively and significantly correlated with each growth indicator. In addition, they divide countries into four categories: very fast, fast, slow and very slow growers to analyse the correlation coefficient. The analysis shows that from countries that experience slower growth to countries with faster growth, there is a corresponding increase in financial depth, the importance of banks relative to central bank, the fraction of credit allocated to the non-financial private sector, and the ratio of private sector credit to GDP, as shown in the four financial indicators. Similarly, countries with faster rates of physical capital accumulation and countries with more efficient capital allocation tend to have more developed financial systems.

But a positive correlation did not indicate the direction of causality. The causal relationship may run from financial development to growth, the reverse or even both ways. Even if financial development indeed enhances growth, the studies did not shed light on the channels which finance affects growth. Patrick (1966) recognized that positive associations between financial development and economic growth are insufficient in establishing the direction of causality between financial development and

economic growth. This is supported by McKinnon (1988) who stated that "... Although a higher rate of financial growth is positively correlated with successful real growth, Patrick's (1966) problem remains unsolved: What is the cause and what is the effect? Is finance a leading sector in economic development, or does it simply follow growth in real output which is generated elsewhere?"

2.3 Empirical Evidence Based on Cross Sectional Regression

The second group of evidence consists of research using cross sectional data of many economies averaged over certain time period. The data are analyzed using regression analysis on structural equations consisting of growth and financial development indicators. As there are many papers using similar methodology, I analyze the research by King and Levine (1993a, 1993b) which I consider as a representative among the literature in this area.

King and Levine (1993a, 1993b) study the strength between four finance indicators (F) and the four growth indicators (G) by running the following regression model:

$$G(j) = \alpha + \beta F(i) + \gamma X + \varepsilon$$

where $F(i)$ represents the value of the i th finance indicator and $G(j)$ the value of the j th growth indicator. The four growth and financial indicators are explained in page 25. X represents a matrix of conditioning information to control for other factors associated with economic growth, such as income per capita, education, political stability, indicators of exchange rate, trade, fiscal and monetary policy. The data are obtained from 80 countries and averaged over the period 1960 to 1989. Their results indicate a strong

positive relationship between each of the four finance indicators and the three growth indicators. The coefficients of all the finance indicators are statistically significant and their sizes imply an economically important relationship.

They have also proposed an ingenious attempt to address the issue of causality (1993a). They examine the relationship between the initial values of the financial development indicators at the beginning of the period and the subsequent economic growth using OLS regressions. The dependent variable is each of the four growth indicators averaged over the 1960s, 1970s and 1980s, while the independent variable is the initial value (1960, 1970 or 1980) of each of the four finance indicators for 57 countries. The regression results suggest that the initial level of financial development is a good predictor of subsequent rates of economic growth, physical capital accumulation and economic efficiency improvements over the next 10 years even after controlling for income, education, political stability, and measures of monetary, trade, and fiscal policy.

The additional empirical evidence provided by King and Levine (1993b) also highlights the importance of financial sector reforms in Argentina, Chile, Indonesia, Korea and the Philippines. By comparing the pre-reform and post-reform values of financial development indicators, they discover that the financial indicators tend to rise following financial reforms. Since financial indicators can predict future economic growth, financial sector reforms that liberalize and relax the control on credit, interest rate and encourage the emergence of new financial institutions will also promote economic growth.

Table 2.1 surveys selective empirical evidence based on analysis of cross sectional data. The work by Levine (1992), Roubini and Sala-I-Martin (1992) and Gregorio and Guidotti (1995) employ similar methodology as King and Levine (1993a, 1993b) and obtain the same results, which is financial development leads to subsequent economic growth. Harris (1997) and Levine and Zervos (1998) analyze the relationship between stock market development and economic growth and have different results. While Harris (1997) shows that stock market development has a very weak effect on growth, Levine and Zervos (1998) show that it is important to economic growth. Finally, the work by Rajan and Zingales (1998) that uses US as the benchmark to compare with 41 countries indicates that financial development has a substantial supportive influence on the rate of economic growth. This works partly by reducing the cost of external finance to financially dependent firms. In addition, financial development may be beneficial for the rise of new firms. If new firms generate new ideas, financial development can enhance innovation and thus enhancing growth indirectly.

However, the results obtained through cross sectional data analysis are subjected to a number of criticisms, as mentioned in Barro (1991), Demetriades and Hussein (1996) and Xu (2000). One limitation is that most of the cross sectional regression equations are based on specification that does not encompass a test for reverse causation that is justified by growth theory. The other limitation is the unrealistic assumptions that each economy has a stable growth path. The other possible problems are omitted variable bias, sample selection bias and inappropriate weighting of countries. In addition, financial development indicators in a given country are correlated across time. The initial value of

an indicator may be a good proxy for its contemporaneous level – which was omitted from the equation. Finally, the cross section technique cannot allow different countries to exhibit different pattern of causality. Arestis and Demetriades (1996) highlight that differences in the institutional structure of the financial system, financial sector policies and government effectiveness may have important implications on the causal relationship between financial development and growth. Thus cross-country differences in the causality between financial development and economic growth may exist. It may be better to use time series regression to test for the causal effect between finance and growth.

Table 2.1: Empirical Evidence on Cross-sectional Regression

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Levine (1992)	87 countries, 1960-1989 (OLS)	Per capita real GDP growth, Physical investment efficiency, Physical investment/ GDP	M2/GDP, M3/ GDP, Deposit bank credit / Total credit, Credit to private enterprises / credit to governments plus private enterprises	Financial intermediaries provide services to stimulate long run growth rates. M3/GDP or M2/GDP is not significantly correlated to current and future per capita growth rates.
Roubini and Sala-I-Martin (1992)	53 countries, 1960-1985 (OLS)	Per capita average GDP growth	Dummy for real interest rate and distortions in financial markets, Bank reserves /money supply	Financial underdevelopment and financial repression will lead to lower economic growth.
Atje and Jovanovic (1993)	39 countries, 1970 -1988 (OLS)	Per capita real GDP growth	Domestic credit/GDP, Stock market traded value/GDP,	Large effect of stock markets but no effect of bank lending on subsequent development of the economy.
Gregorio and Guidotti (1995)	95 countries 1960-1985 (OLS)	Per capita average GDP growth	Initial private domestic credit / GDP Average private domestic credit/GDP	Per capita real output growth is positively correlated with the financial intermediation variable.

Table 2.1: Empirical Evidence on Cross-sectional Regression

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Harris (1997)	49 countries, 1980 – 1991 (OLS & 2SLS)	Real GDP per effective labour growth rate	Stock market total value traded/GDP	Effects of stock market on growth are very weak for less developed countries and only slightly stronger for developed countries.
Levine and Zervos (1998)	47 countries, 1976 - 1993 (OLS)	Per capita average real GDP growth rate, Per capita real capital stock growth, Private savings/GDP, TFP growth	Stock market capitalization/ GDP, Total value traded/GDP, Total value traded/ stock market capitalization, Stock market integration index, Private sector bank credit/ GDP	Stock market liquidity and banking development both positively predict growth, capital accumulation and productivity improvement.
Rajan and Zingales (1998)	42 countries, 1980-1990 (OLS)	Average annual real growth rate of value added in various industry	Domestic credit + stock market, capitalization / GDP, Accounting standard indicator, External finance indicator	Financial development reducing the cost of external finance to financially dependent firms Financial development enhances innovation of new ideas from new firms and promotes growth.

2.4 Empirical Evidence Based on Time Series Analysis

To overcome the limitations encountered by cross sectional regression, many economists use time series data to test for the causal effect between finance and growth. As mentioned by Arestis and Demetriades (1997), it is possible that the long run causality may vary across countries and that the long run relationships themselves may exhibit substantial variations. Thus a time series analysis may yield deeper insights into the relationship between financial development and real output than cross-country regressions.

However, time series analysis requires sufficiently long time series national accounts data in countries. Since most national accounts data are available in annual frequency, there is always scarcity in time series data, especially for developing countries. This tends to hinder empirical work in the causality between financial development and economic growth for developing countries. Nevertheless, over the years more empirical evidence has been generated by researchers. The methodology has also become more sophisticated, from simple linear regression to Granger causality, error correction models and eventually to impulse response functions and variance decomposition.

The earliest work with time series data employs the technique of linear time series regression, such as the one by Gupta (1984). He uses quarterly data on industrial output to measure the level of economic development and the level of M2 to measure financial development in a study of the causality issue using the Granger causality test. Data on

industrial output is used because it is available in quarterly frequency which allows him to put together a much larger sample size than is typically possible.

But Demetriades and Hussein (1996) highlighted that interpreting Gupta's result is difficult due to three reasons. Firstly, causality tests by Gupta have more to say about whether money causes output than about whether financial deepening promotes economic development. In addition, in developing countries industrial output represents only a small component of total output, as a larger component output is generated by the agricultural sector. Finally, as far as the power of time series tests is concerned, the span of data is much more important than the number of observations. It is preferable to use data sets containing fewer annual observations over a long time period than data sets containing more observations over a short time period.

In a similar attempt, Fritz (1984) uses data for Philippines to construct two indexes for finance and economic development. The finance development index consists of components such as SDR, currency in circulation, commercial bank and non-bank deposits, domestic credit etc. The economic development index consists of components such as GNP, export and production of various products like cement and electricity, among others. The weight of each component is determined by factor analysis. Using the Sims (1972) test, his conclusion is that there is no causality if the entire series is used. But if the series are divided into two equal parts, then causation runs from financial to economic development at the early stage of development while the direction of causation

is reversed at the later stage. This evidence supports the claim of bi-directional causality by Patrick (1966).

From time series linear regression onwards, the research methodology become increasing advanced and sophisticated over the years. The methods range from the Granger causality test to vector autoregression, vector error correction model and impulse response functions and variance decompositions. As the literature in this area is huge, I focus on two studies which I consider as representative of research in this area. One research is by Demetriades and Hussein (1996) and the other is by Rousseau and Vuthipadadorn (2005). The other research are selectively reviewed and discussed in Table 2.2

Demetriades and Khaled (1996) perform Granger causality tests using time series data from 16 countries. The proxies for financial development are ratio of bank deposit liabilities to nominal GDP and the ratio of bank claims on the private sector to nominal GDP. The indicator for economic development is real GDP per capita. The model used is a bivariate VAR model consisting of a finance variable and a growth variable. Causality tests are carried out using the Granger causality test on VAR in levels, VAR in first differences and also the VECM. The evidence provides little support that finance is a leading sector in the process of economic development. However, there is a considerable evidence of bi-directional causality and some evidence of reverse causation. This paper highlights the dangers of studies that lump cross-sectional data of different countries together. Different countries tend to have different directions of causality and

hence cross sectional analysis may not reveal the actual relationship between finance and growth.

The work by Rousseau and Vuthipadadorn (2005) involves 10 Asian economies over the period 1950-2000. Using a trivariate VAR model consisting of a finance variable, a money supply variable and a growth model, they use the method proposed by Sims et al. (1990), to test for Granger non-causality in levels in the presence of one cointegrating vector. They also estimate a VECM to test for the significance of the error correction term. Two finance variables and growth variables are used in the study. The finance variables are M2 less M1 and credit allocated to the private sector. The growth variables are GDP and gross domestic fixed investment. The third variable is M1, based on the fact that in many economies, currency serves as an important store of value and thus complements intermediated finance in facilitating the accumulation of capital. Their results show that finance is a driving force behind investment but the role of finance in promoting output is weaker. Their study supports the factor accumulation channel as the primary mechanism through which the financial sector influences the economy.

Table 2.2 surveys selective literature on time series analysis of finance and growth. The survey consists of mainly Granger causality test on VAR and/or VECM, with some studies using impulse response functions and variance decompositions to discern the relationship between finance and growth. There is no consistent conclusion from these studies as the results are full of conflict. The studies by Demetriades and Luintel (1996), Rousseau and Wachtel (1998), Rousseau (1999), Wang (1999), Xu (2000), Arestis et al.

(2001) and Fase and Abma (2003) provide strong support of the proposition that finance promotes economic growth using various finance and growth indicators. The studies by Arestis and Demetriades (1996), Wachtel and Rousseau (1996) only show limited support of the supply leading hypothesis. In contrast, the study by Masih and Masih (1996) supports the demand following hypothesis. On the other hand, the studies by Odedokun (1992) and Luintel and Khan (1999) favour bidirectional causality between finance and growth. Finally, the study by Chang (2002) actually shows that finance and growth are independent.

There are many criticisms of the existing literature. One major criticism of these studies is that the data series are assumed to be stationary. Granger causality test is only valid for stationary series or cointegrated series. However, it is more likely that macroeconomic series are non-stationary in nature. Some writers did not perform any test on cointegration and hence the validity of these results is doubtful. Moreover, even if the two series are cointegrated, the causality result is only valid asymptotically. Some studies, in particular the earlier studies have very few observations and hence results based on the asymptotic theory cannot be expected to hold.

Another criticism is that most of these studies use highly aggregated indicators of financial intermediation, such as the ratio of M1 or M2 to nominal GDP or total domestic credit. Pagano (1993) highlights this neglects the issue that the effect of financial development can vary depending on the specific market where it occurs. A fine disaggregation is needed to distinguish the role of the stock market, the bond market, the

insurance market and the market for household credit. Although there are some studies on the role of stock market in economic development, there are very few that study the effects of credit, stocks, bonds and insurance markets on economic development.

One more criticism is that even if finance causes growth, it should not be the only factor and may not be the most important factor that influences growth. Models consist of growth and finance proxies are insufficient to approximate an economy. The other important variables must be included in the model to enhance its validity. The more relevant model should incorporate production theory, such as the study by Wang (1999) in the survey. But the set back in this framework is that output is considered as endogenous while financial development is considered as exogenous. There is no consideration of the possibility of financial development being endogenous and hence this framework is not useful in identifying the direction of causality.

In terms of research methodology, Temin (1996) criticizes the work of Wachtel and Rousseau (1996) and the same criticism can be applied to similar studies by many other researchers. Specifically, Temin (1996) doubts the value added in applying Granger causality to study the role of financial intermediaries in growth. He emphasizes that the Granger causality test is suitable to analyze the financial market which is changing rapidly, but not suitable in the application to historical financial intermediation in the study of institutional development. They did not specify a dynamic model indicating how financial intermediaries affect growth, but Granger causality methodology imposes dynamics on it. The impact of financial intermediation on economic growth is likely to

be a long run effect and hence the implicit dynamics imposed by the Granger causality technique are inappropriate. He also questioned the suitability of using real GDP and investment as growth indicators. The connection between investment and growth should be long term and not occurring in a year-to-year form of efficiency. Hence the rate of growth of output over longer run periods, rather than output changes from year to year, is a more relevant measure of intermediary effects. The investment ratio tends to represent the generation of funds rather than be an indicator for growth. Due to these limitations, there is increasing empirical work using panel data to study the relationship between finance and growth. The review of evidence using panel data is discussed in the next section.

Table 2.2: Empirical Evidence on time series analysis

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Odedokun (1992)	Annual data 1964-1988, 17 high income and 18 low income Less Developed Countries (LDC) (Granger causality test on VAR)	Real gross fixed capital formation growth rate, Real gross fixed capital formation/ real GDP	Real development banks' stock of claims/ real GDP Real flow of development banks' claims / real GDP	Supply leading and demand following relationship occur with about the same frequency among the low and high income LDCs.
Arestis and Demetriades (1996)	Annual data 1960-1989, 12 countries at various levels of development (Granger causality test on VAR)	Per capita Real GDP	M2/nominal GDP, M2 less currency/nominal GDP, Private sector credit/ nominal GDP	Limited support of financial development causes growth in industrialized countries. No clear direction in the causality in other countries.
Demetriades and Luintel (1996)	Annual data 1961-1991, India (Granger causality test on VECM)	Per capita Real GDP	Bank deposit/ GDP, Number of bank branches Real deposit rate	Banking sector controls have negative effects on financial development.
Wachtel and Rousseau (1996)	Annual data 1870 – 1929, 1946-1991 and 1870-1991 exclude 1930-1945, USA, UK and Canada (Granger causality test on VAR)	Per capita Real GDP growth, Investment/GDP % change in real GDP per capita/ investment	M2 less Monetary Base/ nominal GDP, M2 less Monetary Base/ Monetary Base	Bank activity causes growth in pre-1930 and only US in post 1945. Few cases of economic performance cause financial intensity.

Table 2.2: Empirical evidence on time series analysis (Continued)

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Masih and Masih (1996)	Annual data 1955 – 1991, Indonesia (VECM, variance decomposition and impulse response function)	Real GDP	M1, M2	Causality run from real output to money supply
Rousseau and Wachtel (1998)	Annual data 1870-1929, USA, UK, Canada, Norway and Sweden (Granger causality test on VAR and VECM)	Per capita real GNP	Commercial banks assets, Commercial banks and savings institutions assets, Commercial banks and other institutions' assets, Monetary stock less monetary base	Financial intermediation Granger causes real output Little evidence of feedback from output to financial intermediation.
Luintel and Khan (1999)	Annual data 1951-1995, 10 countries (Granger causality test on VAR)	Per capita real GDP, Per capita real capital stock	Bank deposits /lagged nominal GDP	Bi-directional causality between finance and growth.
Wang (1999)	Annual data 1961-1995, Taiwan (Multiple linear regression)	Total output of financial and real sector	Liquid liabilities/ GDP, Share of formal finances in total finances, Interest rate differential	Evidence of supply leading hypothesis dominates that of demand following hypothesis.

Table 2.2: Empirical evidence on time series analysis (Continued)

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Xu (2000)	Annual data 1960-1993, 56 countries (VAR and Impulse Response Functions)	Real GDP, Real investment	M2 less currency/nominal GDP	Financial development is important to growth via the channel of investment
Arestis et al. (2001)	Quarterly data 1968:1 to 1998:1, 5 countries (Weak exogeneity tests on VECM)	Real GDP	Stock market value/nominal GDP, Domestic bank credit/nominal GDP, Index of stock market volatility	Both banks and stock markets may be able to promote economic growth but the effects of banks are more powerful
Chang (2002)	Quarterly data 1987:1 to 1999:4, China (Granger causality test on VECM)	Nominal GDP	Monetary survey/GDP	Independence between financial development and economic growth.
Fase and Abma (2003)	Annual data 1951 – 1999, 9 Asian Countries (Granger causality test on VECM)	Real GDP	Aggregate financial assets	Causality runs from financial development to economic growth.

2.5 Empirical Evidence Based on Panel Data

More recently, there is increasing empirical evidence that combine both the cross-sectional and time series data, known as panel data, to perform analysis on the relationship between finance and growth. Compared to cross sectional analysis, the panel analysis allows researchers to exploit the time series nature of relationship between finance and growth and can control for country specific effects and the potential endogeneity of explanatory variables. Among the different methodologies involving panel studies, the dynamic panel method by Arellano and Bond (1991) and the dynamic error correction model approach are most commonly used.

The studies by Beck et al. (2000), Levine et al. (2000), Schich and Pelgrin (2002) and Rioja and Valev (2004) show positive effect of development of financial intermediaries and growth. The studies by Levine and Zervos (1996) and Rosseau and Wachtel (2000) indicate the stock market is important in promoting economic activity. Finally, Edison et al. (2002) conclude that international financial integration is positively associated with economic growth. The evidences favour a positive linkage between financial development and economic growth, in line with Schumpeter's theory.

Panel analysis is not without its criticisms. Luintel and Khan (1999) mentioned that inferences are based on contemporaneous partial correlations in a static panel which are difficult to interpret as causality. The dynamic panel model method by Arellano and Bond (1991) has the problem of being difficult to estimate. As mentioned by Greene (2000), complications in estimating the dynamic panel model arise from the fact that the

lagged dependent variable in such a model is correlated with the disturbances, even if the disturbances are not themselves autocorrelated.

Table 2.3: Empirical evidence on panel analysis

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Levine and Zervos (1996)	Annual data 1976 – 1985 and 1986 – 1993, 41 countries (Static fixed effect panel)	Per capita average real GDP	Stock market development index incorporates market capitalization, turnover value, turnover ratio and asset pricing theory mispricing indicator	Stock market development is positively and robustly associated with long run economic growth.
Beck et al. (2000)	Annual data 1960 – 1995, 63 countries (GMM dynamic panel method)	Per capita real GDP growth Per capita capital stock growth, TFP growth, Private savings rates	Financial intermediaries private sector credit /GDP, Currency + liabilities of financial intermediaries/ GDP, Bank assets/ Bank and central bank assets	Financial intermediary has a large and positive impact on TFP growth. Weak long run links between financial development to both physical capital growth and private savings rates.
Rousseau and Wachtel (2000)	Annual data 1980 – 1995, 44 countries (Panel GMM estimates of VAR system)	Per capita real GDP	Real M3 per capita, Per capita stock market capitalization, Per capita stock market total value traded	Stock market is important in promoting economic activity.

Table 2.3: Empirical evidence on panel analysis (Continued)

Author (Year)	Data (Methodology)	Growth Variable	Finance Variable	Results
Schich and Pelgrin (2002)	Annual data 1970 – 1997, 19 OECD countries (Dynamic panel ECM method)	Real business capital formation	Currency and liabilities of financial intermediaries, Private sector bank credit, Stock market capitalization	Financial development is significantly related to the levels of investment, with stock market capitalization having the strongest effect.
Edison et al. (2002)	Annual data 1976 – 1980, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 57 countries (GMM dynamic panel method)	Per capita real GDP growth rate	Accumulated capital inflows and outflows/GDP, Capital inflows and outflows /GDP, Accumulated capital inflows /GDP Capital inflows/GDP	International financial integration is positively associated with per capita real GDP but the relationship is not robust.
Rioja and Valev (2004)	Annual data 1961 – 1995, 74 countries (GMM dynamic panel method)	Per capita real per GDP growth rate	Currency + deposits of financial intermediaries/GDP, Bank assets / Banks + Central bank assets, Financial intermediaries private credit /GDP	Positive effect for intermediate and high level of financial development on economic growth but uncertain effect for low financial development.

2.6 Conclusion

In conclusion, economic theory does neither yield a specification of an estimable equation nor a well-defined causality pattern for economic growth and the stage of financial development. Although the financial sector provides many valuable services in allocation of resources to facilitate economic growth, it is also possible that financial development leads to ambiguous effects on the savings rate and that may retard growth. The presence of market failure may advocate financial repression to achieve economic growth.

The empirical evidence is also far from conclusive. Analysis based on correlation tends to indicate a positive association between financial indicators and growth indicators, and analysis based on cross country regression where financial indicators appear as explanatory variables tend to conclude that financial development is important in explaining economic growth. But the direction of causality cannot be revealed based on correlation coefficients and regression alone.

In cross-country studies, the implications of causality are usually done by regressing a growth indicator on the initial value of a financial indicator. The method of interpretation is open to critics. More importantly, a cross sectional study based on many countries tends to assume that each country follows a stable economic development path, which is highly unlikely. Many economists tend to support using time series analysis to study the relationship between finance and growth. No doubt that time series method on individual

countries is better in identifying the direction of causality. But to date most empirical studies on financial and economic development use highly aggregated indicators of financial intermediation. This neglects the issue that the effect of financial development can vary depending on the specific market where it occurs. As shown in the empirical work discussed, different choices of financial indicator may result in different directions of causality. A fine disaggregation is needed to distinguish the role of the stock market, the bond market, the insurance market and the market for household credit. It might be fruitful to conduct studies based on specific financial markets to discover the path in which financial development leads to economic growth.

As pointed out by Chandavarkar (1992), there are many major gaps in the literature on the analytic, institutional, operational and policy aspects of finance in the developing countries. A rich agenda of country-specific, issues-oriented research invoking the techniques and insights of analytical and institutional economics may be needed to explore the relationship between financial development and economic growth.

Chapter 3: Data and Methodology

3.1 Introduction

In this chapter, we will define the variables, data sources and introduce the research methodology involved in establishing the causal relationship between financial development and economic growth. Since the causal relationship between financial development and economic growth is long term, a suitable technique is a Granger causality test on a vector error correction model framework. A detailed description of the data used and the justification of the variables selected to represent financial development and economic growth are also included.

3.2 Data Definitions

The theoretical discussion implies that there are two distinct, yet complementary channels that financial development can influence economic growth. The first channel is based on the "debt accumulation" hypothesis by Gurley and Shaw (1955) and also by Bencivenga and Smith (1991). It focuses on the spread of organized finance at the expense of self-finance and the former's ability to overcome indivisibilities through the mobilization of unproductive resources. The second channel, sometimes called the "total factor productivity" channel, emphasizes the role of innovative financial technologies in ameliorating the informational asymmetries that hinder the efficient allocation of funds and the monitoring of the resulting projects. This is the idea considered by Greenwood and Jovanovic (1990) and King and Levine (1993b), among others. Thus the appropriate growth indicator must be able to reflect the level and efficiency effect of capital.

A suitable growth indicator is the real gross fixed capital formation per capita (denoted by GFCF hereafter). This is because when a financial sector is more developed, it should allocate more financial resources into productive use. This will lead to more physical capital being formed and reflected in a higher GFCF. The physical capital created can contribute positively to economic growth and this is relevant to the first channel of finance enhances growth. This economic growth indicator is also used by researchers such as Odedokun (1992), Rousseau (1999) and Bell and Rousseau (2001), among others. The second suitable growth indicator is the total factor productivity (denoted by TFP hereafter), which is the portion of real GDP not explained by changes in capital stock and labour quantity. However, it is difficult to measure efficiency in an economy and the TFP data for most economies are not available. We follow the method by Collins and Bosworth (1995) to construct the TFP series. They measure capital stock using a perpetual inventory model and assume a fixed capital share of 0.35. Their results are robust to varying the assumed capital share between 0.3 and 0.4. In our studies, we assume the GFCF in 1964 (or the earliest possible GFCF data available) as the initial capital stock an economy had¹. We then use the GFCF value in the subsequent year as investment in capital stock with a depreciation rate of 7% to compute capital stocks in later years. Since most of the economies we selected are developing economies which are less capital intensive, we use a fixed capital share of 0.3. This is also the value used by King and Levine (1993a, 1993b) in constructing the TFP data. Our TFP series is generated using real GDP per capita less 0.3 of real capital stock per capita. This

¹ The alternative measure of capital growth is based on assuming an initial capital stock of zero which is less preferred.

economic growth indicator is also used by researchers such as Neusser and Kugler (1998), King and Levine (1993a, 1993b) and Levine and Zervos (1998), among others.

It might be difficult to disentangle the effect of debt accumulation channel from the total factor productivity channel. Hence most of the studies surveyed use real GDP per capita as the growth indicator. For completeness of the study we also use the real GDP per capita as the third growth indicator (denoted by GDP hereafter). Regardless of which channel, the joint effect on economic growth due to more investment and/or a higher level of efficiency should eventually be reflected in a higher GDP. In the event that the first two disaggregated growth variables are unable to pick up the effect of financial development in the economy, the third growth variable should be able to do so. Real GDP per capita or its growth rate is very commonly used in the finance growth study. Researchers that use this economic growth indicator include Demetriades and Khaled (1996), Luintel and Khan (1999) and Rousseau and Vuthipadadorn (2005), among others. This study considers three distinct domestic financial markets that may have implications for economic growth. They are the banking credit market, the stock market and the insurance market. In most developed and developing countries, commercial banks are the most important and most established financial institutions in the credit market. Besides channeling unproductive savings into productive investment and thereby augment the amount of capital, the commercial banks also evaluate loans applications, supervise the usage of the funds borrowed by the investors and hence allocate the funds to the most promising investment projects. Thus a suitable financial indicator is total commercial bank credits to the private sector per capita (denoted by BANK hereafter).

We only focus on the private sector since funds channeled to the government sector may not be consistent with the growth enhancement effect of financial development. This financial development indicator is also used by Gregorio and Guidotti (1995), Arestis and Demetriades (1996) and Bell and Rousseau (2001), among others.

The next best alternative to the bank credit market is usually the stock market. A firm may choose to sell its shares in the stock market to raise the necessary funds for investment. This is especially common if the lending rate is high, or if it is difficult to obtain funds from commercial banks. Besides allowing firms to raise funds from selling equities, the stock market also performs the role of monitoring firms' performance. A well-performed firm will see its share price rising while a poorly performed firm will see its share price falling. This enhances the efficiency of investment. The stock market also provides an exit for entrepreneurs to channel the funds to more attractive alternatives. Hence a suitable indicator for the stock market development is the stock market capitalization per capita (denoted by STOCK hereafter). This financial development indicator is also used by Arestis and Demetriades (1997), Levine and Zervos (1998) and Aretis et al. (2001), among others.

The role of the third financial indicator is to indicate the development of insurance markets. The main objective of an insurance market is to allow investors to hedge business risks. In the absence of an insurance market, risk-averse investors may decide not to invest in promising but risky projects. In this case the funds may not be allocated to projects with highest returns. With suitable insurance coverage, firms are able to

reduce the uncertainty in business and hence are more willing to invest in risky projects. Thus a suitable indicator for the development of an insurance market is the total assets of insurance companies per capita (denoted by INSUR hereafter). Whenever possible, we use the sum of both life and general insurance assets in our analysis. But in some cases only life insurance assets are used. We did not discover any study that focuses on the effects of an insurance market on economic growth. The only study that involves an insurance market is done by Wachtel and Rousseau (1996) where they construct a measure of intensity of financial intermediation which includes insurance companies' assets.

So far the finance variables originate mainly from the domestic market. The fourth financial indicator is the foreign direct investment per capita in the recipient economy. For economies that are open to foreign capital, the inflow of foreign capital can supplement the domestic capital to influence the domestic economy. However, there are two main types of capital inflow. One is to finance direct investment (denoted by FDI hereafter) which is usually long term in nature and results in capital accumulation of the recipient country. The second type is to finance portfolio investment which is short term and could be speculative in nature. There are several indicators for international financial development that can be used to study international financial integration. For example, the study by Edison et al. (2002) considers FDI plus portfolio inflow and outflow, FDI inflow and outflow, stocks of FDI plus portfolio inflow and outflow, stock of FDI inflow and outflow, and some measures on restriction on capital account transaction as international financial integration indicators. In this study, the interest is in the long term

effect of international finance on economic growth and hence only foreign direct investment inflow per capita is analyzed (denoted by FDI henceforth).

3.3 Nature and Sources of Data

Since at different levels of economic development the relationship between financial development and economic growth could be different, this research considers economies at different levels of economic development. The criteria developed by the World Bank (2004) divide economies into three groups based on their Gross National Income per capita in 2001. They are low income economies with US\$745 or less, middle income economies with income between US\$746 and US\$9205 and high income economies with income above US\$9206.²

Using the same criteria, we select 20 economies that span across Asia Pacific, Europe and the American continent. However, we single out Hong Kong, Singapore, South Korea and Taiwan and group them under the newly industrialized economies. As for the other economies, there are 5 low income economies, 6 middle income economies and 5 high income economies. The low income economies are Bangladesh, India, Pakistan and Indonesia and Sri Lanka. The middle income economies are Brazil, China, Philippines, Malaysia, Thailand and Turkey. The high income economies are Australia, Italy, Japan, United Kingdom and United States of America. In this research, we use the notation HIE, NIE, MIE and LIE to indicate high income economies, newly industrialized economies, middle income economies and low income economies respectively.

² World Bank divides middle income economies into lower middle income economies and upper middle income economies, with US\$2975 as the demarcation. Our thesis does not require such demarcation.

Since the relationship between financial development and economic growth is essentially a long term one, annual data over a sufficient long period of time is the most appropriate. The data used in the study are annual data commencing from 1965 to 2004 in most cases. In a few cases, only a shorter data series are available but there must be at least 16 annual data points.

As mentioned earlier, if the financial development indicator is not exogenous to the growth indicator, it is difficult to imply a causal relationship between the two variables. This study explores the use of spread between lending and borrowing rates as an instrument for development of the credit market, and the stock market turnover ratio as an instrument for the development of stock market. In our opinion, these two financial development instruments are exogenous to the growth indicator and hence can be used to imply the causal relationship between finance and growth.

This study also explores the static and dynamic panel approach in studying the relationship between finance and growth. The economies are divided into low income economies, middle income economies, NIEs and high income economies and panel analyses are performed within each group. In the static panel analysis, the two instruments mentioned earlier are used as financial development indicators. In the dynamic panel analysis, the lagged value of BANK and STOCK are used as instruments. The data for commercial bank credit to private sector, nominal GDP, nominal gross fixed capital formation, foreign direct investment, lending rate, deposit rate and population for all economies except Taiwan are obtained from the IFS online 2005 version. The real

data is calculated from the nominal data using the GDP deflator (with 2000 as the base year) which is also obtained from IFS. The stock market capitalization, stock market turnover value, insurance companies' assets for all economies and the relevant data for Taiwan are obtained from CEIC online 2005 version. In some cases where the data is not available in IFS, then the data from CEIC is used as its replacement. Except for foreign direct investment which is available in US dollars, all the data are valued in domestic currency. For the usual statistical reasons, all variables are analyzed in natural logarithms.

3.4 Research Methodology

To establish a causal relationship between the finance and growth data, we will make use of the Granger causality framework, where causality is assessed by the Granger causality test. According to Granger (1963), an economic time series X_{1t} is said to 'cause' another series X_{2t} if $E(X_{2t+1}/J_t) \neq E(X_{2t+1}/J_t')$ where J_t is the information set containing all available information. J_t' excludes the information in the past and present X_{1t} . This implies that X_{2t+1} will be better forecasted (in terms of smaller forecast error variance) if the information in X_{1t-j} is used than if it is not.

The conventional Granger causality test involves specifying a bivariate k th order vector autoregressive model (VAR) as follows:

$$X_{1t} = \mu_1 + \pi_{11}(L) X_{1t-1} + \pi_{12}(L) X_{2t-1} + \varepsilon_{1t} \quad (3.1)$$

$$X_{2t} = \mu_2 + \pi_{21}(L) X_{1t-1} + \pi_{22}(L) X_{2t-1} + \varepsilon_{2t} \quad (3.2)$$

where μ_1 and μ_2 are constant drifts and $\pi_{12}(L)$ are polynomials of order $k-1$ in the lag operator L . The null hypothesis that X_{1t} does not Granger causes X_{2t} amounts to a zero polynomial $\pi_{21}(L)$ and can be tested by standard methods such as a F test if the variables are stationary. The testing procedures become more complex if the variables are non stationary. In such cases it is useful to transform the model into an equivalent error correction model (ECM) form as follows:

$$\Delta X_{1t} = \mu_1 + \gamma_{11}(L)\Delta X_{1t-1} + \gamma_{12}(L)\Delta X_{2t-1} + [\pi_{11}(1) - 1]X_{1t-1} + \pi_{12}(1)X_{2t-1} + \varepsilon_{1t} \quad (3.3)$$

$$\Delta X_{2t} = \mu_2 + \gamma_{21}(L)\Delta X_{1t-1} + \gamma_{22}(L)\Delta X_{2t-1} + \pi_{21}(1)X_{1t-1} + [\pi_{12}(1) - 1]X_{2t-1} + \varepsilon_{2t} \quad (3.4)$$

where γ_{ij} are now polynomials of order $k - 2$. The ECM can be written in a more compact form as

$$\Delta \mathbf{X}_t = \boldsymbol{\mu} + \boldsymbol{\Gamma}(L)\Delta \mathbf{X}_{t-1} + \mathbf{P}_0\mathbf{X}_{t-1} + \boldsymbol{\varepsilon}_t \quad (3.5)$$

where $\mathbf{X}_t = (X_{1t}, X_{2t})'$, $\boldsymbol{\mu} = (\mu_1, \mu_2)'$, $\boldsymbol{\Gamma}(L) = \{ \gamma_{ij}(L) \}$, $\mathbf{P}_0 = [\Pi(1) - I_2]$, $\Pi(1) = \{ \pi_{ij}(1) \}$ and $\boldsymbol{\varepsilon}_t = (\varepsilon_{1t}, \varepsilon_{2t})'$.

The number of unit roots in the characteristic polynomial is crucial in determining the stability of the system. If there are no unit roots, the VAR in (3.1) and (3.2) is stable and $\{\mathbf{X}_t\}$ is a stationary process. The conventional Granger causality tests are valid in a VAR levels framework. If there are unit roots of order two, then $\Pi(1) = I_2$ and the system is non-stationary. In such a case the causality test may be carried out in a first differenced VAR by standard method as follows:

$$\Delta X_{1t} = \mu_1 + \gamma_{11}(L)\Delta X_{1t-1} + \gamma_{12}(L)\Delta X_{2t-1} + \varepsilon_{1t} \quad (3.6)$$

$$\Delta X_{2t} = \mu_2 + \gamma_{21}(L)\Delta X_{1t-1} + \gamma_{22}(L)\Delta X_{2t-1} + \varepsilon_{2t}. \quad (3.7)$$

The most interesting case is when there is a unit root of order 1. This corresponds to the definition of cointegration given by Engle and Granger (1987), where X_1 and X_2 are integrated of order 1 but there is a linear combination $\beta'X_t$ which is stationary. In such a case $P_0 = \alpha\beta'$ and the vectors α and β are both different from 0. Equation (3.5) can then be rewritten as follows:

$$\Delta X_t = \mu + \Gamma(L)\Delta X_{t-1} + \alpha(\beta'X_{t-1}) + \varepsilon_t. \quad (3.8)$$

Thus when X_1 and X_2 are $I(1)$ and cointegrated, X_1 can Granger cause X_2 by two sources. One is through the lagged dynamic terms ΔX_{1t} if $\gamma_{21}(L) \neq 0$. The other is through the lagged cointegrating vector $\beta'X_{t-1}$ if $\alpha_2 \neq 0$. Granger (1988) has cautioned that failure to include the error correction term with a cointegrated $I(1)$ process will result in models which are mis-specified and the causality testing can lead to erroneous outcomes. The ECM based causality tests offer the additional advantage that the source of causation can be identified, in the form of either short run dynamics or disequilibrium adjustment.

Cointegration can be tested by the methods suggested by Engle and Granger (1987) or by Johansen (1988). This thesis follows the approach by Johansen since it is found to be more powerful than that of Engle and Granger, as mentioned by Demetriades and Hussein (1996). The Johansen procedure focuses on the rank of the matrix P_0 , which determines the number of distinct cointegrating vectors. Two likelihood ratio tests can be used. The first test is based on the maximal eigenvalue and is designed to test the hypothesis that the number of cointegrating vectors is r against the alternative of $r+1$ cointegrating vectors. The maximum eigenvalue test is given by the statistics $J_{ME} = -T \ln(1-\lambda_r)$, where T is the number of observations and λ_r is the maximum eigenvalue. The

second likelihood ratio test is based on the trace of the stochastic matrix and is defined as $J_T = -T \sum \ln(1 - \lambda_r)$. In a bivariate system, the maximum number of cointegration vectors is 1 so that the null hypothesis is of no cointegrating vector is tested against the alternative that there is one cointegrating vector.

When cointegration between variables is detected, the ECM based causality tests are used. In this thesis two types of causality tests are considered. The first one relates to the joint significance of lagged dynamic terms ΔX_{1t-i} and ΔX_{2t-i} . The second is a test of statistical significance of the lagged cointegrating vector in the equation ($\alpha_1 = 0$ in the X_1 equation and $\alpha_2 = 0$ in the X_2 equation). The problem with this methodology is the difficulty in obtaining the appropriate framework due to low power of unit root and cointegration tests, and also the low power of the Granger causality test to detect causality, as highlighted in Banerjee et al. (1993) and Demetriades and Hussein (1996).

It may not be necessary to perform differencing on non-stationary series in order to test for causality. Sims et al. (1990) have shown that in a tri-variate system, if there is a single cointegrating relationship the Wald tests for Granger causality are asymptotically distributed as chi-square. Thus the Granger causality test can be performed on the level for all the three series. However, Toda and Phillips (1993) have doubted the usefulness of unrestricted levels Vector autoregressions as it is valid only asymptotically and hence subject to many uncertainties. Their preference is the Johansen-type ECM approach which is also the approach adopted in this thesis.

Another method to studying the causal relationship among variables is to consider innovation accounting such as impulse responses and variance decomposition analysis. An impulse response function essentially maps out the dynamic response path of a variable due to a one-period standard deviation shock to another variable. In a similar way, the process of variance decomposition involves partitioning the variance of the forecast error of a certain variable into proportions attributable to innovations or shocks in each variable in the system including its own. A variable that is optimally forecast from its own lagged values will have all its forecast error variance accounted for by its own disturbances. Both processes can be used to gauge the relative strength of the Granger-causal relationship among the variables beyond the sample period.

Lutkepohl and Reimers (1992) show that impulse response functions and variance decomposition can be used to obtain information concerning the interactions among variables. In obtaining impulse response functions and variance decompositions, the Choleski decomposition method is often used to orthogonalize the innovations. Masih and Masih (1996) mention that in the Vector Error Correction Model (VECM), F tests and t-tests are considered as within-sample causality tests which indicate only the Granger-exogeneity or endogeneity of the dependent variable within the sample period. These methods can neither provide an indicator of the dynamic properties of the system nor assess the relative strength of the Granger-causal relationship or degree of exogeneity amongst the variables beyond the sample period. They suggest using variance decomposition or impulse response functions, which can be considered as an out-of-

sample causality test. Since both methods effectively provide the same information, this research only reports the variance decomposition between the two selected variables.

In view of the unsettled state of the econometric literature regarding causality tests, this thesis performs a variety of causality tests between financial development and economic growth using both the VAR and the VECM representation. These tests are preceded by unit root tests aiming to establish the order of the integration of each variable and cointegration testing as they have important implications for causality testing. Since there is no well-established theory linking the financial sector to economic growth, this research uses a bi-variate vector autoregressive model, consisting of a growth indicator and a finance indicator as the baseline model. The exact form of the bi-variate models and the appropriate tests for short and long term statistical causation will depend critically on the stationarity and cointegration properties of each system. The investigation begins with testing for unit root on the two series. Unit root tests are carried out using the two most popular tests, the Augmented Dickey Fuller (ADF) test by Dickey and Fuller (1981) and the Phillips-Perron (PP) tests by Phillips and Perron (1988).

Under both tests, the null hypothesis of unit root is tested against the alternative of the absence of a unit root. Tests on all the series are conducted on the level followed by their first difference. The procedure discussed in Enders (2004)³ is used to decide whether to include an intercept and/or trend test in the unit root tests. However, given that both the tests tend to be sensitive to the order of augmentation, the SIC criteria is used to determine the number of lags used in the tests.

If unit roots are found in both variables, then the Johansen test is used to test for cointegration among the variables. However, one problem associated with the Johansen procedure is that the results are sensitive to the lag length of the VAR (see Banerjee et al., 1993). We place more emphasis on the statistics obtained from the longer lag lengths as it is now known that the Johansen tests statistics are more sensitive to under-parameterization than over-parameterization (Cheung and Lai, 1993). To minimize the effect of data mining, we will accept the results only when both the maximum eigenvalue test and trace tests by Johansen and Juselius (1990) indicate the presence of cointegration. If it is established that the financial development indicator and the growth indicator are cointegrated, the vector error correction model will be formed. The number of lags in the VECM is determined using the SIC criteria. There will be two tests for causality. One is the significance of the error correction term which shows the long term effect. The error correction term follows the t-distribution and hence the test can be conducted using a t-test. The other test is on the joint significance of the lagged dynamic terms which shows the short term effect. In this case the block exogeneity test which restricts the lags of other variables to be zero for a given variable is useful. The test involves a likelihood ratio statistic which has a χ^2 distribution with degrees of freedom equal to twice the number of lags. If there is no cointegrating relationship between the indicators, then there is no long-term relationship between financial development and economic growth. In this case the VAR model with first differences will be formed and only the block exogeneity test is used.

³ The procedure is discussed in Figure 4.13, page 213 of Enders (2004).

To further enhance the evidence on the direction of causality between finance and growth, we compute the percentages of movements in the growth variables that can be attributed to the finance variables at horizon of 10 years using the variance decomposition. To implement this, we apply the Choleski decomposition to the variance-covariance matrix of the residuals from the VAR systems. Since the results are sensitive to the ordering of the variables in the matrix, we consider both orders and obtain two versions of the variance decomposition.

The theoretical discussion in Chapter 1 clearly states that although financial development can affect economic growth, economic growth can affect financial development as well. As mentioned by Xu (2000), it is essential to confront this feedback problem and to account for dynamic interactions among financial development and growth variables. Such dynamic interactions between financial and growth variables require the equilibrium value of all variables to be determined simultaneously. The bivariate VAR approach which we discussed earlier is well suited for this purpose.

An alternative method is to use a dynamic panel estimation method. Panel data involves pooling cross section (different economies) and time series data. It allows the researcher to exploit the time series nature of the relationship between finance and growth when using many countries data. Moreover, when using pure cross-country instrumental variable regression there is the problem that any unobserved country-specific effect becomes part of the error term and this may bias the coefficient estimates. Panel procedures can control for country specific effects. This thesis groups the economies

according to their income level and combines the time series data of each economy within the group to perform the panel estimation. Two estimation methods, the static fixed effects approach and the dynamic panel approach are considered. Two financial development instruments are used in the panel analysis and the detail of this approach is discussed in Chapter 7 of this research.

The basic framework for the static panel model is a regression of the form

$$Y_{it} = \alpha_i + \beta_i X_{it} + \varepsilon_{it} \quad (3.9)$$

where Y_{it} is the growth variable of economy i at time t and X_{it} is the financial development indicator of economy i at time t . The individual effect is α_i , which is taken to be constant over time t and specific to the individual economy i . The fixed effects approach takes α_i to be a group specific constant term in the regression model.

The basic framework for the dynamic panel model is a regression of the form

$$Y_{it} - Y_{i,t-1} = \beta_i(X_{it} - X_{i,t-1}) + \delta_i(Y_{i,t-1} - Y_{i,t-2}) + (\varepsilon_{it} - \varepsilon_{i,t-1}). \quad (3.10)$$

However, this model is difficult to estimate. As mentioned in Greene (2000), complications in estimating the dynamic panel model arises from the fact that the lagged dependent variable in such a model is correlated with the disturbance, even if the disturbance is not itself autocorrelated. The panel estimation method we used in this research is proposed by Arellano and Bond (1991) and the detail is discussed in Chapter 7.

3.5 Conclusion

The methodology selected in this study is Granger causality test in a VAR or VECM framework. To provide further evidence in establishing the causal relationship between financial development and economic growth, variance decompositions, instrumental analysis and panel analysis are also used. The data used span across 20 economies from 1965 to 2004, with at least 16 observations for any variable. Three indicators are used to represent economic growth arises from the development of financial sector. The first indicator is real gross fixed capital formation per capita which represents the capital augmentation channel. The second indicator is the TFP which represents the efficiency channel. The third indicator is real GDP per capita which represents the combined effect of both capital accumulation and efficiency. Four specific financial sectors are considered in this study. They are the bank credit market, stock market, insurance market and foreign credit financing direct investment. Two instruments are also considered in the study in the analysis using panel data. The empirical results are presented in the next few chapters.

Chapter 4: Finance-Growth Nexus in Singapore

4.1 Introduction

To study the cause and effect between the financial market and economic growth, it is not suitable to use aggregated financial data, such as money supply, total domestic credit or total assets of financial institutions as the financial development indicator. This is because different financial instruments perform different functions and have different effects on the economy. In fact, Pagano (1993) has highlighted the importance of using disaggregated financial data in the study of causality between finance and growth. The literature by Odedekun (1992) which focuses only on credit by development banks and Aretis and Demetriades (1996) which focuses only stock market capitalization are showing support in this area. Selecting the appropriate financial development indicators is very important in the study of the finance-growth nexus.

Many economies rely on commercial banks for investment funds. Besides banking credit, the other form of financing is through selling equities in the stock market. The more developed the stock market is, the more firms may raise funds through the stock market to finance expanding and this may have an important contribution to economic development. Another issue to consider is the business risk. If some business risk can be hedged using suitable insurance policies, then more firms may be willing to pursue risky projects with higher return and again this may in turn contribute positively to economic development. This chapter explores the relationship between three financial markets and the economic growth of Singapore. They are the commercial bank credit market, the stock market and the insurance market.

4.2 Empirical Investigations

This research uses three domestic financial development indicators and three economic growth indicators. The finance variables are BANK, STOCK and INSUR and the three growth variables are GFCF, TFP and GDP. As mentioned in Chapter 3, BANK refers to the commercial bank credit to the private sector per capita, STOCK refers to stock market capitalization per capita and INSUR refers to insurance companies’ assets per capita. The GDP series is real GDP per capita, the GFCF series is real gross fixed capital formation per capita and the TFP is the total factor productivity. The empirical analysis begins with unit root tests, follow by cointegration tests, then the Granger causality tests and finally the variance decomposition.

The unit root tests using the ADF test and PP test on the Singapore economy are shown in Table 4.1. Rejection of the null hypothesis of unit root at 1%, 5% and 10% levels are denoted by ***, ** and * respectively, using the critical values by MacKinnon (1996).

Table 4.1: Unit Root Tests

Variable	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
GFCF	1965-2004	-2.98	-3.60**	-1.34	-3.63**
TFP	1965-2004	-2.13	-5.23***	-2.09	-5.13***
GDP	1965-2004	-1.59	-4.38***	-1.61	-4.28***
BANK	1965-2004	-1.08	-4.19**	-0.13	-4.13**
STOCK	1980-2004	-1.64	-7.17***	-1.64	-7.60***
INSUR	1968-2004	-2.03	-4.19***	-1.60	-3.18***

The results show that for all the series the 2 tests do not reject the null of a unit root for the data in levels and rejects the null for each of the differenced series. This means we can accept that all the series involved are $I(1)$.

The cointegration tests between the three finance variables and each of the growth variables using the Johansen method are shown in Table 4.2. The rejection of the null hypothesis of no cointegration ($r = 0$) coupled with a failure to reject the null of one cointegrating vector ($r = 1$) provides evidence of a single long-run relationship in a given system. The term k is the minimum lag at which both the trace and maximum eigenvalue tests show the presence of cointegration.

Table 4.2: Cointegration Tests

Cointegrating System	Lag	Trace		Maximum eigenvalue	
		$r = 0$	$r = 1$	$r = 0$	$r = 1$
GFCF and BANK	6	23.35***	3.78	19.57***	3.78
TFP and BANK	2	18.13**	1.69	16.44**	1.69
GDP and BANK	8	27.43***	7.20***	20.23***	7.20***
GFCF and STOCK	5	16.04**	1.12	14.92**	1.12
TFP and STOCK	6	46.47***	6.98***	34.47***	6.98***
GDP and STOCK	6	44.09***	7.12***	36.96***	7.12***
GFCF and INSUR	10	61.27***	0.07	61.20***	0.07
TFP and INSUR	6	17.19**	0.006	17.18**	0.006
GDP and INSUR	6	21.39***	0.054	21.34***	0.054

We allow up to a maximum of 11 lags to detect cointegration since the relationship between finance and growth is long term. Rejection of the null hypothesis of no cointegration at 1% and 5% levels are denoted by *** and ** respectively. Since there are only two variables, the maximum number of cointegrating vector is one. We accept the presence of cointegration when the null of no cointegration is rejected but the null of one cointegrating vector is not rejected. In the event that the null of one cointegrating vector is also rejected, we will consider it as no cointegration. The results show that there is no cointegration between GDP and BANK, TFP and STOCK and also GDP and STOCK. For the other systems, there are long term relationships between the finance variables and the growth variables in the Singapore economy.

When cointegration between the finance variables and the growth variables are detected, we use the VECM model to test for the cause and effect between the two variables. In the absence of cointegration between the finance and the growth variables, the VAR model at first difference is used to test for the causal effect. As mentioned by Enders (2004), it is preferable to use first differences if the $I(1)$ variables are not cointegrated. Using VAR in levels when $I(1)$ are not cointegrated encounter the problems of losing power in hypothesis testing, test for Granger causality do not have the standard F distribution and impulse responses of long forecasts are inconsistent. The block exogeneity Wald test is used to detect the presence of short run causality while the significance of the error correction coefficient supports long run causality from the independent variable to the dependent variable. The lag length is selected using the AIC

criteria. The significance of the variable at 1%, 5% and 10% levels are denoted by ***, ** and * respectively in Table 4.3.

Table 4.3: Causality Test Between Growth and Finance Variables

Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
GFCF	3.48*	-0.27***
BANK	8.75***	-0.018
TFP	8.71**	0.05***
BANK	11.57***	0.06**
ΔGDP	0.11	-
ΔBANK	33.22***	-
GFCF	0.31	-0.38***
STOCK	0.14	-0.12
ΔTFP	2.63	-
ΔSTOCK	0.97	-
ΔGDP	4.31**	-
ΔSTOCK	0.37	-
GFCF	0.01	-0.14***
INSUR	0.17	-0.01
TFP	8.71**	-0.09*
INSUR	5.41	0.08
GDP	8.05**	-0.05**
INSUR	6.96*	0.04

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

The results in Table 4.3 show that long run causality effect from finance to growth occurs most obviously in the insurance market, where INSUR Granger causes all the three growth variables. The development on the bank credit market and the stock market affects growth mainly through the capital accumulation channel. There is a bi-directional causality between stock market development and the total factor productivity in the long

run. Most short run causal effects are bi-directional, especially in the bank credit market. Only the stock market has a short run positive effect on the GDP of Singapore.

After considering the Granger-causal relationship between our financial development and growth variables, we compute the percentages of movements in the growth variable that can be attributed to the financial development variables at horizon of 10 years using the variance decomposition. To implement this, we apply the Choleski decomposition to the variance-covariance matrix of the residuals from our VECM systems, which is sensitive to the ordering of the variables in the matrix. We use the results of our Granger-causality tests as a guide for choosing this ordering.

Variance decomposition of the finance variables and the growth variables in Singapore at the 10 years horizon are reported in Table 4.4. We order the finance variable first in the variance decomposition because our Granger causality tests suggest that the finance variables behave most exogenously among the variables in our bi-variate systems. This is in line with the recent endogenous growth model discussed in Chapter 1 which presents mechanisms through which finance leads the real sector. Placing the finance variables first allows the largest possible effect of finance on the real sector to emerge.

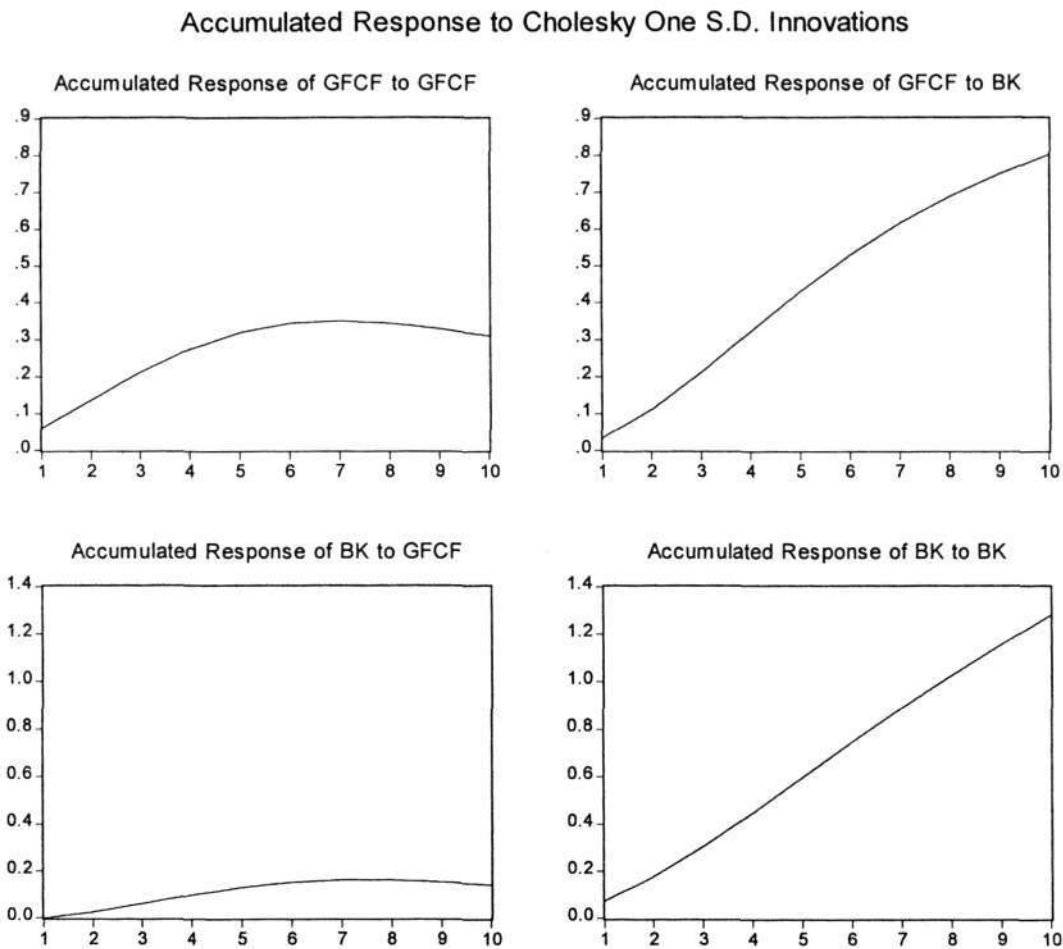
Table 4.4: Variance Decompositions Between Finance and Growth Variables

Finance Variable	Growth Variable	Variance Decomposition of growth variable by finance variable	Variance Decomposition of finance variable by growth variable
BANK	GFCF	75.84	2.95
	TFP	28.84	18.29
	GDP	13.64	51.73
STOCK	GFCF	72.77	0.42
	TFP	45.55	3.07
	GDP	56.97	0.89
INSUR	GFCF	7.32	1.10
	TFP	16.34	10.14
	GDP	24.87	8.29

The three finance variables can explain a large percentage of the variance of the three growth variables significantly in all cases. But the growth variables can only explain the finance variables significantly in 4 cases and the percentage explained is much smaller. The only exception is the variance decomposition between GDP and BANK in that GDP can explain 51.73% of the variation in BANK, while BANK can only explain 13.64% of the variation in GDP over a 10 year horizon. Overall, the variance decomposition confirms that financial market development matters for economic growth.

The diagrams of the impulse response functions and the variance decompositions between GFCF and BANK, and also between GFCF and STOCK for Singapore are shown in Figure 4.1 to Figure 4.4.

Figure 4.1: Impulse Response Functions of BANK and GFCF in Singapore



Note: BK denotes BANK. The X axis shows the number of years.

Figure 4.1 shows the impulse response function of GFCF and BANK (denoted by BK in the diagram) in Singapore accumulated over a 10 year horizon. There is hardly any response by the variable BANK to a one standard deviation innovation of the variable GFCF, as shown in the bottom left panel diagram. But the response on the GFCF to a one standard deviation innovation of the BANK is very strong, as shown in the top right panel of the diagram. This shows that BANK has a very strong influence on the GFCF in Singapore.

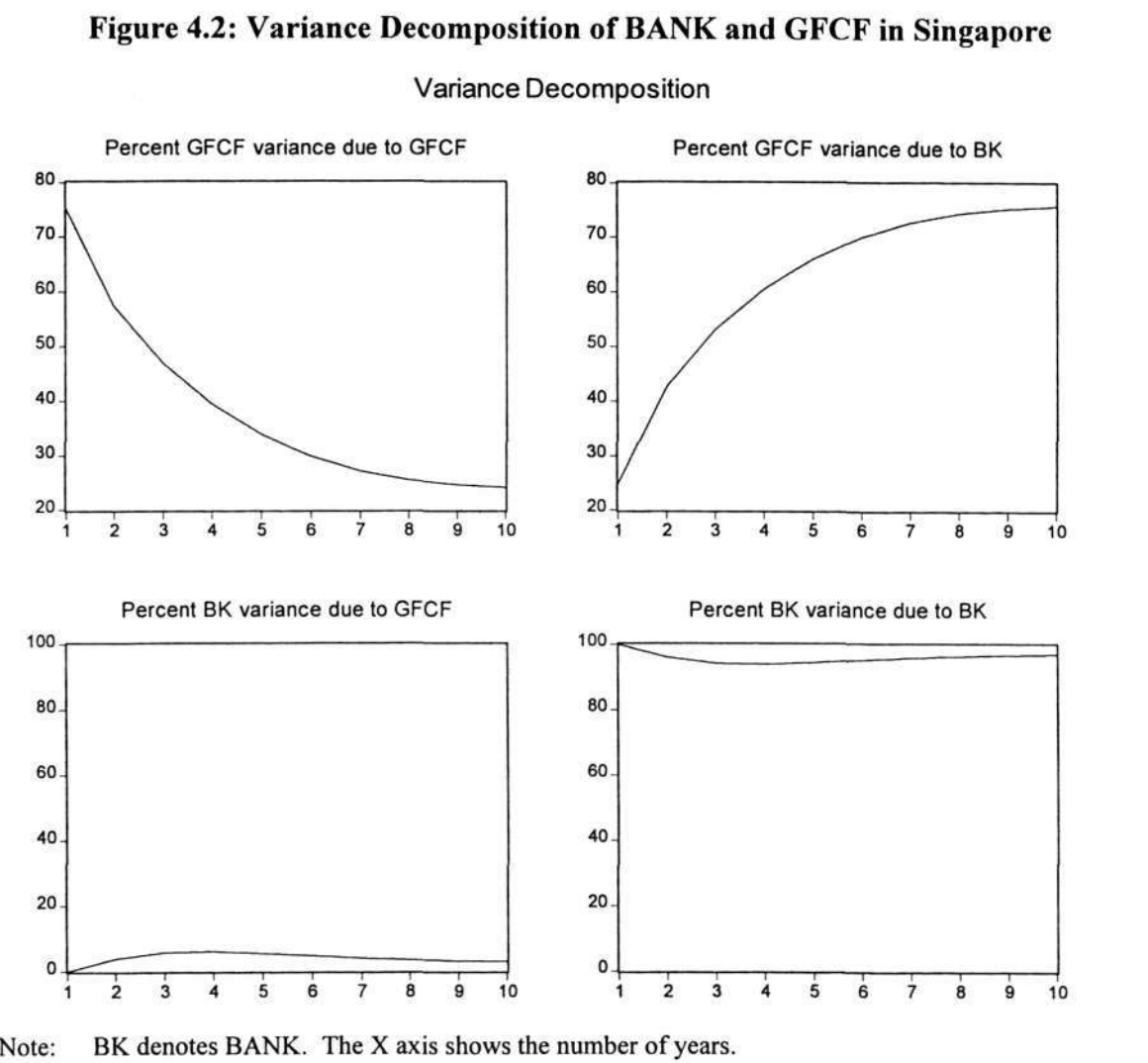
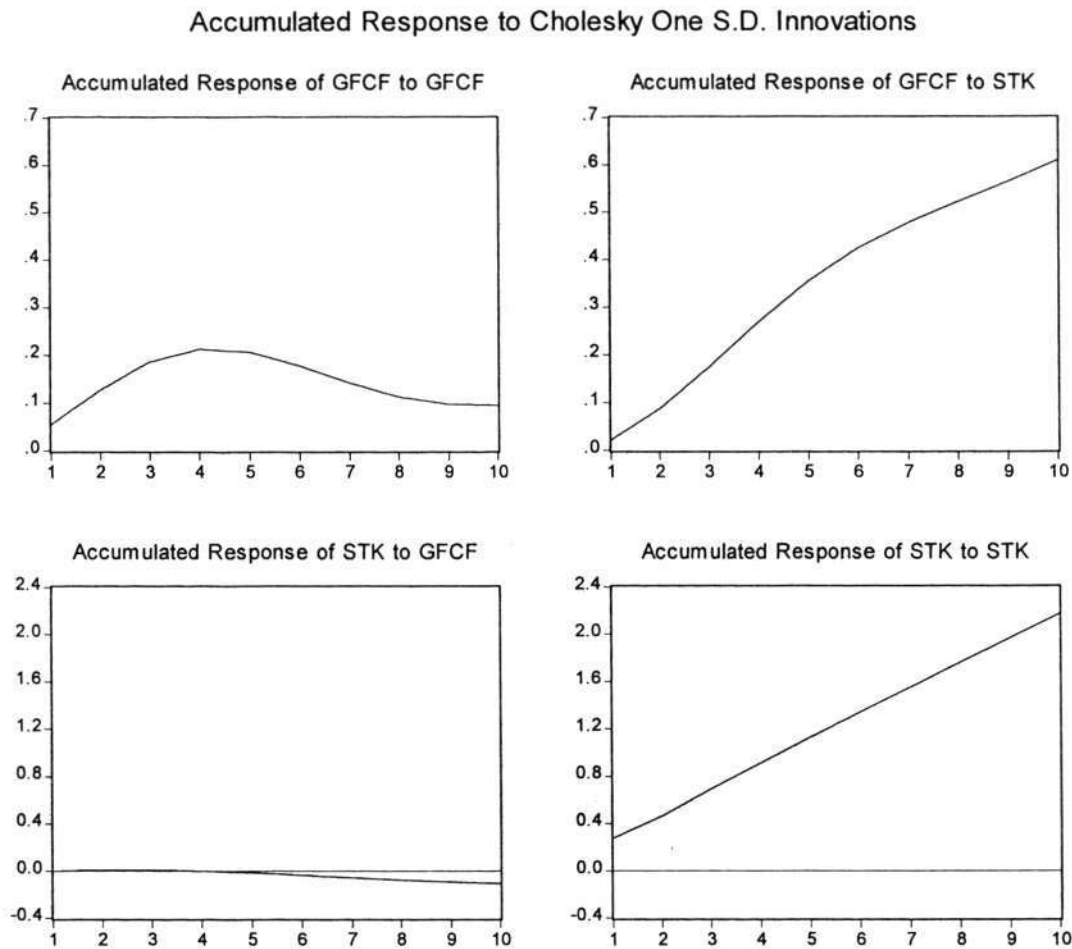


Figure 4.2 shows the variance decomposition of GFCF and BANK (denoted by BK in the diagram) in Singapore. Even after 10 years, there is only a small percentage of the variation in the variable BANK attributed to the variable GFCF, as shown in the bottom left panel diagram. But there is a large percentage of the variation in GFCF attributed to BANK, as shown in the top right panel of the diagram. This shows that BANK has a very strong influence on the GFCF in Singapore.

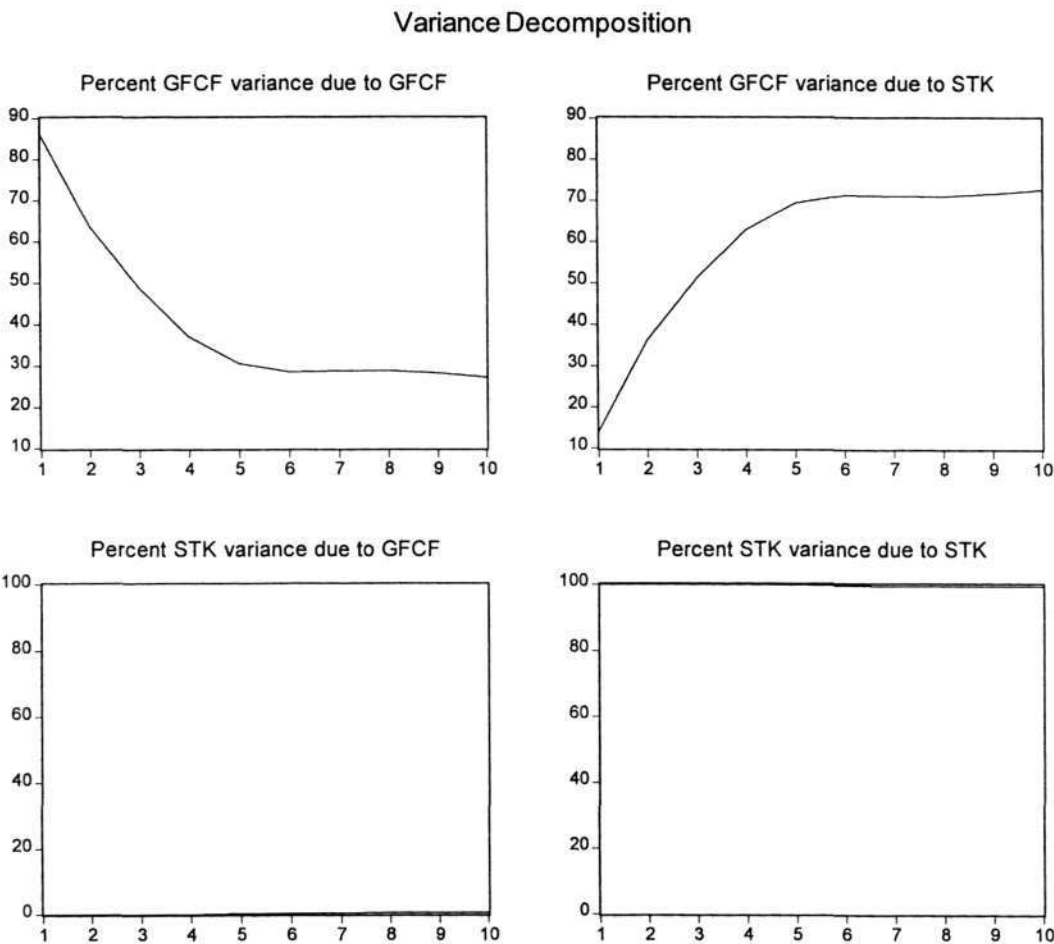
Figure 4.3: Impulse Response Function of STOCK and GFCF in Singapore



Note: STK denotes STOCK. The X axis shows the number of years.

Figure 4.3 shows the impulse response function of GFCF and STOCK (denoted by STK in the diagram) in Singapore, accumulated over a 10 year horizon. There is hardly any response on the variable STOCK to a one standard deviation innovation of the variable GFCF, as shown in the bottom left panel diagram. But the response on the GFCF to a one standard deviation innovation of the STOCK is very strong, as shown in the top right panel of the diagram. This shows that STOCK has very strong influence on the GFCF in Singapore.

Figure 4.4: Variance Decomposition of STOCK and GFCF in Singapore



Note: STK denotes STOCK. The X axis shows the number of years.

Figure 4.4 shows the variance decomposition of STOCK (denoted by STK in the diagram) and GFCF over a 10 year horizon for Singapore. Even after 10 years, there is only a small percentage of variation in the variable STOCK attributed to the variable GFCF, as shown in the bottom left panel diagram. But there is a large percentage of variation in GFCF attributed to STOCK, as shown in the top right panel of the diagram. This shows that STOCK has a very strong influence on the GFCF in Singapore.

4.3 Policy Implications

The results show that for Singapore the development of the bank credit market may have a long term positive effect on economic growth via the capital accumulation channel. But the evidence is more conclusive for the stock market development which leads to economic growth in both the short run and the long run. The development of the insurance market is also important to its economic growth in the long run. This result is consistent with the study by Murinde and Eng (1994) although they use broad money supply M2 and M3 as financial development indicators. The result is also consistent with the study by Odedokun (1992) which shows development bank's credit Granger causes investment in Singapore.

To develop the bank credit market, the government can consider reducing the interest rate spread and liberalizing the bank credit market. This includes breaking up the local banking monopoly, allowing foreign bank participation, abolishing interest rate control and credit allocation and also encouraging greater competition among banks. The liberalization of the domestic banking market by allowing more foreign financial institutions to provide more services in the economy is also a possible option.

To develop the stock market, the government may wish to relax the listing rules to make it easier for local and foreign companies to list in the stock market. There should be a stringent rule of disclosure to ensure greater transparency in the operations of listed companies. In addition, the government should also encourage mergers and take-overs among stock broking firms in order to reduce the transaction costs of trading shares. The

promotion of online trading should also be encouraged as this will lead to lower brokerage fees and hence a higher stock market turnover value.

The insurance market can be developed by encouraging foreign participation and also generate awareness of insurance policies by firms and individuals. With greater competition among insurance companies, the premium may be reduced and this will encourage more participation in the insurance market. The result could be a higher total insurance premium per head and larger insurance assets.

4.4 Conclusion

This study shows that there is an important relationship between the development of the three financial markets and the economic growth in Singapore. Using commercial bank credit to private sector as finance indicator, the evidence suggests a growth enhancing effect occurs via the capital accumulation channel, although in the short term the relationship is bi-directional. However, there is bi-directional causality in the efficiency channel in both the short term and the long term. For the stock market, the empirical evidence clearly supports that stock market development leads to economic growth. The evidence from the insurance market overwhelmingly support that insurance market development Granger causes economic growth. Further evidence provided by the variance decomposition also supports the causal effect from financial development to economic growth. Hence, it might be beneficial if more effort is put into the development of financial markets in Singapore, especially the stock market and the insurance market.

Chapter 5: Finance-Growth Nexus in the Financial Markets

5.1 Introduction

In this chapter, methodologies of Chapter 4 are followed to apply on 19 economies in the global environment. The empirical evidence is arranged according to the sequence of low income economies (LIE), middle income economies (MIE), newly industrialized economies (NIE) and high income economies (HIE) as classified in Chapter 3. We begin analyzing the finance-growth nexus with the bank credit market, followed by the stock market and finally the insurance market.

5.2 Empirical Results with Bank Credit

Recall that the notifications BANK, GFCF, TFP and GDP abbreviated as commercial bank credit to private sector per capita, real gross fixed capital formation per capita, total factor productivity and real GDP per capita respectively⁴. The unit root tests on all the 19 economies with BANK as the finance variable, together with the three growth variables are shown in Appendix 1. The results show that for almost all the series the two tests do not reject the null of a unit root for the data in levels and rejects the null for each of the differenced series. The exceptions are the BANK data for South Korea and Taiwan; TFP data for Japan and Malaysia, GFCF data for Italy and GDP data for Taiwan which appears to be stationary. The GFCF data for UK and the BANK data for Hong Kong, Turkey and Japan also appear to have more than one unit root. This means caution is needed when interpreting the results involving these data.

⁴ For Brazil the nominal value of bank credit is less than 1 for some earlier years. So the BANK series is computed with bank credit/nominal GDP.

The results of cointegration test between BANK and each of the growth variables using the Johansen method on all the economies are shown in Appendix 2. The results indicate the presence of cointegration between BANK and each of the three growth indicators in most cases. The exceptions are that BANK and GFCF in Bangladesh, Pakistan and Australia; BANK and TFP in Philippines and Italy; BANK and GDP in Thailand and Singapore; BANK and TFP as well as GDP in Indonesia and Brazil; and finally BANK and GFCF as well as GDP in Hong Kong and Taiwan. Only in China is there no cointegration between BANK and all the three growth variables. Thus there is a long term relationship between banking credit and the economic growth in all the economies except China.

If BANK and any of the growth variables are cointegrated, the VECM procedure is used to test for the cause and effect between them. However, if BANK and the growth variables are not cointegrated, there is no long term relationship between them and we will take the first difference of BANK and the growth variables in a VAR model to test for the causal relationship between them.

5.2.1 Causality Tests Between BANK and Growth Variables for Low Income Economies

Table 5.1 shows the causality tests for the low income economies (LIE). From the error correction coefficient, the results indicate that in the long run, BANK Granger causes growth in India using GFCF as the growth variable, Pakistan using TFP and GDP as growth variables and Sri Lanka using GFCF and TFP as growth variables. But the reverse causation occurs in Indonesia using GFCF as the growth variable and Bangladesh

using TFP as the growth variable. Bangladesh also shows some evidence of bi-directional causality when GDP is used as the growth variable. In the short run the causal effects are mainly from economic growth to BANK except for Pakistan and Sri Lanka.

Table 5.1: Causality Test Between BANK and Growth Variables for Low Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Bangladesh	Δ GFCF	15.05**	-
	Δ BANK	12.51	-
	TFP	2.75	-1.26
	BANK	9.56**	2.82**
	GDP	2.61	-0.09***
	BANK	11.64***	0.59**
India	GFCF	0.93	-0.76***
	BANK	2.31	-0.25
	TFP	0.14	-0.06
	BANK	0.42	0.04
	GDP	0.23	-0.06
	BANK	0.35	0.05
Indonesia	GFCF	5.88	-0.56
	BANK	97.18***	-3.37***
	Δ TFP	0.26	-
	Δ BANK	42.59***	-
	Δ GDP	0.12	-
	Δ BANK	52.21***	-
Pakistan	Δ GFCF	0.003	-
	Δ BANK	1.54	-
	TFP	8.88	-0.30***
	BANK	8.47	-0.36
	GDP	11.21**	-0.30***
	BANK	8.90	-0.31

Table 5.1: Causality Test Between BANK and Growth Variables for Low Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Sri Lanka	GFCF	0.24	-0.26***
	BANK	0.01	0.14
	TFP	19.20***	-1.03***
	BANK	1.42	0.40
	GDP	3.51	0.09
	BANK	7.46	3.68***

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

In Table 5.2, we consider the variance decomposition between BANK and the growth variables for low income economies at 10 years horizon. We order BANK first followed by the growth variables since BANK behaves most exogenously among the two variables. The evidence of financial development causes growth occurs when BANK can explain a larger percentage of the variation in the growth variables. The results show that for Indonesia the three growth variables explain more of the variance of BANK but for Pakistan it is BANK that explains more of the variance of the three growth variables. BANK can explain more of the variance of the growth variable in Bangladesh only when GDP is used, in India only when GFCF is used and in Sri Lanka only when GFCF and TFP are used. Overall the evidence favours economic growth causes financial development in the low income economies.

Table 5.2: Variance Decomposition Between BANK and Growth Variables for Low Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by BANK	Variance Decomposition of BANK by growth variable
Bangladesh	GFCF	39.76	41.32
	TFP	1.42	40.20
	GDP	27.34	13.30
India	GFCF	38.81	10.89
	TFP	1.29	2.67
	GDP	1.31	3.23
Indonesia	GFCF	31.92	63.22
	TFP	2.61	68.25
	GDP	1.56	70.96
Pakistan	GFCF	8.78	4.71
	TFP	26.11	5.09
	GDP	22.43	3.61
Sri Lanka	GFCF	35.47	6.19
	TFP	77.24	0.67
	GDP	2.99	56.59

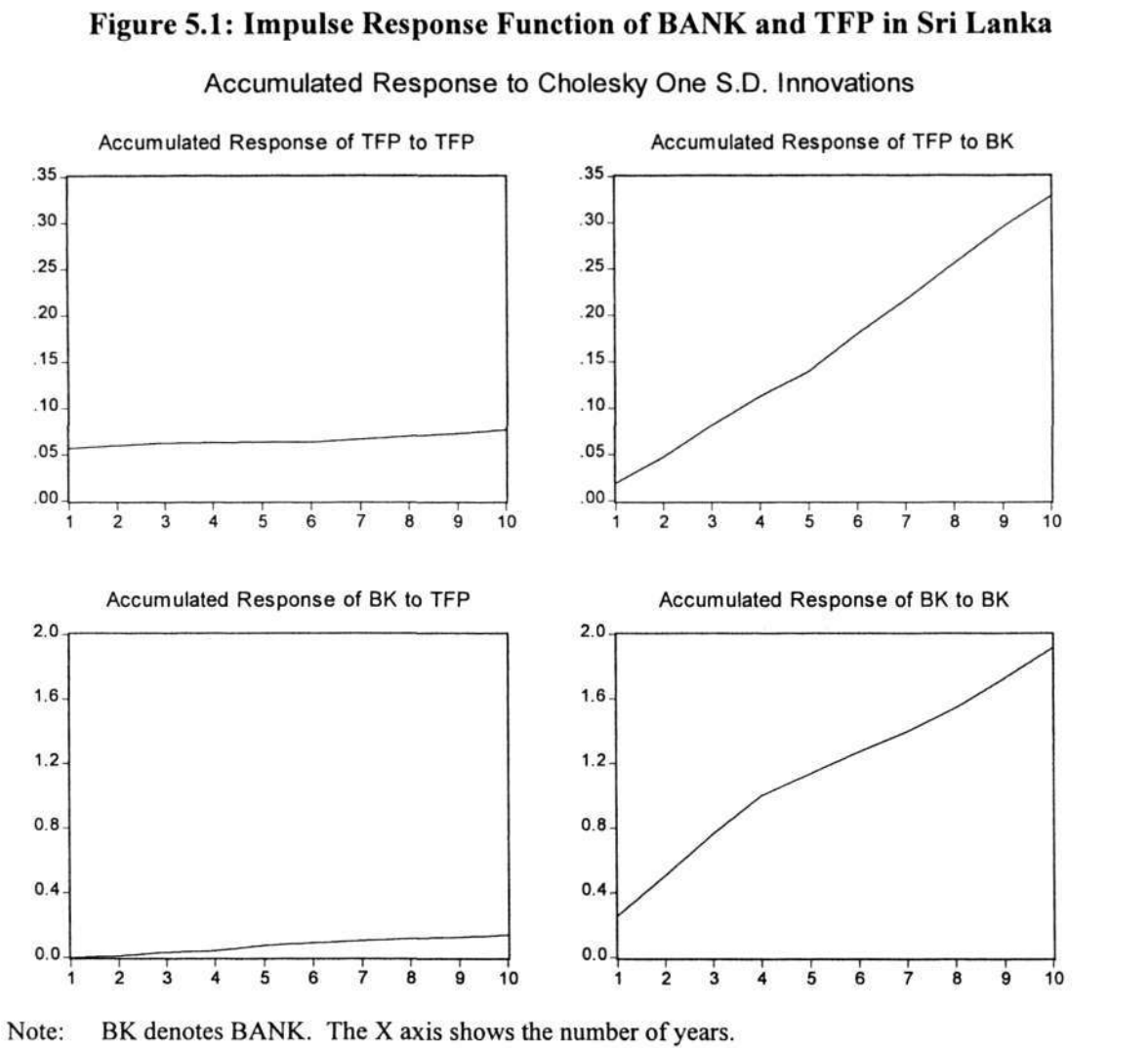
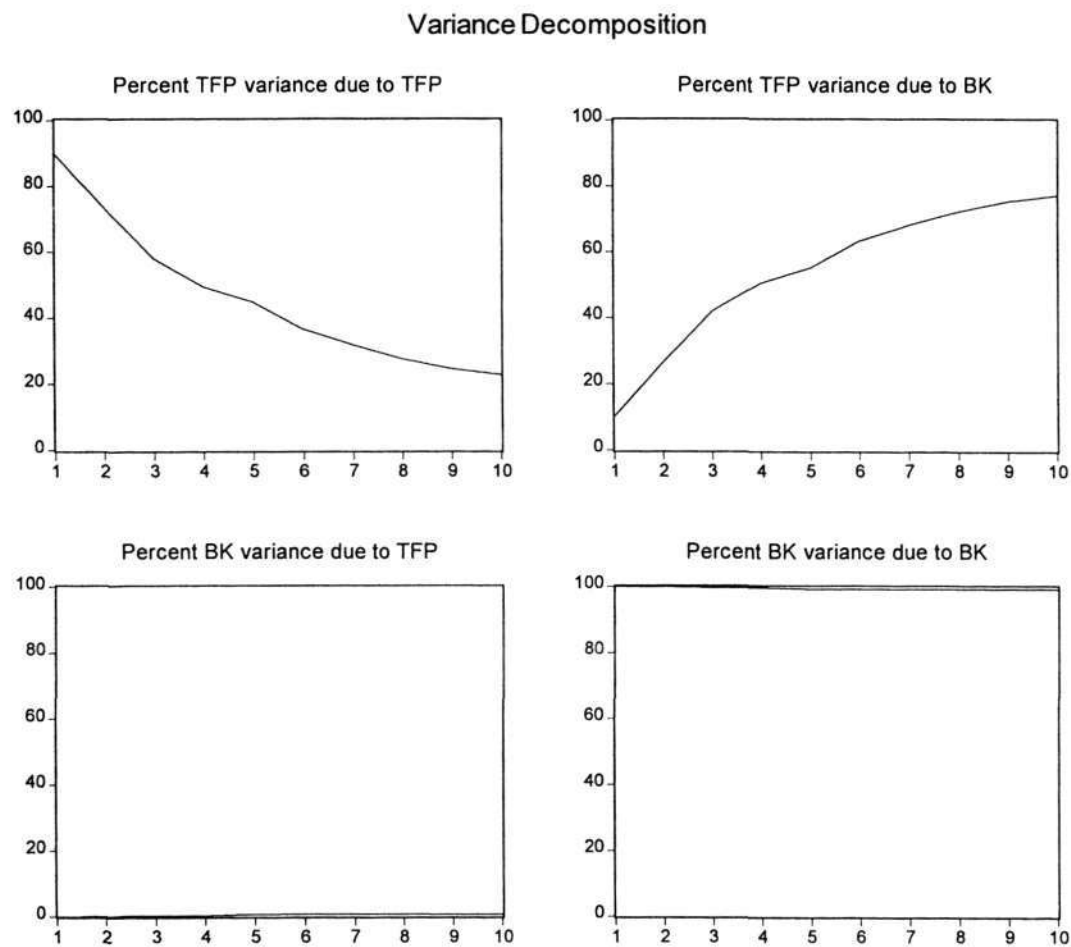


Figure 5.1 shows the accumulated impulse response function of BANK (denoted by BK in the diagram) and TFP over a 10 year horizon for Sri Lanka. There is hardly any response on the variable BANK to a one standard deviation innovation of the variable TFP, as shown in the bottom left panel diagram. But the response on TFP to a one standard deviation innovation of BANK is very strong, as shown in the top right panel of the diagram. This shows that BANK has very strong influence on TFP in Sri Lanka.

Figure 5.2: Variance Decomposition of BANK and TFP in Sri Lanka



Note: BK denotes BANK. The X axis shows the number of years.

Figure 5.2 shows the variance decomposition of BANK (denoted by BK in the diagram) and TFP over a 10 year horizon for Sri Lanka. Even after 10 years, there is only a negligible percentage of the variation in the variable BANK attributed to the variable TFP, as shown in the bottom left panel diagram. But there is a large percentage of the variation in TFP attributed to BANK, as shown in the top right panel of the diagram. This shows that BANK has very strong influence on TFP in Sri Lanka.

5.2.2 Causality Tests between BANK and Growth Variables for Middle Income Economies

Table 5.3 shows the causality tests for the middle income economies. In the long run, BANK Granger causes economic growth in Brazil when GFCF is used, in Philippines when GFCF and GDP are used and in Turkey for all the three growth variables. But the reverse causation occurs in Malaysia when TFP and GDP are used as the growth variables. There is bi-directional causality in Malaysia and Thailand when GFCF is used as the growth variable. The short run causal effect is from BANK to growth in Turkey and Brazil but the reverse is true for China, Philippines and Thailand. Overall the evidence favours financial development causes growth in the middle income economies.

Table 5.3: Causality Test Between BANK and Growth Variables for Middle Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficients
Brazil	GFCF	9.09**	-0.34***
	BANK	1.83	0.07
	ΔTFP	1.06	-
	ΔBANK	1.42	-
	ΔGDP	3.30*	-
	ΔBANK	1.33	-
China	ΔGFCF	2.59	-
	ΔBANK	4.26	-
	ΔTFP	0.02	-
	ΔBANK	15.75***	-
	ΔGDP	1.87	-
	ΔBANK	9.65***	-

Table 5.3: Causality Test Between BANK and Growth Variables for Middle Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Malaysia	GFCF	4.32	-0.07*
	BANK	4.16	-0.04**
	TFP	3.86	0.06
	BANK	1.05	0.31**
	GDP	6.42	0.11
	BANK	2.50	0.33***
Philippines	GFCF	1.48	-0.25***
	BANK	1.51	-0.12
	Δ TFP	2.68	-
	Δ BANK	8.88***	-
	GDP	0.95	-0.16**
	BANK	7.76***	-0.27
Thailand	GFCF	0.01	-0.23*
	BANK	1.48	0.19*
	TFP	0.55	-0.089
	BANK	0.27	0.19
	Δ GDP	0.66	-
	Δ BANK	3.06*	-
Turkey	GFCF	12.09***	-0.85***
	BANK	0.17	-0.19
	TFP	14.06***	-3.80***
	BANK	1.09	-5.59
	GDP	10.73**	-3.41***
	BANK	1.41	-5.31

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

The results of variance decomposition between BANK and the growth variables for MIE are shown in Table 5.4. We ordered BANK first followed by the growth variables since BANK behaves most exogenous among the two variables. For Brazil, Thailand and

Turkey BANK can explain a larger percentage of the variation of all the three growth variables. But for China BANK can only explain a larger percentage of the variation in the growth variable only when GFCF is used, in Malaysia only when TFP is used and in Philippines only when GFCF and GDP are used.

Table 5.4: Variance Decomposition Between BANK and Growth Variables for Middle Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by BANK	Variance Decomposition of BANK by growth variable
Brazil	GFCF	25.50	0.42
	TFP	3.88	3.41
	GDP	6.76	3.36
China	GFCF	24.57	19.18
	TFP	6.50	37.91
	GDP	20.49	34.98
Malaysia	GFCF	10.13	12.85
	TFP	19.56	12.53
	GDP	6.83	64.41
Philippines	GFCF	50.98	8.06
	TFP	7.56	24.58
	GDP	7.27	5.55
Thailand	GFCF	49.59	26.05
	TFP	59.97	6.77
	GDP	21.44	10.81
Turkey	GFCF	81.07	1.02
	TFP	73.19	2.40
	GDP	74.07	3.68

5.2.3 Causality Tests Between BANK and Growth Variables for Newly Industrialized Economies

In Table 5.5, the Granger causality test is used between BANK and the three growth variables for the newly industrialized economies. The results favour economic growth causes bank credit market development in both short run and long run, although there is bi-directional causality in South Korea when GFCF is used.

Table 5.5: Causality Test Between BANK and Growth Variables for Newly Industrialized Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Hong Kong	Δ GFCF	9.39	-
	Δ BANK	18.67***	-
	TFP	1.16	0.05
	BANK	8.43	0.01
	Δ GDP	2.55	-
	Δ BANK	5.86	-
South Korea	GFCF	5.79	0.06**
	BANK	3.77	0.07***
	TFP	2.31	0.04
	BANK	2.39	0.14***
	GDP	0.88	0.04
	BANK	1.77	0.15***
Taiwan	Δ GFCF	1.74	-
	Δ BANK	2.50	-
	TFP	1.28	0.05
	BANK	0.63	0.23***
	Δ GDP	0.77	-
	Δ BANK	15.38***	-

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

In Table 5.6, we consider the variance decomposition between BANK and the growth variables for NIE. We ordered BANK first followed by the growth variables since BANK behaves most exogenous among the two variables.

Table 5.6: Variance Decomposition Between BANK and Growth Variables for Newly Industrialized Economies

Economy	Growth Variable	Variance Decomposition of growth variable by BANK	Variance Decomposition of BANK by growth variable
Hong Kong	GFCF	14.57	53.76
	TFP	51.90	34.02
	GDP	81.73	6.65
South Korea	GFCF	6.53	25.47
	TFP	4.46	5.05
	GDP	1.74	8.57
Taiwan	GFCF	38.22	6.57
	TFP	11.78	53.07
	GDP	4.97	42.27

The results show that the variance decomposition of BANK by the growth variables is higher than that of the growth variables by BANK in South Korea for all the three growth variables, in Taiwan when TFP and GDP are used and in Hong Kong when GFCF are used. Only for Hong Kong BANK explains 81.73% of GDP (compared to GDP explains 6.65% of BANK) and 51.90% of TFP (compared to TFP explains 34.02% of BANK), and for Taiwan BANK explains 38.22% of GFCF (compared to GFCF explains 6.57% of BANK). Thus the evidence favours economic growth causes financial development in the Newly Industrialized Economies.

5.2.4 Causality Tests Between BANK and Growth Variables for High Income Economies

In Table 5.7, the results illustrate that BANK Granger causes economic growth in Australia when TFP is used, in Italy when GFCF and GDP are used, in Japan and in UK when GFCF are used. The reverse is true in Japan and USA when TFP and GDP are used. The overall evidence of bank credit market Granger causes economic growth is stronger.

Table 5.7: Causality Test Between BANK and Growth Variables for High Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Corrcetion Coefficient
Australia	GFCF	7.62***	-
	BANK	0.06	-
	TFP	3.13*	-0.12*
	BANK	0.03	0.10
	GDP	3.09*	-0.09
	BANK	0.09	0.16
Italy	GFCF	5.01**	-0.35***
	BANK	0.42	0.04
	TFP	0.43	-
	BANK	0.33	-
	GDP	0.86	-0.37***
	BANK	0.84	0.16
Japan	GFCF	5.14**	-0.35***
	BANK	0.19	-0.05
	TFP	18.81**	0.02
	BANK	7.47	-0.35***
	GDP	14.35**	0.043
	BANK	9.85*	-0.42***

Table 5.7: Causality Test Between BANK and Growth Variables for High Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Corrction Coefficient
UK	GFCF	0.22	-0.68**
	BANK	0.56	-0.24
	TFP	0.01	0.001
	BANK	0.61	-0.02
	GDP	0.21	0.00
	BANK	0.68	0.02
USA	GFCF	1.80	-0.12
	BANK	4.64**	0.12
	TFP	3.02*	0.01
	BANK	5.87**	0.07*
	GDP	1.07	0.02
	BANK	6.59**	0.15**

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

Table 5.8 shows the results of variance decomposition between BANK and the growth variables for High Income Economies. Again ordered first is BANK as it appears to be more exogenous than the growth variables. For all the economies except UK, the percentage of the variation in the growth variables attributes to BANK is higher than that of BANK attributes to the growth variables using all the three growth variables. For UK, BANK can only explain 0.87% of the variation in GFCF but GFCF can explain 36.6% of the variance of BANK. Overall the evidence favours financial development matters for economic growth.

Table 5.8: Variance Decomposition Between BANK and Growth Variables for High Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by BANK	Variance Decomposition of BANK by growth variable
Australia	GFCF	34.93	0.17
	TFP	17.03	1.32
	GDP	12.99	3.45
Italy	GFCF	63.46	1.01
	TFP	6.93	0.60
	GDP	81.14	1.89
Japan	GFCF	76.29	2.83
	TFP	67.51	18.73
	GDP	59.11	52.92
UK	GFCF	0.87	36.60
	TFP	6.76	1.91
	GDP	9.57	3.58
USA	GFCF	56.96	12.44
	TFP	27.66	11.13
	GDP	36.63	8.56

5.3 Empirical Results with Stock Market Capitalization

The unit root test and result for the series STOCK for 18 economies⁵ are shown in Appendix 1. The STOCK series for China is too short for meaningful analysis and hence is not included in this study. Except for Turkey, the two tests do not reject the null of a

⁵ For Brazil the STOCK variable is the ratio of stock market capitalization to nominal GDP instead of stock market capitalization per capita.

unit root for the data in levels and rejects the null for each of the differenced series. The findings imply that it is reasonable to model all of the STOCK variables as non-stationary that become stationary after first differencing. We have also conducted the unit root tests on the three growth series under the same period. Their results are similar to those reported in Appendix 1, and hence they are not reflected.

The results of cointegration test between BANK and each of the growth variables using Johansen method on all the 19 economies are shown in Appendix 3. In most cases, there is a cointegrating relationship between STOCK and each of the growth variables. The exceptions are STOCK and GFCF in Indonesia, Brazil, Turkey and Japan, STOCK and TFP in Taiwan, STOCK and GDP in Sri Lanka and finally STOCK and TFP as well as GDP in Pakistan, Malaysia, Hong Kong and Italy. As before, all the cointegrating relations are estimated with a bi-variate VECM model. If there is no cointegrating relation between STOCK and the growth variables, a VAR model with first differences is used since the variables have one unit root.

5.3.1 Causality Tests Between STOCK and Growth Variables for Low Income Economies

The causality tests between STOCK and each of the growth variables for Low Income Economies are shown in Table 5.9. The evidence supporting STOCK Granger causes economic growth in the long run is very clear in Pakistan when GFCF is used and in Sri Lanka when both GFCF and TFP are used. STOCK also Granger causes GFCF in Bangladesh and Granger causes GDP in Bangladesh, India and Indonesia. But bi-directional causality occurs for Bangladesh and India when TFP is used as the growth

variable. In the short run, the causal relationship is from STOCK to GFCF in Indonesia and Pakistan. However, in India GFCF and TFP both Granger cause STOCK, and in Pakistan and Sri Lanka it is GDP that Granger causes STOCK.

Table 5.9: Causality Test Between STOCK and Growth Variables for Low Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficients
Bangladesh	GFCF	0.53	-0.22***
	STOCK	0.35	0.33
	TFP	1.01	0.14*
	STOCK	5.40	-5.01*
	GDP	2.84	0.24**
	STOCK	5.21	-6.63
India	GFCF	5.92	0.49
	STOCK	13.03**	6.17**
	TFP	6.54	-0.29
	STOCK	13.14**	-0.37
	GDP	15.14***	-0.36***
	STOCK	8.20**	-0.25
Indonesia	Δ GFCF	4.85**	-
	Δ STOCK	0.43	-
	TFP	0.57	-0.37*
	STOCK	2.58	5.52**
	GDP	1.77	-0.45**
	STOCK	3.55	4.22
Pakistan	GFCF	21.02***	0.28**
	STOCK	8.79	-0.42
	Δ TFP	4.08	-
	Δ STOCK	6.16	-
	Δ GDP	2.12	-
	Δ STOCK	2.83*	-

Table 5.9: Causality Test Between STOCK and Growth Variables for Low Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Sri Lanka	GFCF	0.10	-0.42**
	STOCK	0.67	0.09
	TFP	4.23	-0.17*
	STOCK	3.02	1.16
	Δ GDP	6.86	-
	Δ STOCK	1430.43***	-

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

In Table 5.10, the results of variance decomposition between STOCK and the growth variables for Low Income Economies are reflected. We order STOCK first in the variance decomposition since STOCK appears to behave most exogenously in our bi-variate systems. In all economies except India, the variance decomposition of the three growth variables by STOCK is stronger than that of STOCK by the three growth variables. In India STOCK can explain 73.97% of the variance of GDP (compared to GDP explain 24.74% of the variance of STOCK), but for the other two growth variables they can explain a larger percentage of the variation in STOCK than the other way round. Overall the evidence favours STOCK causes economic growth.

Table 5.10: Variance Decomposition Between STOCK and Growth Variables for Low Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by STOCK	Variance Decomposition of STOCK by growth variable
Bangladesh	GFCF	67.97	4.06
	TFP	14.11	13.46
	GDP	19.07	16.81
India	GFCF	24.22	58.29
	TFP	41.18	62.29
	GDP	73.97	24.74
Indonesia	GFCF	17.28	2.04
	TFP	53.06	35.92
	GDP	71.09	23.16
Pakistan	GFCF	53.11	45.86
	TFP	17.05	14.40
	GDP	14.26	11.11
Sri Lanka	GFCF	86.61	0.54
	TFP	84.60	10.93
	GDP	62.50	34.61

5.3.2 Causality Tests Between STOCK and Growth Variables for Middle Income Economies

The causality tests between STOCK and each of the growth variables for Middle Income Economies are shown in Table 5.11. The evidence suggests STOCK Granger causes economic growth in Brazil and Philippines when TFP is used; and in Malaysia and Thailand when GFCF is used. But reverse causation occurs in Thailand when GDP is used and in Turkey when TFP is used. There are also bi-directional causalities in

Philippines when GFCF and GDP are used and in Turkey when GDP is used. In the short run, the causal direction is from STOCK to economic growth in Malaysia for all the three growth variables, in Philippines when TFP is used, in Brazil when GFCF and TFP are used and in Thailand when TFP and GDP are used. However, reverse causation occurs in Turkey when GFCF is used. Overall the evidence favours stock market development leads to economic growth in Middle Income Economies.

Table 5.11: Causality Test Between STOCK and Growth Variables for Middle Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficients
Brazil	Δ GFCF	34.71***	-
	Δ STOCK	6.14	-
	TFP	11.71**	-0.23**
	STOCK	5.70	1.07
	GDP	2.21	-0.12
	STOCK	8.94	1.07
Malaysia	GFCF	5.29**	-0.39**
	STOCK	0.02	-0.06
	Δ TFP	12.79***	-
	Δ STOCK	0.35	-
	Δ GDP	16.80***	-
	Δ STOCK	0.41	-
Philippines	GFCF	1.13	-0.26***
	STOCK	0.50	-0.76**
	TFP	15.44***	-0.35***
	STOCK	7.49	0.56
	GDP	0.05	-0.19***
	STOCK	1.47	-2.05**

Table 5.11: Causality Test Between STOCK and Growth Variables for Middle Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Thailand	GFCF	28.44***	-0.34***
	STOCK	9.23*	-0.82
	TFP	10.95***	-0.05
	STOCK	0.00	1.23
	GDP	8.67*	-0.12
	STOCK	2.95	6.01*
Turkey	Δ GFCF	1.73	-
	Δ STOCK	60.46***	-
	TFP	0.12	-0.40
	STOCK	1.12	9.69**
	GDP	2.55	-2.49*
	STOCK	2.65	29.79*

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

In Table 5.12, we consider the decompositions of STOCK and the growth variables in Middle Income Economies. We order STOCK first in the variance decomposition since it is more exogenous than the growth variables in the systems. The decomposition of the three growth variables by STOCK is stronger than that of STOCK by the three growth variables for most of the economies. The exceptions occur only in Philippines when GFCF and GDP are considered and in Turkey when TFP is used. Thus stock market development matters for economic growth in Middle Income Economies.

Table 5.12: Variance Decomposition Between STOCK and Growth Variables for Middle Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by STOCK	Variance Decomposition of STOCK by growth variable
Brazil	GFCF	82.10	8.71
	TFP	85.10	24.77
	GDP	90.34	26.09
Malaysia	GFCF	82.80	0.24
	TFP	52.88	1.59
	GDP	52.38	0.97
Philippines	GFCF	13.76	48.67
	TFP	23.78	4.54
	GDP	22.52	43.40
Thailand	GFCF	91.76	9.74
	TFP	78.36	4.95
	GDP	81.56	17.15
Turkey	GFCF	57.25	41.32
	TFP	21.55	60.89
	GDP	80.58	13.78

5.3.3 Causality Tests Between STOCK and Growth Variables for Newly Industrialized Economies

The causality tests between STOCK and each of the growth variables for Newly Industrialized Economies are shown in Table 5.13. In the long run for Hong Kong and South Korea there is evidence that STOCK Granger causes economic growth when GFCF is used. But for Taiwan the evidence favours bi-directional causality when GFCF is used and GDP Granger causes stock market development. As for short run, the

evidence favours stock market development Granger causes economic growth in Hong Kong and South Korea but not in Taiwan.

Table 5.13: Causality Test Between STOCK and Growth Variables for Newly Industrialized Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficients
Hong Kong	GFCF	9.54***	-0.32***
	STOCK	0.12	-0.38
	Δ TFP	1.72	-
	Δ STOCK	0.48	-
	Δ GDP	4.12**	-
	Δ STOCK	0.49	-
South Korea	GFCF	2.58	-0.52***
	STOCK	4.58	0.79
	TFP	11.67***	-0.019
	STOCK	1.85	1.12**
	GDP	10.15***	-0.06
	STOCK	0.66	1.25**
Taiwan	GFCF	0.21	-0.19***
	STOCK	2.23	0.75**
	Δ TFP	2.52	-
	Δ STOCK	2.84	-
	GDP	0.00	-0.02
	STOCK	3.03*	1.92***

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

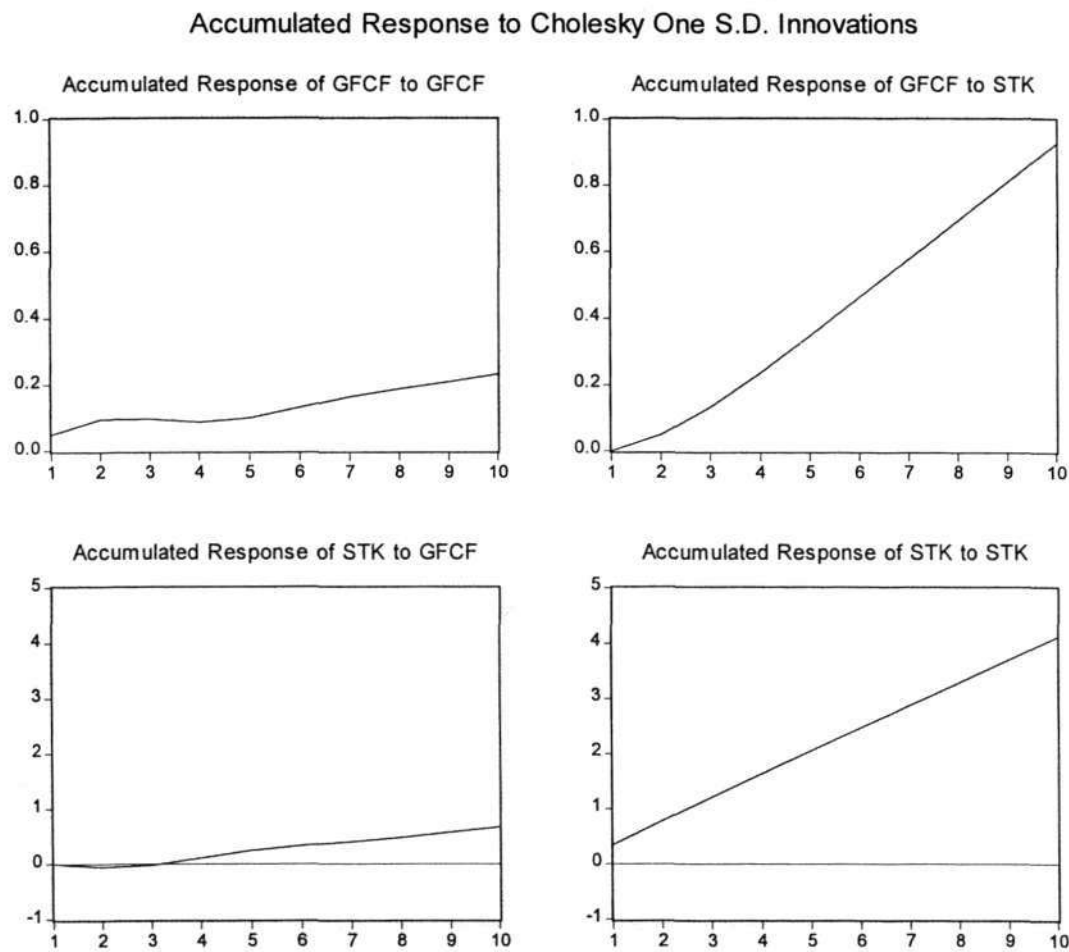
In Table 5.14, we present the variance decomposition between the variable STOCK and the growth variables in Newly Industrialized Economies. We order STOCK first as it appears to be more exogenous than the growth variables in the system. For all economies except Taiwan, the variance decomposition of the three growth variables by STOCK is stronger than that of STOCK by the three growth variables. For Taiwan only GDP

explains a larger percentage of the variation in STOCK (43.07%) compared to what STOCK explains (25.08%) of the variation in GDP. Thus the evidence favours that STOCK causes economic growth.

Table 5.14: Variance Decomposition Between STOCK and Growth Variables for Newly Industrialized Economies

Economy	Growth Variable	Variance Decomposition of growth variable by STOCK	Variance Decomposition of STOCK by growth variable
Hong Kong	GFCF	82.44	4.67
	TFP	19.52	1.76
	GDP	30.72	1.48
South Korea	GFCF	92.14	4.29
	TFP	17.60	16.72
	GDP	34.70	18.09
Taiwan	GFCF	61.36	19.55
	TFP	19.73	6.45
	GDP	25.08	43.07

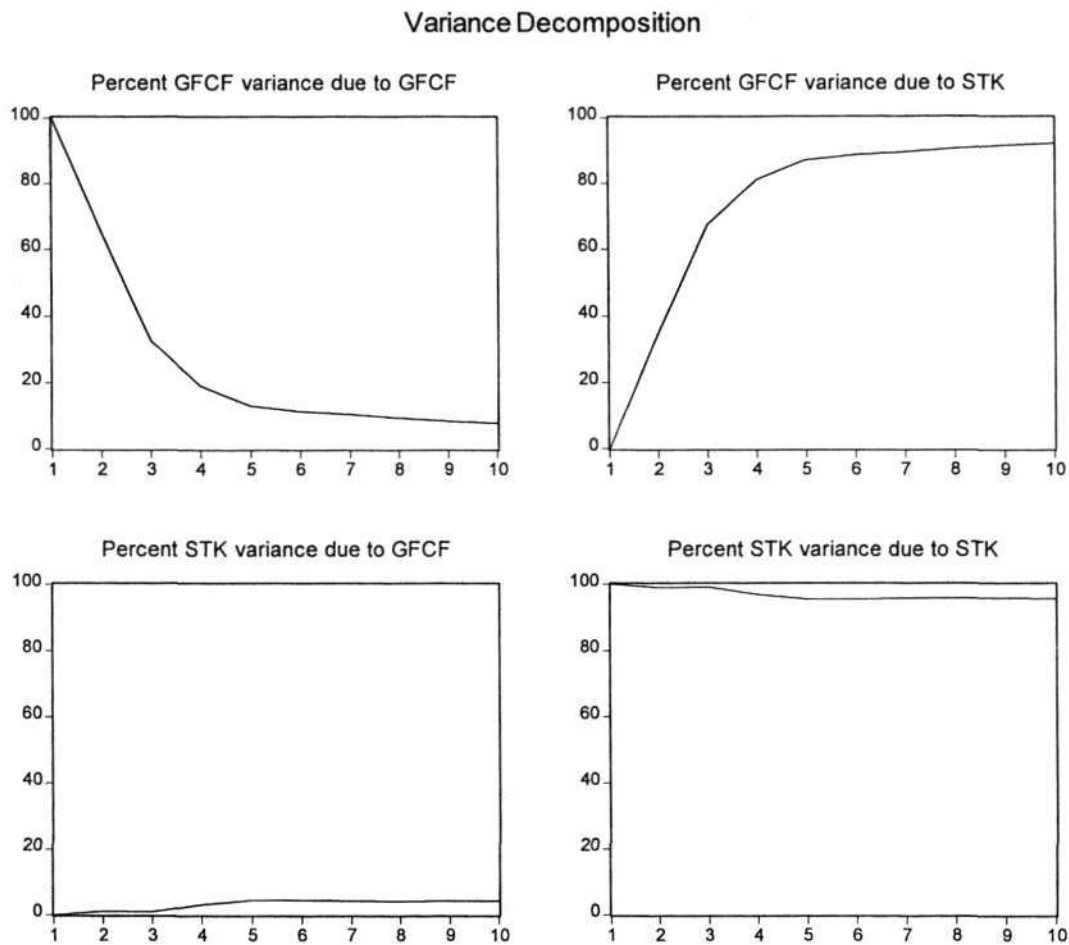
Figure 5.3: Impulse Response Function of STOCK and GFCF in South Korea



Note: STK denotes STOCK. The X axis shows the number of years

Figure 5.3 shows the accumulated impulse response function of STOCK (denoted by STK in the diagram) and GFCF over a 10 year horizon for South Korea. There is hardly any response on the variable STOCK to a one standard deviation innovation of the variable GFCF, as shown in the bottom left panel diagram. But the response on the GFCF to a one standard deviation innovation of the STOCK is very strong, as shown in the top right panel of the diagram. This shows that STOCK has a very strong influence on the GFCF in South Korea.

Figure 5.4: Variance Decomposition of STOCK and GFCF in South Korea



Note: STK denotes STOCK. The X axis shows the number of years

Figure 5.4 shows the variance decomposition of STOCK (denoted by STK in the diagram) and GFCF over a 10 year horizon for South Korea. Even after 10 years, there is only a small percentage of variation in the variable STOCK attributed to the variable GFCF, as shown in the bottom left panel diagram. But there is a large percentage of the variation in GFCF attributed to STOCK, as shown in the top right panel of the diagram. This shows that STOCK has very strong influence on the GFCF in Thailand.

5.3.4 Causality Tests Between STOCK and Growth Variables for High Income Economies

The causality tests between STOCK and each of the growth variables for High Income Economies are shown in Table 5.15. The results suggest that in the long run STOCK Granger causes growth in Italy when GFCF is used and USA for all the three growth variables. But reverse causation occurs for Australia when GFCF is used and for the UK when TFP and GDP are used. There is evidence of bidirectional causality for Japan between STOCK and TFP and GDP, and for UK between STOCK and GFCF. As for a short run effect, there is causality from STOCK to growth in Australia and Italy when GDP is used, in Japan and UK when GFCF is used and in USA for all the three growth variables. There are also bidirectional causalities in Australia when GFCF is used, in Japan when TFP and GDP are used and in UK when GDP is used.

Table 5.15: Causality Test Between STOCK and Growth Variables for High Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Australia	GFCF	10.09*	0.09
	STOCK	46.99***	-0.35**
	TFP	2.75	-0.16
	STOCK	1.97	1.90
	GDP	9.60*	-0.03
	STOCK	5.20	0.34
Italy	GFCF	0.05	-0.45***
	STOCK	0.16	-1.18
	Δ TFP	1.76	-
	Δ STOCK	3.50	-
	Δ GDP	12.87**	-
	Δ STOCK	1.89	-

Table 5.15: Causality Test Between STOCK and Growth Variables for High Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Japan	Δ GFCF	31.84***	-
	Δ STOCK	4.91	-
	TFP	5.67**	-0.05***
	STOCK	4.22**	-0.48**
	GDP	5.24**	-0.08***
	STOCK	3.65*	-0.72**
UK	GFCF	38.13***	1.62**
	STOCK	4.37	-1.46**
	TFP	10.58	0.07
	STOCK	10.39	-1.82**
	GDP	15.78**	0.09
	STOCK	12.22**	-2.19***
USA	GFCF	15.62*	-0.75**
	STOCK	6.48	-2.11
	TFP	23.50***	-0.97***
	STOCK	3.31	2.85
	GDP	22.03***	-1.08***
	STOCK	3.95	2.82

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

In Table 5.16, we present the percentage of variation in the growth variables that can be attributed to the BANK variable with variance decompositions for the High Income Economies. We order STOCK first as it appears to be more exogenous than the growth variables in the bi-variate systems. The results indicate that for Italy and Japan, STOCK can explain a larger percentage of the variation of all the three growth variables. For Australia and USA only the decomposition of TFP and GDP by STOCK is stronger than the other way round. As for the UK, STOCK can explain a larger percentage of variation

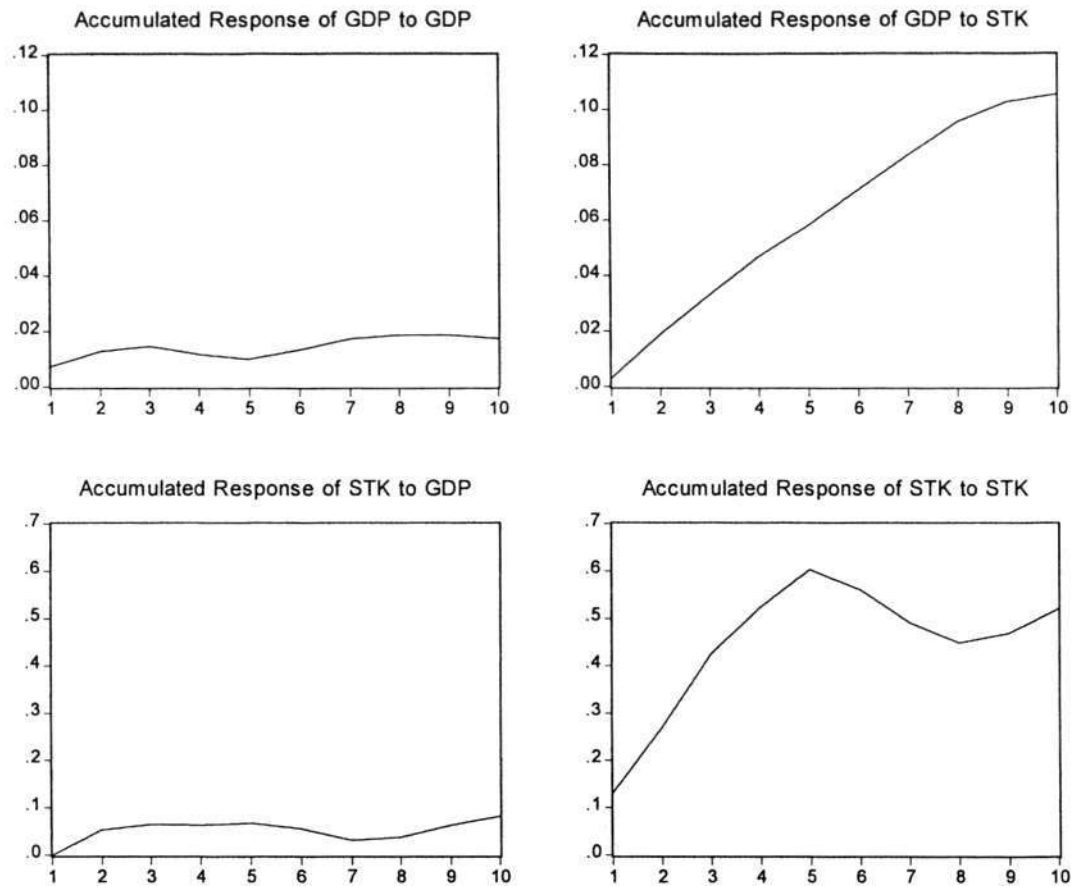
only when GFCF is used. Thus the evidence favours STOCK causes economic growth in High Income Economies

Table 5.16: Variance Decomposition Between STOCK and Growth Variables for High Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by STOCK	Variance Decomposition of STOCK by Growth variable
Australia	GFCF	4.51	85.28
	TFP	88.71	7.38
	GDP	69.25	19.82
Italy	GFCF	42.19	5.98
	TFP	27.17	7.68
	GDP	57.88	6.17
Japan	GFCF	60.10	15.18
	TFP	82.15	59.70
	GDP	69.01	22.84
UK	GFCF	77.78	41.71
	TFP	16.90	50.19
	GDP	4.19	40.18
USA	GFCF	25.50	34.29
	TFP	90.93	3.22
	GDP	90.91	5.14

Figure 5.5: Impulse Response Function of STOCK and GDP in USA

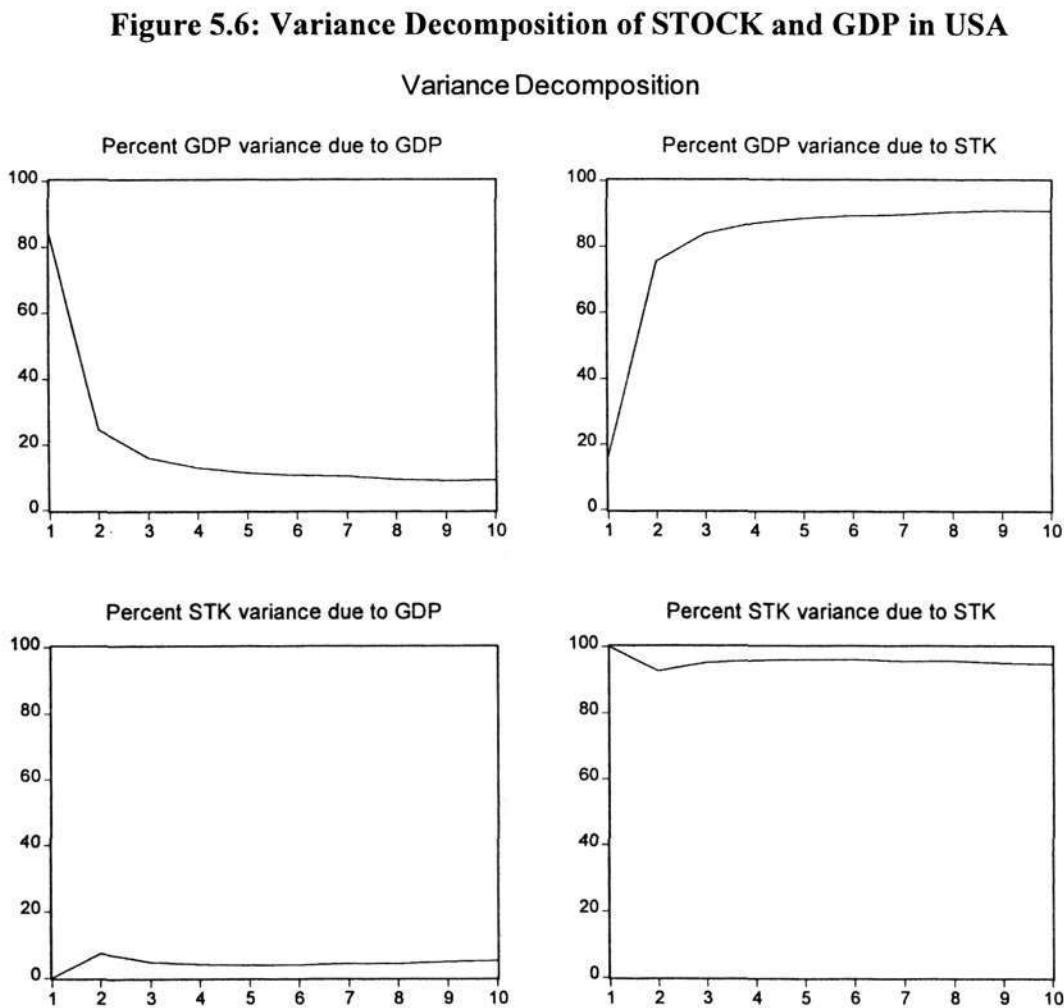
Accumulated Response to Cholesky One S.D. Innovations



Note: STK denotes STOCK. The X axis shows the number of years

Figure 5.5 shows the accumulated impulse response function of STOCK (denoted by STK in the diagram) and GDP over a 10 year horizon for the United States of America. There is hardly any response by the variable STOCK to a one standard deviation innovation of the variable GDP, as shown in the bottom left panel diagram. But the response on the GDP to a one standard deviation innovation of the STOCK is very strong, as shown in the top right panel of the diagram. This shows that STOCK has a very strong influence on GDP in the United States of America.

Figure 5.6 shows the variance decomposition of STOCK (denoted by STK in the diagram) and GDP over a 10 year horizon in the United States of America. Even after 10 years, there is only a small percentage of the variation in the variable STOCK attributed to the variable GDP, as shown in the bottom left panel diagram. But there is a large percentage of the variation in GDP attributed to STOCK, as shown in the top right panel of the diagram. This shows that STOCK has very strong influence on GDP in the United States of America.



Note: STK denotes STOCK. The X axis shows the number of years.

5.4 Empirical Results with Insurance Companies' Assets

This section explores the causal effect between insurance market development and economic growth. The development of the insurance market is indicated by the total insurance companies' assets per capita, denoted by the notation INSUR while the growth variables are GFCF, TFP and GDP, which stand for real gross fixed capital formation per capita, total factor productivity and real GDP, respectively.

The unit root results for the series INSUR for the 5 economies are shown in Appendix 1. The INSUR series for the other economies are either not available or too short for a meaningful analysis. The unit root tests on the three growth series under the same period were also conducted. Their results are similar to those reported in Appendix 1 and, hence, they are not reflected here. Except for South Korea and Japan, at least one of the two tests do not reject the null of a unit root for the data in levels and rejects the null for each of the differenced series. For Japan and South Korea the INSUR series may have more than one unit root.

The cointegrating relationship between GFCF, TFP, GDP and INSUR were tested using the Johansen method. The results that are shown in Appendix 4, support the presence of a long term relationship between INSUR and each of the growth variables in most of the economies. The exceptions are INSUR and GFCF as well as GDP in South Korea, and also INSUR and GFCF in Taiwan. As before, we use the bi-variate VECM model for causality test on cointegrated relations and VAR model on first differences for non cointegrated series.

The causality results are shown in Table 5.17. In the long run, economic growth Granger causes INSUR in Indonesia for all the three growth variables and in Japan when TFP and GDP are used. But INSUR Granger causes economic growth in Malaysia and Taiwan when TFP and GDP are used and in Japan when GFCF is used. There is bi-directional causality in South Korea when TFP is used. The short run causal effect is from insurance market development to economic growth in Indonesia when TFP is used, in Malaysia when GFCF is used and in Taiwan when GDP is used. But reverse causation occurs in Indonesia when GFCF is used, South Korea and Japan when TFP and GDP are used.

Table 5.17: Causality Test Between INSUR and Growth Variables

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Indonesia	GFCF	2.34	0.11
	INSUR	5.83*	1.61***
	TFP	5.05*	0.25
	INSUR	3.98	3.76***
	GDP	3.52	0.06
	INSUR	1.81	2.97***
Malaysia	GFCF	10.81*	0.89
	INSUR	7.54	-0.17
	TFP	8.21	-3.35*
	INSUR	6.26	-0.57
	GDP	2.77	-4.17*
	INSUR	4.44	0.49
South Korea	Δ GFCF	6.47	-
	Δ INSUR	3.75	-
	TFP	6.15	0.11**
	INSUR	6.54*	0.21***
	Δ GDP	9.18	-
	Δ INSUR	36.05***	-

Table 5.17: Causality Test Between INSUR and Growth Variables (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Taiwan	Δ GFCF	2.60	-
	Δ INSUR	0.64	-
	TFP	3.95	-1.36***
	INSUR	2.51	0.87
	GDP	10.24**	-1.21***
	INSUR	4.46	0.08
Japan	GFCF	66.88***	-0.75**
	INSUR	52.08***	0.30
	TFP	6.77	-0.29
	INSUR	22.13***	-1.39***
	GDP	8.05	-0.12
	INSUR	20.49***	-1.94***

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

Table 5.18 shows the variance decomposition between INSUR and the growth variables. We order INSUR first, since it appears to be more exogenous than the growth variables in the bi-variate systems. The results show that the variance decomposition of the three growth variables by INSUR is stronger than that of INSUR by the three growth variables for Malaysia, South Korea and Taiwan. But for Indonesia and Japan the reverse is true. Thus it may be beneficial for Malaysia, South Korea and Taiwan to develop their insurance market in order to promote economic growth.

Table 5.18: Variance Decomposition Between INSUR and Growth Variables

Economy	Growth Variable	Variance Decomposition of growth variable by INSUR	Variance Decomposition of INSUR by Growth variable
Indonesia	GFCF	26.31	63.02
	TFP	7.49	87.85
	GDP	17.13	69.19
Malaysia	GFCF	92.84	7.04
	TFP	98.28	15.77
	GDP	95.84	1.71
South Korea	GFCF	83.04	9.27
	TFP	38.16	18.10
	GDP	93.41	8.25
Taiwan	GFCF	15.65	2.17
	TFP	95.13	2.38
	GDP	96.38	0.53
Japan	GFCF	35.67	45.26
	TFP	22.59	75.87
	GDP	22.82	80.12

5.5 Policy Implications

Based on the analysis of the various economies regarding the finance-growth relationship, we can identify the more important financial markets among the bank credit market, stock market, insurance market and also the international financial market. From the direction of causality, we can suggest suitable policies for the government to be implemented in order to promote economic growth in these economies.

For Bangladesh, the development of the stock market may make an important contribution to economic growth. Our results contradicts the study by Fase and Abma (2003) which shows that in Bangladesh the causality runs from financial structure to economic development. But their study uses aggregate financial assets as the financial development indicator. This is not as appropriate as the disaggregated financial development indicator such as the BANK variable which is used in our study.

The results for India indicate the development of the bank credit market is important to promote economic growth through capital accumulation. The development of the stock market may have a long run positive effect on the real GDP of the economy. Our result for bank credit is consistent with the study by Bell and Rousseau (2001) which also shows that bank credit leads to economic growth via the capital accumulation channel in India. It is also supported in the study by Demetriades and Hussein (1996) which shows bank credit Granger causes real GDP in India. The study by Ahmed and Ansari (1998) which shows domestic credit Granger causes real GDP in India is also similar to our result. However, our result is different from the study by Demetriades and Luintel (1996) which shows bidirectional causality between bank credit and real GDP.

For Indonesia, the stock market is more important than the bank credit market in promoting economic growth, both in the short run and the long run. The development of the insurance market has only a short run growth effect via the efficiency channel. Our results are different from the study by Odedokun (1992) and also by Rousseau and Vuthipadadorn (2005) which show bi-directional causality between bank credit and real

GDP in Indonesia. The difference could be explained by the different financial development indicators used in the studies. Odedokun (1992) uses development banks' credit to private sector while Rousseau and Vuthipadadorn (2005) use quasi money as the financial development indicators.

The results for Pakistan indicate that to achieve economic growth, it is important to develop the bank credit market. Developing the stock market may also have a long run growth effect via the capital accumulation channel. Our results on bank credit are similar to that of Ahmed and Ansari (1998) in which they discover domestic credit Granger causes real GDP in Pakistan. It is also consistent with the study by Demetriades and Hussein (1996) which shows long run Granger causality from bank credit to real GDP in Pakistan.

For Sri Lanka, it is the development of the bank credit market and the stock market that tends to promote economic growth. Our result on bank credit contradicts the study by Ahmed and Ansari using domestic credit in Sri Lanka as the financial development variable. But our results are consistent with the studies by Rousseau and Vuthipadadorn (2005) and by Demetriades and Hussein (1996).

For Brazil, the results indicate clearly that the development of both the bank credit market and the stock market may promote economic growth in the short run as well as the long run. Our result on bank credit contradicts the study by Odedokun (1992) which

shows development bank's credit in Brazil has a bi-directional causal effect with investment.

The results for China indicate that there is no obvious benefit in promoting any of the three domestic financial markets. Thus China may have to explore other determinants to promote economic growth instead of relying on its financial markets. This result is consistent with the study by Chang (2002) which shows no causal effect between bank credit and real GDP in any direction.

For Malaysia, it is obvious that the stock market matters more than the bank credit market in promoting economic growth in both short run and the long run. The insurance market also appears to be important as it has a growth promoting effect in both the short term and the long term. Our result on bank credit is different from the study by Rousseau and Vuthipadadorn (2005) which shows the causal effect is from bank credit to real GDP in Malaysia in both the short run and long run.

The results for the Philippines show that the development of both the bank credit market and the stock market can lead to economic growth. This result contradicts the study by Luintel and Khan (1999) which shows a bi-directional causality between bank credit and real GDP in the Philippines using a multivariate system.

For Thailand, the results favour economic growth through the development of the stock market. The unimportance of the bank credit market contradicts the result obtained by

Rousseau and Vuthipadadorn (2005) which shows bank credit Granger causes real GDP in Thailand over short term and long term. The study by Demetriades and Hussein (1996) which shows real GDP Granger causes bank credit in Thailand is also different from our result.

For Turkey, the results clearly favour developing the bank credit market for both the short run and long run economic growth. Development of the stock market has a long term positive effect on economic growth via the efficiency channel. This result contradicts the study by Demetriades and Hussein (1996) which shows real GDP Granger causes bank credit in Turkey.

The results for Hong Kong indicate that stock market matters for economic growth in both the short run and the long run. The development of the commercial bank credit market is not significant in explaining growth for Hong Kong.

For South Korea, the bank credit market and also the insurance market are not important to economic growth. The development of the stock market may promote economic growth via the capital accumulation channel but the results are not conclusive. Our result concerning bank credit is different from the study by Demetriades and Hussein (1996) which shows bidirectional causality between bank credit and real GDP in South Korea. It is also different from the study by Rousseau and Vuthipadadorn (2005) which shows bank credit Granger causes GDP in South Korea in the short term.

For Taiwan, both the bank credit market and the stock market have no effect in promoting economic growth. However, the development of the insurance market may be able to promote economic growth in both the short run and the long run via the efficiency channel. Our result is different from the study by Wang (1999) which shows financial development causes economic growth in Taiwan. However, his approach uses a production function where the financial assets are considered as exogenous which is different from our approach.

The results for Australia show that only the bank credit market is important for promoting economic growth in both the short run and long run. The stock market appears to have a positive effect on the growth rate of real GDP only in the short run. Our results contradict the study by Neusser and Kugler (1998) which shows bidirectional causality between manufacturing sector GDP and financial sector GDP. The difference can be attributed to the differences in financial development and economic growth indicators.

The results for Italy show that to achieve economic growth, it is more important for the government to develop the bank credit market and also the stock market. Economic growth is achieved mainly through the capital accumulation channel. The study by Neusser and Kugler (1998) shows no causality between the financial sector and economic growth but they use financial sector GDP for the financial development indicator and manufacturing sector GDP for economic growth which is different from our study.

For Japan, it is bank credit market that matters for economic growth. The stock market has only a short run positive growth effect via the capital accumulation channel. As for the insurance market, it is possible that the development in the insurance market may be growth-enhancing via the capital accumulation channel but the results are not conclusive. This result is consistent with the study by Rousseau (1999) which shows financial intermediary assets and corporate stocks Granger causes real GDP in Japan.

For United Kingdom, the development of the bank credit market is able to lead to economic growth in the long run via the capital accumulation channel. The development of the stock market appears to have only a short run growth-enhancing effect. Our result on bank credit is consistent with the study by Wachtel and Rousseau (1996) which shows bank assets Granger causes investment in the United Kingdom.

The results for United States of America show that the bank credit market did not appear to be able to lead to economic growth. The development of the stock market is more promising to promote economic growth in both the short run and the long run. This result is partially supported in the study by Aretis and Demetriades (1997) which shows bank assets and stock market capitalization Granger causes real GDP in the United States of America. Moreover, our result is consistent with the study by Wachtel and Rousseau (1996) which shows bank credit Granger causes economic growth.

5.6 Conclusion

The study shows that the relationship between financial development and economic growth is dependent on the growth variable selected, and the relationship may be different even among countries of a similar level of development. This highlights the danger of using restrictive growth indicators and putting many countries data together in the study of the finance-growth relationship, such as those by King and Levine (1993a, 1993b). The evidence provided by the variance decomposition is largely consistent with that of causality results thus supporting the use of the selected growth and finance variables in this research.

In addition, a more in depth analysis of the evidence revealed that most causation occurs in the form of a significant coefficient of the error correction term, suggesting a long term relationship between financial development and economic growth. Hence our study using annual data over a long time frame is supported by the evidence. In addition, it seems that the relationship between financial development and economic growth is dependent on the level of economic growth of the economies.

Using commercial bank credit to the private sector as a finance indicator, there are more cases of countries where long term finance leads to growth than reverse causation. For low and middle income economies, the evidence supporting the development of the bank credit market leads to economic growth is stronger than the reverse causation in the long run. For newly industrialized economies the evidence clearly supports the proposition that economic growth leads to bank credit market development, both in the short run and

the long run. But for high income economies, the development of the bank credit market is important to explain economic growth. The evidence implies that the bank credit market needs to be developed first in order to have a positive impact on economic growth. Low and middle income economies may not have regulations and legislations to govern the banking system such that the banking market may not be able to perform the growth promoting role efficiently.

When stock market capitalization is used as the finance indicator, the empirical evidences clearly supports over the long term stock market development leads to economic growth for low income economies as well as middle income economies. The reason could be that the stock market tends to operate based on market forces with lesser ad hoc restrictions compared to the bank credit market. The stock market is also likely to be more competitive compared to the credit market as it is often being quoted as the market that closely resemblances perfect competition. Thus even for low income economies, the stock market is able to perform the role of capital allocation and project supervision which eventually leads to economic growth. For the newly industrialized economies and the high income economies, stock market development conclusively leads to economic growth only in the short run and the long run evidence is less conclusive. This can be attributed to the fact that in these economies, raising funds through the stock market is only one of the alternatives and also the speculative activities of the stock market are not linked to economic growth of the economies.

As for the insurance market, the empirical evidence is very restricted, since we have only data for 5 economies. On the whole, insurance market development leads to economic growth in the middle income economies and newly industrialized economies. For Japan and Indonesia we observe the causal effect from economic growth to insurance market development. In Indonesia it could be due to the less developed insurance market which may not be able to provide the risk hedging function efficiently. For Japan it could be due to other ways of hedging business risk besides going through the insurance market. But for reasonably well developed economies, greater business risk occurs due to the inefficient financial system and hence the ability to hedge business risk by suitable insurance policies could greatly facilitate efficiency and promote growth.

In conclusion, the evidence did not fully support Patrick's hypothesis (1966) that financial development lags behind economic growth for developed economies and leads economic growth for developing economies. For some developing economies the Granger causation from economic growth to financial development is observed. One possible reason is that for less developed economies, the financial system may not be able to perform its role of capital accumulation and efficiency enhancement due to various institutional factors. This is consistent with the discoveries of Wurgler (2000) that the efficiency of capital allocation of financial markets is negatively correlated with the extent of state ownership in the economy, positively correlated with the amount of firm-specific information in domestic stock returns, and positively correlated with the legal protection of minority investors. Thus, it might be necessary for the financial system to be developed first before it can play the role of economic promotion.

Chapter 6: Globalization and the Finance-Growth Nexus

6.1 Introduction

In the previous chapter, the financial markets considered are mainly commercial banks' credit market, stock market and insurance market and all these markets are dominated by domestic funds. This chapter explores the issues of the relationship between inflow of foreign capital and economic growth. Unlike the study by Edison et al. (2002) where they used the stock and the flow of foreign direct investment as well as portfolio investment, this study only uses the annual flow of foreign direct investment in the recipient country as the international financial development indicator. The reason is that the focus of our study is the long-term relationship between foreign funds and economic growth. Foreign direct investment is usually on a long term basis, unlike foreign portfolio investment which is on a short term basis and speculative in nature. Hence foreign direct investment is more suitable in the study of the finance-growth nexus in a globalization context.

6.2 Data and Sample

This research considers 18 economies as the data for India and Hong Kong are too short for meaningful analysis. We only focus on the flow of foreign direct investment into the recipient economy and do not use stock data. This is because our sample consists of some economies that only opened up for foreign funds in recent years and hence the stock value will be less than those economies that have a longer history of receiving foreign funds. The series FDI represents the foreign direct investment (in US\$) received

by the economies and all data with the exception of Taiwan are obtained from IFS 2005. The series for Taiwan is obtained from the online version of CEIC.

6.3 Unit Root Tests, Cointegration Tests and Causality Tests

The sequence of the analysis is firstly to conduct the unit root tests, then the cointegration tests, follow by the causality tests and finally the variance decompositions. The results of the unit root tests on the FDI series are shown in Appendix 1. The unit root tests on the growth variables in the same period were also conducted and the results are similar to those reported in Appendix 1 and hence they are not reflected here. For almost all series a unit root is detected in the level series and rejected at first difference series at the 10% level of significance or less. Only for Japan the FDI appears to be stationary at the 10% level but the first difference makes it stationary at the 1% level using both tests. Hence it is reasonable to model all of the relevant variables as non-stationary.

The tests for cointegration between FDI and each of the growth variables are shown in Appendix 5. The results indicate that there is a cointegrating relationship between FDI and each of the growth variables in most of the economies considered. The exceptions are FDI and GFCF for China; FDI and TFP for Singapore and South Korea; FDI and GDP for Indonesia; FDI and TFP as well as GDP for Taiwan and Australia, and finally FDI and all the three growth variables for Japan. As before, we used the bi-variate VECM model to test for causality in the presence of cointegration and used the VAR model at first difference to test for causality when cointegration is absent.

6.3.1 Causality Tests Between FDI and Growth Variables for Low Income Economies

The causality tests between FDI and the growth variables for Low Income Economies are shown in Table 6.1 below. In the long run FDI Granger causes economic growth in Bangladesh when GFCF and GDP are used, in Indonesia when GFCF is used and in Sri Lanka when TFP is used. But the reverse causation occurs in Pakistan for all the three growth variables and in Sri Lanka when GFCF is used. In the short run FDI Granger causes growth in Bangladesh when GFCF and GDP are used and in Sri Lanka when GFCF and TFP are used. But for Pakistan it is TFP that Granger causes FDI.

Table 6.1: Causality Test Between FDI and Growth Variables for Low Income Economies

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Bangladesh	GFCF	16.07***	-0.52**
	FDI	3.15	1.76
	TFP	3.42	-0.12
	FDI	1.19	20.27
	GDP	6.27*	-0.11**
	FDI	1.88	10.77
Indonesia	GFCF	5.55	-1.14*
	FDI	3.58	-0.23
	TFP	7.26	-4.86
	FDI	1.05	10.51
	ΔGDP	0.00	-
	ΔFDI	1.02	-

Table 6.1: Causality Test Between FDI and Growth Variables for Low Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Pakistan	GFCF	0.57	-0.10
	FDI	1.99	3.39***
	TFP	6.48	-0.09
	FDI	12.36**	3.90**
	GDP	5.31	-0.05
	FDI	5.79	8.03***
Sri Lanka	GFCF	11.10**	-0.18
	FDI	2.45	5.41**
	TFP	14.03***	-0.27***
	FDI	10.24	2.24
	GDP	9.88	-0.46
	FDI	10.49	5.45

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

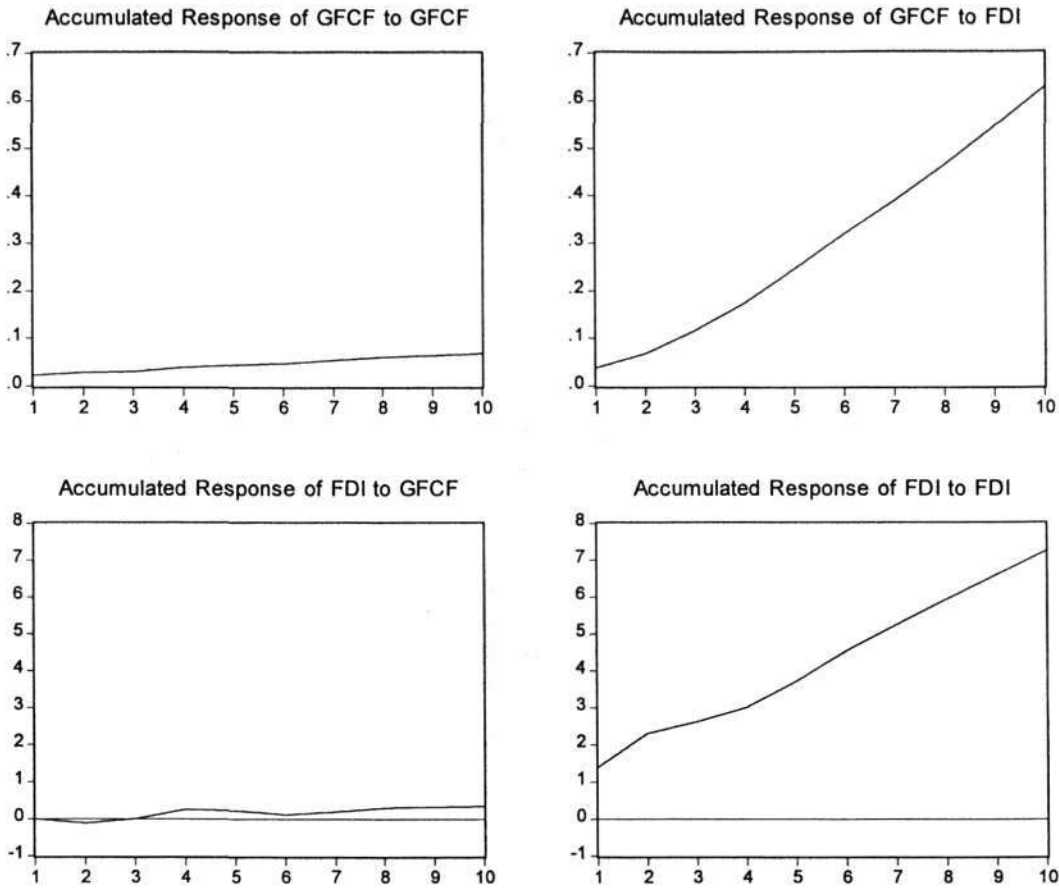
Table 6.2 shows the variance decomposition of FDI and the growth variables for LIE. We order FDI first since it appears to be more exogenous than the growth variables in the bi-variate systems. For all economies except Pakistan, over a 10 year horizon FDI explains a larger percentage of the variance in all the three growth variables, but the three growth variables only explain a small percentage of the variance in FDI. Thus the evidence suggests that FDI is important in explaining economic growth in the Low Income Economies.

Table 6.2: Variance Decomposition Between FDI and Growth Variables for Low Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by FDI	Variance Decomposition of FDI by growth variable
Bangladesh	GFCF	98.13	1.94
	TFP	96.40	1.17
	GDP	94.77	3.61
Indonesia	GFCF	97.55	1.66
	TFP	98.73	0.68
	GDP	7.13	2.78
Pakistan	GFCF	0.81	85.45
	TFP	15.61	54.76
	GDP	2.72	73.55
Sri Lanka	GFCF	71.10	19.51
	TFP	94.97	18.94
	GDP	96.61	24.60

Figure 6.1: Impulse Response Function of FDI and GFCF in Bangladesh

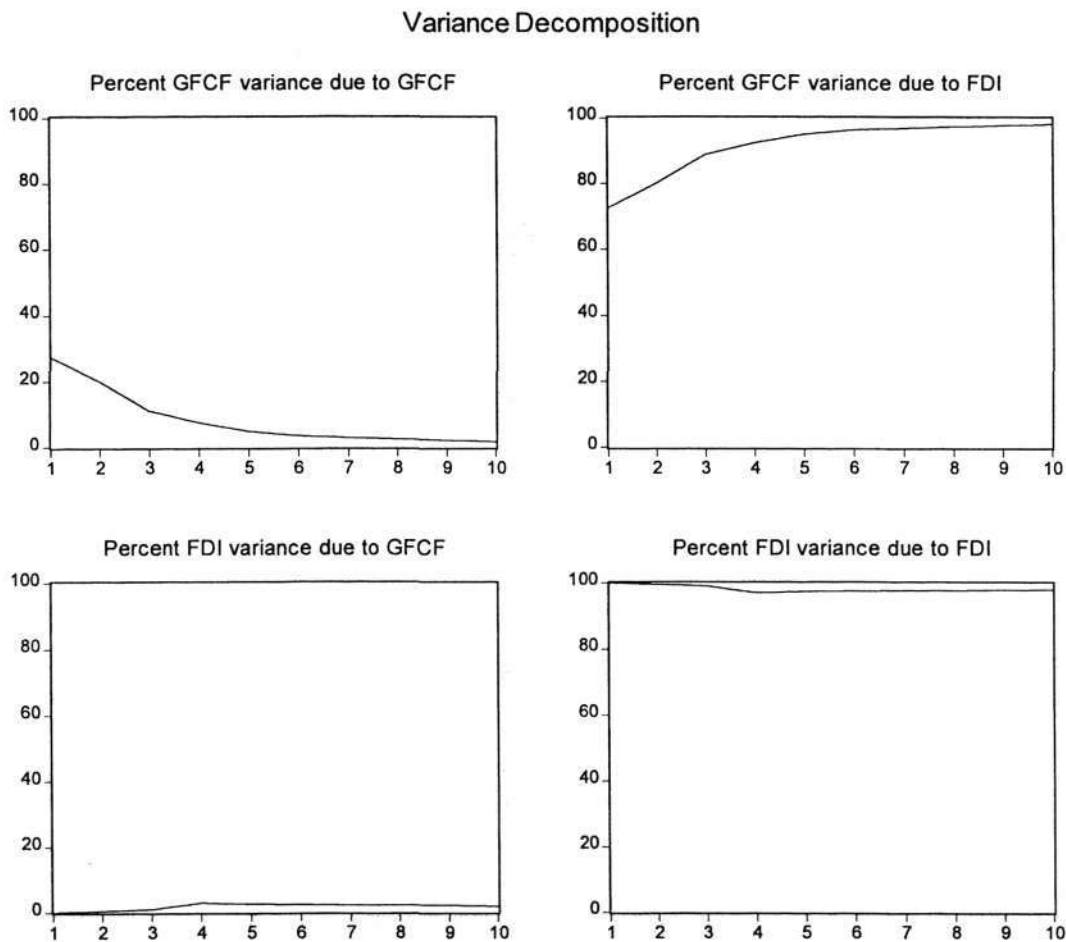
Accumulated Response to Cholesky One S.D. Innovations



Note: The X axis shows the number of years.

Figure 6.1 shows the accumulated impulse response function of FDI and GFCF over a 10 year horizon in Bangladesh. There is hardly any response on the variable FDI to a one standard deviation innovation of the variable GFCF, as shown in the bottom left panel diagram. But the response on GFCF to a one standard deviation innovation of the FDI is very strong, as shown in the top right panel of the diagram. This shows that FDI has a very strong influence on GFCF in Bangladesh.

Figure 6.2: Variance Decomposition of FDI and GFCF in Bangladesh



Note: The X axis shows the number of years.

Figure 6.2 shows the variance decomposition of FDI and GFCF over a 10 year horizon in Bangladesh. Even after 10 years, there is only a small percentage of the variation in the variable FDI attributed to the variable GFCF, as shown in the bottom left panel diagram. But there is a large percent of the variation in GFCF attributed to FDI, as shown in the top right panel of the diagram. This shows that FDI has a very strong influence on GFCF in Bangladesh.

6.3.2 Causality Tests Between FDI and Growth Variables for Middle Income Economies

The causality tests between FDI and the growth variables for Middle Income Economies are shown in Table 6.3. The results show that FDI Granger causes economic growth in Brazil and Malaysia when GFCF is used, in the Philippines for all the three growth variables and in Thailand when GFCF and GDP are used. But reverse causation occurs in Brazil and Thailand when TFP is used, in China when TFP and GDP are used, and in Malaysia and Turkey when GDP is used. The short run causal effect occurs from FDI to economic growth in Brazil when GFCF and TFP are used, in Philippines when GFCF is used and in Thailand when GFCF and GDP are used. Reverse causation occurs in China for all the three growth variables and in Turkey when GDP is used. There is also short run bidirectional causality in the Philippines when TFP and GDP are used.

Table 6.3: Causality Test Between FDI and Growth Variables for MIE

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Brazil	GFCF	8.11**	-1.46***
	FDI	5.18	-2.31
	TFP	14.53**	-0.08
	FDI	4.12	5.32**
	GDP	10.16	-0.08
	FDI	7.21	3.24
China	Δ GFCF	4.33	-
	Δ FDI	114.57***	-
	TFP	2.91	0.012
	FDI	18.34***	-1.87***
	GDP	4.94	-0.03
	FDI	68.71***	-0.85***

Table 6.3: Causality Test Between FDI and Growth Variables for Middle Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Malaysia	GFCF	2.33	-0.89*
	FDI	2.63	0.03
	TFP	0.32	0.04
	FDI	4.66	-0.34
	GDP	1.72	0.05
	FDI	6.20	2.75*
Philippines	GFCF	19.95***	-1.54***
	FDI	4.52	-4.28
	TFP	26.98***	1.12**
	FDI	11.16*	-12.34
	GDP	16.48**	-0.034**
	FDI	15.64**	-0.47
Thailand	GFCF	28.58***	-1.62***
	FDI	3.20	0.83
	TFP	0.07	-0.03
	FDI	0.03	0.97*
	GDP	23.14***	-1.24***
	FDI	2.60	0.17
Turkey	GFCF	1.04	-0.47
	FDI	2.27	-1.31
	TFP	1.72	-0.25*
	FDI	0.08	3.01***
	GDP	1.65	-0.37
	FDI	9.47**	3.45**

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

Table 6.4 shows the results of variance decomposition between FDI and the growth variables for Middle Income Economies over a 10 year horizon. Again we order FDI first as it appears to be more exogenous than the growth variables in the bi-variate

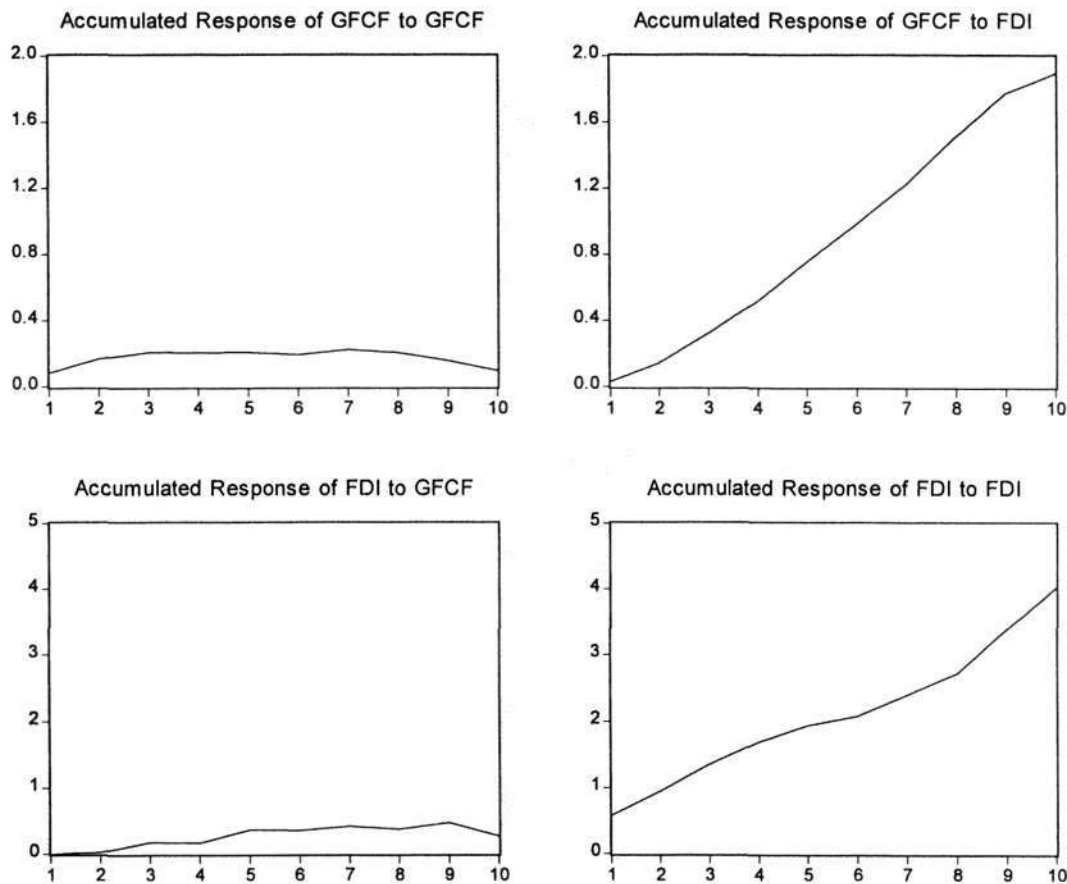
systems. All the economies except China and Turkey have a larger percentage of the variation in all the three growth variables attributed to FDI by the variance decomposition. FDI can only explain a larger percentage of the variation in the growth variable in China when TFP is used and in Turkey when GFCF is used.

Table 6.4: Variance Decomposition Between FDI and Growth Variables for MIE

Economy	Growth Variable	Variance Decomposition of growth variable by FDI	Variance Decomposition of FDI by growth variable
Brazil	GFCF	46.04	5.38
	TFP	52.65	12.48
	GDP	45.84	5.62
China	GFCF	6.76	96.86
	TFP	95.38	20.35
	GDP	20.08	92.55
Malaysia	GFCF	96.71	3.49
	TFP	93.54	2.19
	GDP	66.86	15.21
Philippines	GFCF	92.67	3.79
	TFP	79.67	26.61
	GDP	84.16	23.38
Thailand	GFCF	94.75	6.00
	TFP	14.70	12.80
	GDP	99.04	1.32
Turkey	GFCF	79.74	19.93
	TFP	24.79	36.53
	GDP	13.12	41.45

Figure 6.3: Impulse Response Function of FDI and GFCF in Thailand

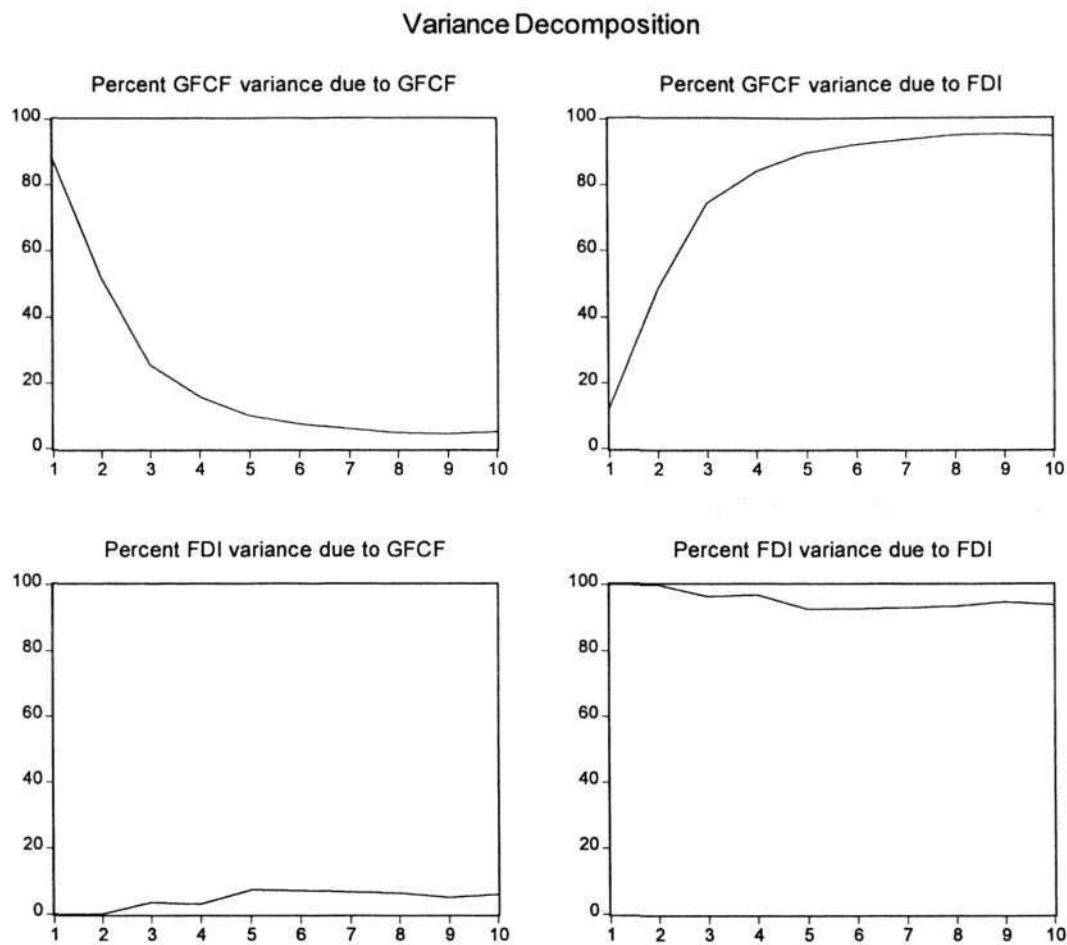
Accumulated Response to Cholesky One S.D. Innovations



Note: The X axis shows the number of years.

Figure 6.3 shows the accumulated impulse response function of FDI and GFCF over a 10 year horizon in Thailand. There is hardly any response on the variable FDI to a one standard deviation innovation of the variable GFCF, as shown in the bottom left panel diagram. But the response on GFCF to a one standard deviation innovation of FDI is very strong, as shown in the top right panel of the diagram. This shows that FDI has very strong influence on GFCF in Thailand.

Figure 6.4: Variance Decomposition of FDI and GFCF in Thailand



Note: The X axis shows the number of years.

Figure 6.4 shows the variance decomposition of FDI and GFCF over a 10 year horizon in Thailand. Even after 10 years, there is only a small percentage of the variation in the variable FDI attributed to the variable GFCF, as shown in the bottom left panel diagram. But there is a large percent of the variation in GFCF attributed to FDI, as shown in the top right panel of the diagram. This shows that FDI has very strong influence on GFCF in Thailand.

6.3.3 Causality Tests Between FDI and Growth Variables for Newly Industrialized Economies

The causality tests between FDI and the growth variables for Newly Industrialized Economies are shown in Table 6.5. The results indicate that FDI Granger causes growth in the long run in South Korea when GFCF and GDP are used and in Taiwan when GFCF is used. As for Singapore, it is GDP that Granger causes FDI and there is also bidirectional causality between FDI and GFCF. There is also evidence to support short run bi-directional causality in Taiwan when TFP and GDP are used.

Table 6.5: Causality Test Between FDI and Growth Variables for NIE

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Singapore	GFCF	6.08	-0.63**
	FDI	7.79	3.23*
	ΔTFP	0.02	-
	ΔFDI	1.83	-
	GDP	0.02	0.01
	FDI	1.08	2.60***
South Korea	GFCF	6.91	-0.45**
	FDI	14.30	-0.16
	ΔTFP	1.77	-
	ΔFDI	5.08	-
	GDP	5.67	-0.37**
	FDI	38.07***	-0.08
Taiwan	GFCF	3.97	-0.21**
	FDI	11.66**	0.14
	ΔTFP	7.45***	-
	ΔFDI	9.88***	-
	ΔGDP	8.00***	-
	ΔFDI	10.58***	-

Note: *, ** and *** represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

Table 6.6 shows the variance decomposition between FDI and the growth variables for Newly Industrialized Economies over a 10 year horizon. In Singapore FDI can explain a larger percentage of the variation of all the three growth variables, while in South Korea FDI can only explain a larger percentage of the variation of GFCF and GDP. In contrast, TFP and GDP can explain a larger percentage of the variation of FDI than the other way round.

Table 6.6: Variance Decomposition Between FDI and Growth Variables for Newly Industrialized Economies

Economy	Growth Variable	Variance Decomposition of growth variable by FDI	Variance Decomposition of FDI by growth variable
Singapore	GFCF	73.66	19.79
	TFP	27.36	6.99
	GDP	27.01	40.34
South Korea	GFCF	82.49	11.76
	TFP	6.29	31.71
	GDP	80.82	24.30
Taiwan	GFCF	51.41	22.93
	TFP	13.81	19.24
	GDP	12.63	19.81

6.3.4 Causality Tests Between FDI and Growth Variables for High Income Economies

The causality tests between FDI and the growth variables for High Income Economies are shown in Table 6.7 below. There is evidence that economic growth Granger causes FDI in the long run in Italy when GFCF and GDP are used, in UK when TFP is used and in USA for all the three growth variables. There are bidirectional causalities between FDI and economic growth in Australia when GFCF is used, in Italy when TFP is used and in UK when GDP is used.

Table 6.7: Causality Test Between FDI and Growth Variables for HIE

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
Australia	GFCF	4.58**	-0.22**
	FDI	4.09**	2.60**
	Δ TFP	0.57	-
	Δ FDI	27.10***	-
	Δ GDP	1.06	-
	Δ FDI	28.20***	-
Italy	GFCF	21.39***	0.19
	FDI	12.68**	17.35***
	TFP	5.81	-0.12***
	FDI	13.91**	6.30***
	GDP	8.35	0.03
	FDI	16.45**	15.08***
Japan	Δ GFCF	1.62	-
	Δ FDI	4.50**	-
	Δ TFP	2.72*	-
	Δ FDI	2.17	-
	Δ GDP	2.31	-
	Δ FDI	2.73*	-

Table 6.7: Causality Test Between FDI and Growth Variables for High Income Economies (Continued)

Economy	Dependent Variables	Block Exogeneity Test Statistics	Error Correction Coefficient
UK	Δ GFCF	0.64	-
	Δ FDI	4.92**	-
	TFP	34.18***	-0.03
	FDI	4.50	13.32**
	GDP	19.74***	0.34***
	FDI	5.14	15.05**
USA	GFCF	1.79	0.001
	FDI	1.11	2.44*
	TFP	1.09	0.02
	FDI	0.72	2.37***
	GDP	11.30*	-0.02
	FDI	5.14	2.67*

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively using McKinnion critical points

Table 6.8 shows the variance decomposition between FDI and the growth variables over a 10 year horizon for High Income Economies. We order FDI first, since it appears to be more exogenous than the growth variables in the bi-variate systems. The results show that in Australia all the three growth variables can explain a larger percentage of variation in FDI. FDI can only explain a larger percentage of the variation of the growth variable in Italy when TFP is used and in USA when GDP is used. For Japan and UK, FDI can explain a larger percentage of the variation in TFP and GDP compared to the other way round. Thus only for these two economies, FDI is important to explain economic growth.

Table 6.8: Variance Decomposition Between FDI and Growth Variables for High Income Economies

Economy	Growth Variable	Variance Decomposition of growth variable by FDI	Variance Decomposition of FDI by growth variable
Australia	GFCF	23.29	50.31
	TFP	22.13	36.41
	GDP	13.87	33.24
Italy	GFCF	16.57	59.92
	TFP	45.07	19.83
	GDP	7.40	40.78
Japan	GFCF	5.05	8.64
	TFP	10.43	4.79
	GDP	6.53	5.37
UK	GFCF	46.40	47.81
	TFP	24.37	4.08
	GDP	72.78	8.10
USA	GFCF	21.46	45.21
	TFP	4.26	23.48
	GDP	35.12	12.91

6.4 Policy Implications

The results show that by encouraging foreign direct investment, it is likely to promote economic growth in both the short run and the long run in Bangladesh. Foreign direct investment is also positive for the economic growth in Indonesia in the long run via the capital accumulation channel, but in Sri Lanka, the inflow of foreign direct investment has only a short run growth promoting effect. The results for Pakistan indicate that

foreign direct investment has no growth promoting effect at all. For low income economies as a whole, the evidence of foreign direct investment promoting economic growth is quite strong. To promote foreign direct investment, the government may relax ad hoc control on foreign capital inflows and outflows, as well as provide guarantee to the investment committed by foreign investors.

The effect of foreign direct investment on economic growth in the middle income economies is unclear. Foreign direct investment also appears to be positive for economic growth in the long run for the Philippines and Thailand, but it appears to have only short run effect in promoting growth in Brazil. The inflow of foreign direct investment is more likely to respond passively to economic growth rather than leading to economic growth in both China and Turkey. As for Malaysia, the inflow of foreign direct investment may lead to economic growth via the capital accumulation channel in the long run but the results for GDP shows that it is following after growth in real GDP of the economy.

Among the newly industrialized economies, the development of foreign direct investment is not significant in explaining growth for Hong Kong and has no clear growth enhancing effect in Singapore. But for South Korea and Taiwan, the inflow of foreign direct investment appears to have a long run positive growth effect, especially via the capital accumulation channel.

The results for the High Income economies show that the inflow of foreign direct investment is either not important or follows passively economic growth in the long run. Only for United Kingdom, the inflow of foreign direct investment appears to have a short run growth-enhancing effect.

6.5 Conclusion

The empirical evidence obtained indicates that in the long term, foreign direct investment did not lead to economic growth, but responds passively to economic growth in the high income economies. For low income economies the evidence supporting economic growth leading to foreign direct investment is stronger than for the reverse. The evidence in the middle income economies is mixed as there is support for foreign direct investment Granger causing economic growth and also the reverse. Only for newly industrialized economies is there stronger support for foreign direct investment leading to economic growth in the long run.

The results are not surprising as high income economies are usually the supplier of foreign direct investment since the developing economies offer more opportunities for investment, possibly due to lower resource costs and a less matured domestic market. For low income economies, foreign funds may be needed to supplement domestic savings in providing the necessary capital for investment. The conflicting results in the middle income economies can be attributed to the diverse nature and characteristics of these economies. As for the newly industrialized economies, foreign direct investment causes economic growth in South Korea and Taiwan but not in Singapore. This could be

attributed to more advanced technology and a larger manufacturing base in these two economies which allows foreign direct investment to enhance capital accumulation.

Chapter 7: Panel Data Analysis in Finance-Growth Nexus

7.1 Introduction

The previous analysis treats each economy separately from each other and estimates each economy individually. In this chapter, we study the finance-growth nexus in economies of similar level of development jointly by using a panel data estimation method. Panel data estimation has the advantages mentioned by Hsiao (2003) that it gives researchers a large number of data points, increasing the degrees of freedom and reducing the collinearity among explanatory variables and hence improving the efficiency of econometric estimates. Baltagi (2001) also cites these advantages and prefers panel data over conventional cross-sectional or time series data.

Xu (2000) mentioned that to study the causal relationship between financial development and economic growth, the presence of feedback between financial development variable and economic growth variable is a major problem. There are two methods to overcome this problem. One method is to estimate a VAR system involving both the financial development and economic growth variables simultaneously which we have used in Chapter 4 to Chapter 6. The alternative method is to use the dynamic panel method proposed by Arellano and Bond (1991). Edison et al. (2002) have supported using the dynamic panel approach to examine the finance-growth link due to several advantages. First, it allows researchers to exploit the time series nature of the relationship between finance variables and growth variables. Second, in a pure cross-country instrumental variable regression, any unobserved country specific effect becomes part of the error

term, which may bias the coefficient estimates. But dynamic panel methods allow one to control for country specific effects and hence reduce some of the biases plaguing past studies.

7.2 Data and Instrumental Variables

In this study we group the sample into panels of low income economies (LIE), middle income economies (MIE), newly industrialized economies (NIE) and high income economies (HIE) according to their per capita gross national income of 2001 as shown in Chapter 3. The rationale of doing so is in line with Schich and Pelgrin (2002). For economies that are at about the same level of development, the long run equilibrium relationship between finance and growth may be similar across countries. This may be due to arbitrage conditions or common technologies that are influencing all economies in the same way. Thus, it is justifiable and efficient to estimate the relationship between finance and growth using a panel consisting of economies of similar income levels. The study by Schich and Plegrin (2002) use a static fixed effect panel, a dynamic fixed effect panel and a dynamic error correction panel in the estimation. The studies by Beck et al. (2000), Levine et al. (2000) and Edison et al. (2002) use two stage least squares and dynamic panel estimation proposed by Arellano and Bover (1995). We use the static fixed effect estimation method, the two stage least squares method and the Arellano and Bond method in our estimation using panel data.

Instruments for financial development are frequently used in panel analysis. Studies by Beck et al. (2000) and Levine et al. (2000) use the origin of the legal system of

economies as instruments for financial development. The study by Edison et al. (2002) uses the legal origin of economies as well as the absolute value of latitudinal distance from the equator as the instruments for financial development. In our study, we have long time series but only 20 cross-sections and hence the first instrument we used is the interest rate spread (denoted by SPRD), suggested by Pagano (1993) as an indicator for the development of credit market. The second instrument we used is the stock market turnover value (denoted by TNOV), suggested by Arestis and Demetriades (1997) as an indicator for the efficiency of stock market. We use real GDP per capita, denoted by GDP, as the growth variable and two variables as the instrumental variables for BANK and STOCK. We consider the fixed effect panel and the dynamic panel estimation methods proposed by Arellano and Bond (1991) in the panel analysis.

The data are available at various time periods for all economies except Brazil. However, we exclude 4 economies, Indonesia, Sri Lanka, Turkey and United Kingdom in the panel analysis using SPRD. The reason is that they have negative SPRD at various time periods which is inconsistent with our expectation about bank credit market development. We also exclude 2 economies, China and Pakistan, in the panel analysis using TNOV, since the data series available are too short for meaningful analysis. The data for the panel analysis is shown in Table 7.1.

Table 7.1: Data Sample for Panel Analysis

Economy	Period for BANK and SPRD	Period for STOCK and TNOV
Low Income Economies		
Bangladesh	1976-2003	1988-2003
India	1965-2003	1986-2003
Indonesia	-	1977-2003
Pakistan	1982-2004	-
Sri Lanka	-	1986-2003
Middle Income Economies		
China	1980-2003	-
Malaysia	1983-2004	1987-2004
Philippines	1976-2004	1987-2004
Thailand	1977-2004	1975-2004
Turkey	-	1987-2004
Newly Industrialized Economies		
Hong Kong	1975-2004	1970-2004
Singapore	1968-2004	1968-2003
South Korea	1980-2004	1971-2004
Taiwan	1981-2004	1965-2004
High Income Economies		
Australia	1975-2004	1979-2004
Italy	1978-2003	1975-2003
Japan	1965-2004	1965-2004
UK	-	1965-2003
USA	1965-2004	1986-2004

7.3 Research Methodology

The framework for the static fixed effect panel model is of the form:

$$GDP_{it} = \alpha_i + \beta BANK_{it} + \varepsilon_{it} \quad (1)$$

where GDP is the real GDP per capita, BANK is the commercial bank credit to private sector per capita, i refers to the cross-sections in each panel and t is the time period. The individual effect is α_i , which is taken to be constant over time t and specific to the individual economy i in the grouping. The fixed effects approach takes α_i to be a group specific constant term in the regression model. We use the variable SPRD as the instrument for BANK in the estimation. Although there are potential benefits of estimating economies with similar income level and closely related to each other geographically as a panel, we also recognize that different economies have their own characteristics and hence we allow the fixed effect to reflect the individual characteristics of each economy. It is more compelling to consider a constant relationship between GDP and BANK in these economies.

To take into consideration the lagged effect of finance and growth, we incorporate four lags of the BANK variable and estimate the model:

$$GDP_{it} = \alpha_i + \beta BANK_{it} + \gamma_1 BANK_{i,t-1} + \gamma_2 BANK_{i,t-2} + \gamma_3 BANK_{i,t-3} + \gamma_4 BANK_{i,t-4} + \varepsilon_{it} \quad (2)$$

Panel data are also well suited for examining dynamic effects. We consider the following regression equation

$$GDP_{it} - GDP_{i,t-1} = \beta(BANK_{it}) + (\delta - 1)GDP_{i,t-1} + \eta_i + \varepsilon_{it} \quad (3)$$

where η_i is an unobserved country-specific effect and the subscripts i and t represent country and time period respectively. We can rewrite Equation (3) as

$$GDP_{it} = \beta(BANK_{it}) + \delta GDP_{i,t-1} + \eta_i + \varepsilon_{it}. \quad (4)$$

Now, to eliminate the country-specific effect, take first difference of Equation (4),

$$GDP_{it} - GDP_{i,t-1} = \beta(BANK_{it} - BANK_{i,t-1}) + \delta(GDP_{i,t-1} - GDP_{i,t-2}) + (\varepsilon_{it} - \varepsilon_{i,t-1}). \quad (5)$$

As reported in Greene (2000), this model is complicated by correlation between the lagged dependent variable and the disturbance term (and by its first order moving average disturbance term). But without the group effects, there is a simple instrumental variables estimator available. If the time series is long enough, one could use the differences, $(GDP_{i,t-2} - GDP_{i,t-3})$ or the lagged levels $GDP_{i,t-2}$ and $GDP_{i,t-3}$ as one or two instrumental variables for $(GDP_{i,t-1} - GDP_{i,t-2})$. There is a question as to whether one should use differences or levels as instruments. Arellano (1989) give evidence that the latter is preferable and so in this study we use $GDP_{i,t-2}$ and $GDP_{i,t-3}$ as the two instruments. In addition, we also use the variable $SPRD$ as an extra instrument for $BANK$. We use the method proposed by Arellano and Bond (1991) which has become very popular recently to estimate the panel equations. However, this method is more relevant for panel with a large number of cross-sections and a small number of time series. Since we have only three to five economies in each cross-section but the time series is relatively long, we did not include any period dummy variables in the model being estimated.

In a similar context to BANK, we use the variable TNOV as the instrument for STOCK and estimate the following three panel models. Model (1) is the static fixed effect panel model, Model (2) is the static fixed effect model with 4 lags and Model (3) is the dynamic panel model.

$$GDP_{it} = \alpha_i + \beta STOCK_{it} + \varepsilon_{it} \tag{6}$$

$$GDP_{it} = \alpha_i + \beta STOCK_{it} + \gamma_1 STOCK_{i,t-1} + \gamma_2 STOCK_{i,t-2} + \gamma_3 STOCK_{i,t-3} + \gamma_4 STOCK_{i,t-4} + \varepsilon_{it} \tag{7}$$

$$GDP_{it} - GDP_{i,t-1} = \beta (STOCK_{it} - STOCK_{i,t-1}) + \delta (GDP_{i,t-1} - GDP_{i,t-2}) + (\varepsilon_{it} - \varepsilon_{i,t-1}). \tag{8}$$

7.4 Empirical Analysis of Panel Data

The estimates of the three models using static fixed effect method and Arellano and Bond (1991) one step dynamic estimation method are shown in Table 7.2 and Table 7.3. The results are presented with BANK as the explanatory variable and SPRD as an instrument and then with STOCK as the explanatory variable and TNOV as an instrument. In both cases, the second and third lagged values of GDP are used as instruments for the first difference of GDP.

7.4.1 Panel Data Analysis of BANK

Table 7.2: Panel Data Analysis of BANK

Economy	Model (1) β	Model (2) β	$\Sigma \gamma_i$	Model (5) β	δ
LIE	0.19***	0.23**	-0.02	0.02	0.91***
MIE	0.20**	0.23*	-0.15**	0.05	0.81***
NIE	0.44***	0.08	-0.08	0.12	0.68***
HIE	0.20***	0.29**	-0.13*	0.07***	0.70***

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

Table 7.2 shows the panel data estimates of BANK. The static fixed effect method gives a consistently positive and significant coefficient for BANK. But when lags are considered, the effect becomes weaker and the coefficient for NIE is insignificant. The aggregate lagged effect on GDP is negative in all cases and this is misleading. Thus the level effect for BANK is stronger than the lagged effects in promoting growth in all cases.

For the dynamic panel method, the analysis of the relationship between bank credit market and economic growth is conditioned upon the existing income level, measured by lagged GDP. As shown in the table, the coefficients for the lagged GDP for all the four panels are positive and significant up to 1% level. The magnitude of this coefficient is the largest for LIE, with a value of 0.91. The next largest magnitude is for MIE, with a value of 0.81. For NIE and HIE the magnitudes of the coefficients are 0.68 and 0.70 respectively, much smaller compared to LIE and MIE. The results clearly indicate that it is important to include the lagged GDP term in the study of causal relationship between bank credit market and economic growth. The effect of income levels on the lesser developed economies is different from that on the more developed economies. Ignoring the effect of income levels will bias the comparison of the causal effect between bank credit market and economic growth between economies. Since the coefficients are positive, the bias is positive and the studies that ignore the existing state of development of the economies tend to overstate the importance of bank credit market to growth.

As for the coefficient for BANK, only for HIE is there a positive and significant coefficient. The evidence suggests that only for high income economies the development in the bank credit market has an important positive effect on economic growth. Again this can be attributed to high income economies that tend to have a banking industry that responds to market forces and is more efficient in performing the growth enhancing functions.

7.4.2 Panel Data Analysis of STOCK

Table 7.3: Panel Data Analysis of STOCK

Economy	Model (6)	Model (7)		Model (8)	
	β	β	$\Sigma\gamma_i$	β	δ
LIE	0.01	-0.01	0.01	0.02***	0.82***
MIE	-0.03*	0.03**	0.15***	0.01	0.87***
NIE	0.30***	0.15***	0.12***	0.04***	0.83***
HIE	0.02*	0.00	0.06***	0.03***	0.81***

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

Table 7.3 shows the panel estimates of STOCK. For the static fixed effect model, only LIE did not have a significant coefficient at level and with lags. The negative significant coefficient of MIE at level is misleading but with lags, the coefficients become positive and significant. Thus on the whole the growth promoting effect of the stock market is stronger than for the bank credit market.

For the dynamic panel method, the analysis of the relationship between stock market development and economic growth is again conditioned upon the existing income level, measured by lagged GDP. As shown in the table, the coefficients for the lagged GDP for

all the four panels are positive and significant up to 1% level. The magnitude of this coefficient is the largest for MIE, with a value of 0.87. For LIE, NIE and HIE the magnitudes of the coefficients are 0.82, 0.83 and 0.81 respectively, slightly smaller compared to MIE. The results again indicate that it is important to include the lagged GDP term in the study of stock market development and economic growth. The effect of income levels on economies at different level of development is different, although the difference in magnitude is smaller compared to the bank credit market. Ignoring this effect will again bias the comparison of the causal effect between stock market development and economic growth between economies. The bias is positive and the research that ignores the existing state of development of economies again tends to overstate the importance of stock market in economic growth.

As for the coefficients for STOCK, the results are more encouraging than for the bank credit market. Except for MIE, the other three panels show a positive and significant estimate for STOCK. The reason can again be attributed to the stock market tending to be more competitive in all economies compared to the bank credit market, even for low income economies. Thus the stock market is able to perform the function of allowing firms to raise more capital efficiently and also providing funds to the more promising firms and hence its effect on real GDP is stronger.

7.5 Conclusion

We consider three estimation methods using two instruments in the panel data analysis. The first one is the static fixed effect at level, the second one is the static fixed effect with

lags and the third one is the dynamic panel estimation method. The results with interest rate spread as the instrument for BANK shows that the level static growth enhancing effect is stronger than the lagged effect in all economies. When the dynamic effect is considered BANK has growth enhancing effect only in the high income economies. The results using stock market turnover value per capita as the instrument for stock market capitalization is different. It shows that the fixed effect of STOCK on the real GDP is stronger with lags than at level. But the dynamic panel method shows a positive and significant effect of STOCK on the real GDP in most of the economies.

The dynamic panel analysis also indicates that in studying the causal effect between bank credit market, stock market and economic growth, it is important to include the lagged GDP term to capture the effect of income levels on the economies. The research that ignores the existing state of development of economies is likely to have positive bias and over emphasize the importance of finance to economic growth. Overall, the results suggest that the development of stock market is important to the growth of economies, especially for low income economies. But it is important to improve on the quality and efficiency of the bank credit market first before the bank credit market can perform the role of promoting economic growth in the less developed economies.

Chapter 8: Conclusions

8.1 Summary of the Results

In this thesis, the empirical evidence shows that the direction of causality is dependent on the economic growth variable and also the financial development variable used. Moreover, the causal relationship may be different even between countries of similar levels of economic development. This section summarizes the main results, highlights the main contribution of the thesis and suggests the directions of future research in this area.

The results are presented according to low income economies, middle income economies, newly industrialized economies and high income economies for comparisons between economies of similar level of development. The causal results between the three growth variables and three financial development variables are presented in Tables 8.1 to 8.4. The three growth variables are real gross fixed capital formation per capita, total factor productivity and real gross domestic product per capita, denoted by GFCF, TFP and GDP respectively. The three financial development variables are the domestic bank credit per capita, stock market capitalization per capita and foreign direct investment per capita, denoted by BANK, STOCK and FDI respectively. Table 8.5 shows the causal results between insurance companies' assets denoted by INSUR and the three growth variables for the six economies involved.

For Table 8.1 to Table 8.5, the notation SR means short run, LR means long term, F implies finance variable, G implies growth variable and BC implies bi-directional

causality. The direction of Granger causality is indicated by the arrow. We also use the term “n.a.” to represent the systems where the finance variable and the growth variable are not cointegrated and hence there is no long run causal effect. The symbol “-” means no significant causal effect is detected.

8.1.1 Causality Results of Low Income Economies

Table 8.1 shows the causality results of low income economies. We differentiate between short run and long run effects by the significance of the block exogeneity test statistics and the error correction terms. It is clear that the majority of the causal effect occurs in the long run. Over the short run, there are more incidents of economic growth Granger causing financial development. But over the long run the evidence favours financial development Granger causes economic growth. Among the three growth variables, most of the causal effect occurs with GFCF and the least with TFP. This shows that the channel that financial development leads to economic growth is more likely to be the capital accumulation channel and not the efficiency channel. The development of the bank credit market and stock market is beneficial to the economic growth in Pakistan and Sri Lanka. India may be benefited from the credit market development only. Developing stock market and encouraging foreign direct investment may promote growth in Bangladesh and Indonesia.

Table 8.1: Directions of Causality Results of Low Income Economies

Economy	Growth Variable	BANK		STOCK		FDI	
		SR	LR	SR	LR	SR	LR
Bangladesh	GFCF	$F \rightarrow G$	n.a.	-	$F \rightarrow G$	$F \rightarrow G$	$F \rightarrow G$
	TFP	$G \rightarrow F$	$G \rightarrow F$	-	BC	-	-
	GDP	$G \rightarrow F$	BC	-	$F \rightarrow G$	$F \rightarrow G$	$F \rightarrow G$
India	GFCF	-	$F \rightarrow G$	$G \rightarrow F$	$G \rightarrow F$	n.a.	n.a.
	TFP	-	-	$G \rightarrow F$		n.a.	n.a.
	GDP	-	-	BC	$F \rightarrow G$	n.a.	n.a.
Indonesia	GFCF	$G \rightarrow F$	$G \rightarrow F$	$F \rightarrow G$	n.a.	-	$F \rightarrow G$
	TFP	$G \rightarrow F$	n.a.	-	BC	-	-
	GDP	$G \rightarrow F$	n.a.	-	$F \rightarrow G$	-	n.a.
Pakistan	GFCF	-	n.a.	-	$F \rightarrow G$	-	$G \rightarrow F$
	TFP	-	$F \rightarrow G$	-	n.a.	$G \rightarrow F$	$G \rightarrow F$
	GDP	$F \rightarrow G$	$F \rightarrow G$	$G \rightarrow F$	n.a.	-	$G \rightarrow F$
Sri Lanka	GFCF	-	$F \rightarrow G$	-	$F \rightarrow G$	$F \rightarrow G$	$G \rightarrow F$
	TFP	$F \rightarrow G$	$F \rightarrow G$	-	$F \rightarrow G$	$F \rightarrow G$	-
	GDP	-	$G \rightarrow F$	$G \rightarrow F$	n.a.	-	-

Note: SR means short run, LR means long run, G means growth variable, F means finance variables, n.a. means no cointegration and - means insignificant causal effect

8.1.2 Causality Results of Middle Income Economies

Table 8.2 shows the causality results of middle income economies. There are slightly more cases of causal effect occurring in the short run than in the long run. However, for both short run and long run, the evidence favours Granger causality from financial development to economic growth. There are more cases of causal effect occurs with GFCF and least cases with TFP, implying that the capital accumulation channel is more

important than the efficiency channel in promoting growth. Brazil and Turkey could benefit by the development of the bank credit market. All economies except China may benefit from a more developed stock market. Finally, foreign direct investment may promote growth in Brazil, Philippines, Malaysia and Thailand.

Table 8.2: Direction of Causality Results of Middle Income Economies

Economy	Growth Variable	BANK		STOCK		FDI	
		SR	LR	SR	LR	SR	LR
Brazil	GFCF	F → G	F → G	F → G	n.a.	F → G	F → G
	TFP	-	n.a.	F → G	F → G	F → G	G → F
	GDP	F → G	n.a.	-	-	-	-
China	GFCF	-	n.a.	n.a.	n.a.	G → F	n.a.
	TFP	G → F	n.a.	n.a.	n.a.	G → F	G → F
	GDP	G → F	n.a.	n.a.	n.a.	G → F	G → F
Malaysia	GFCF	-	BC	F → G	F → G	-	F → G
	TFP	-	G → F	F → G	n.a.	-	-
	GDP	-	G → F	F → G	n.a.	-	G → F
Philippines	GFCF	-	F → G	-	BC	F → G	F → G
	TFP	G → F	n.a.	F → G	F → G	BC	F → G
	GDP	G → F	F → G	-	BC	BC	F → G
Thailand	GFCF	-	BC	BC	F → G	F → G	F → G
	TFP	-	-	F → G	-	-	G → F
	GDP	G → F	n.a.	F → G	G → F	F → G	F → G
Turkey	GFCF	F → G	F → G	G → F	n.a.	-	-
	TFP	F → G	F → G	-	F → G	-	BC
	GDP	F → G	F → G	-	BC	G → F	G → F

Note: SR means short run, LR means long run, G means growth variable, F means finance variables, n.a. means no cointegration and – means insignificant causal effect

8.1.3 Causality Results of Newly Industrialized Economies

Table 8.3 shows the causality results of newly industrialized economies. There are more long run than short run causal effects and slightly more causal effects from economic growth to financial development than the other way round. Most of the causal effects are detected with GFCF and the least with TFP, implying that the capital accumulation channel is more important than the efficiency channel in promoting economic growth. Singapore may benefit from the development of the bank credit market in the long term. Stock market development may benefit Hong Kong and Singapore but foreign direct investment is more important for South Korea and Taiwan in promoting growth.

Table 8.3: Direction of Causality Results of Newly Industrialized Economies

Economy	Growth Variable	BANK		STOCK		FDI	
		SR	LR	SR	LR	SR	LR
Hong Kong	GFCF	$G \rightarrow F$	n.a.	$F \rightarrow G$	$F \rightarrow G$	n.a.	n.a.
	TFP	-	-	-	n.a.	n.a.	n.a.
	GDP	-	n.a.	$F \rightarrow G$	n.a.	n.a.	n.a.
Singapore	GFCF	BC	$F \rightarrow G$	-	$F \rightarrow G$	-	BC
	TFP	BC	BC	-	n.a.	-	n.a.
	GDP	$G \rightarrow F$	n.a.	$F \rightarrow G$	n.a.	-	$G \rightarrow F$
South Korea	GFCF	-	BC	-	$F \rightarrow G$	-	$F \rightarrow G$
	TFP	-	$G \rightarrow F$	$F \rightarrow G$	$G \rightarrow F$	-	n.a.
	GDP	-	$G \rightarrow F$	$F \rightarrow G$	$G \rightarrow F$	$G \rightarrow F$	$F \rightarrow G$
Taiwan	GFCF	-	n.a.	-	BC	$G \rightarrow F$	$F \rightarrow G$
	TFP	-	$G \rightarrow F$	-	n.a.	BC	n.a.
	GDP	$G \rightarrow F$	n.a.	$G \rightarrow F$	$G \rightarrow F$	BC	n.a.

Note: SR means short run, LR means long run, G means growth variable, F means finance variables, n.a. means no cointegration and - means insignificant causal effect

8.1.4 Causality Results of High Income Economies

Table 8.4 below shows the causality results of high income economies. There are more cases of causal effect occurring in the short run than in the long run. As for the direction of causality, in the short run the evidence suggest that financial development Granger causes economic growth but in the long run the evidence favours reverse causation. Again there are more cases of causal effects detected with GFCF and least cases with TFP, indicating the capital accumulation channel instead of the efficiency channel for financial development is likely to promote economic growth. Development of the bank credit market may promote growth in all economies except the United States. The development of the stock market may benefit the United States of America and Italy. But none of the economies appear to have growth enhanced from an increase in foreign direct investment in the long run.

Table 8.4: Direction of Causality Results of High Income Economies

Economy	Growth Variable	BANK		STOCK		FDI	
		SR	LR	SR	LR	SR	LR
Australia	GFCF	$F \rightarrow G$	n.a.	BC	$G \rightarrow F$	BC	BC
	TFP	$F \rightarrow G$	$F \rightarrow G$	-	-	$G \rightarrow F$	n.a.
	GDP	$F \rightarrow G$	-	$F \rightarrow G$	-	$G \rightarrow F$	n.a.
Italy	GFCF	$F \rightarrow G$	$F \rightarrow G$	-	$F \rightarrow G$	BC	$G \rightarrow F$
	TFP	-	n.a.	-	n.a.	$G \rightarrow F$	BC
	GDP	-	$F \rightarrow G$	$F \rightarrow G$	n.a.	$G \rightarrow F$	$G \rightarrow F$
Japan	GFCF	$F \rightarrow G$	$F \rightarrow G$	$F \rightarrow G$	n.a.	$G \rightarrow F$	n.a.
	TFP	$F \rightarrow G$	-	BC	BC	$F \rightarrow G$	n.a.
	GDP	BC	$F \rightarrow G$	BC	BC	$G \rightarrow F$	n.a.

Table 8.4: Direction of Causality Results of High Income Economies (Continued)

Economy	Growth Variable	BANK		STOCK		FDI	
		SR	LR	SR	LR	SR	LR
UK	GFCF	-	$F \rightarrow G$	$F \rightarrow G$	BC	$G \rightarrow F$	n.a.
	TFP	-	-	-	$G \rightarrow F$	$F \rightarrow G$	$G \rightarrow F$
	GDP	-	-	BC	$G \rightarrow F$	$F \rightarrow G$	BC
USA	GFCF	$G \rightarrow F$	-	$F \rightarrow G$	$F \rightarrow G$	-	$G \rightarrow F$
	TFP	BC	$G \rightarrow F$	$F \rightarrow G$	$F \rightarrow G$	-	$G \rightarrow F$
	GDP	$G \rightarrow F$	$G \rightarrow F$	$F \rightarrow G$	$F \rightarrow G$	$F \rightarrow G$	$G \rightarrow F$

Note: SR means short run, LR means long run, G means growth variable, F means finance variables, n.a. means no cointegration and – means insignificant causal effect

8.1.5 Causality Results of INSUR and Growth Variables

Table 8.5 shows the causality results of INSUR and the three growth variables for all the 6 economies considered. There are more cases of long term causality than short term between insurance companies’ assets and the growth variables. As for the direction of causality, there are more cases of the insurance market development that Granger causes economic growth in the long term than in the short term. There are more cases of causality detected with TFP than with GFCF, suggesting that development of the insurance market may promote growth through greater efficiency instead of capital accumulation. But the insurance market development appears to benefit only Malaysia, Singapore and Taiwan.

Table 8.5: Causality Results of INSUR and Growth Variables

Economy	Growth Variable	INSUR	
		SR	LR
Indonesia	GFCF	$G \rightarrow F$	$G \rightarrow F$
	TFP	$F \rightarrow G$	$G \rightarrow F$
	GDP	-	$G \rightarrow F$
Malaysia	GFCF	$F \rightarrow G$	-
	TFP	-	$F \rightarrow G$
	GDP	-	$F \rightarrow G$
Singapore	GFCF	-	$F \rightarrow G$
	TFP	$F \rightarrow G$	$F \rightarrow G$
	GDP	BC	$F \rightarrow G$
South Korea	GFCF	-	n.a.
	TFP	$G \rightarrow F$	BC
	GDP	$G \rightarrow F$	n.a.
Taiwan	GFCF	-	n.a.
	TFP	-	$F \rightarrow G$
	GDP	$F \rightarrow G$	$F \rightarrow G$
Japan	GFCF	BC	$F \rightarrow G$
	TFP	$G \rightarrow F$	$G \rightarrow F$
	GDP	$G \rightarrow F$	$G \rightarrow F$

Note: SR means short run, LR means long run, G means growth variable, F means finance variables, n.a. means no cointegration and – means insignificant causal effect

Overall, by comparing the results of the three growth indicators, the development of the bank credit market and stock market are important for economies at all levels of development. Foreign direct investment does not appear to be significant in promoting growth in the high income economies. The stock market seems to be more important

than bank credit market for promoting economic growth. This could be due to the fact that before the credit market can perform the growth enhancement role, suitable regulations and institutional factors must be present first and these may not be available in the less developed economies. But the stock market tends to be more competitive in nature which means it can perform the function of growth promotion more efficiently even in the less developed economies.

8.1.6 Results of Panel Data Analysis

This study employs three estimation methods using 4 groups of panel data according to the income level of the economies. The first method is the static fixed effect estimation method using levels, the second method is the static fixed effect model with lags and the third method is the dynamic panel model. The results tend to support a long term stable relationship between stock market development and real GDP for economies at all levels of development. But a strong and positive relationship between the bank credit market and real GDP growth is only detected in the high income economies using the dynamic panel method. The conclusion is that stock market development appears to be more important than credit market development in promoting economic growth. Our results on the high income economies are consistent with the study by Schich and Pelgrin (2002) on 19 OECD economies which shows stock market capitalization has the strongest effect on investment followed by private credits issued by deposit money banks. However, our result on the low income economies contradicts the study by Ahmed and Ansari (1998) in which their panel study on India, Pakistan and Sri Lanka shows that domestic credit is positively related to real GDP. The difference could be due to using only commercial

bank credit in our analysis, which is narrower than the domestic credit used in their study. Also their panel study simply treats domestic credit as exogenous in the panel equation which is not appropriate. The dynamic panel analysis also indicates that in studying the causal effect between bank credit market, stock market and economic growth, it is important to include the lagged GDP term to capture the effect of income levels on the economies studied. Studies that ignore the existing state of development of economies are likely to have positive bias and over emphasize the importance of finance to growth.

8.2 Major Contributions

In view of the restrictions and pitfalls in the empirical works to explain financial development and economic growth, this thesis hopes to fill some of the gaps by considering a sample of economies at different stages of development, using a variety of financial development and growth indicators, and also explores the use of a variety of econometric techniques in the study of financial development and economic growth. This thesis makes the following four contributions.

First, it considers a wide variety of financial development indicators and growth indicators to analyze the causal relationship between financial development and economic growth. Previous studies tend to use highly arrogated financial development data, such as money supply by Jung (1986) or financial intermediary assets by Rousseau (1999). Even if disaggregated data is used, most of the studies focus on only one financial market, such as the study by Odedokun (1992) which focuses on development banks' credits and by Harris (1997) which focuses on the stock market. In this study, we

focus on three domestic financial markets, the bank credit market to the private sector, stock market capitalization and insurance companies' assets. We also study the effects of international financial integration by analyzing the flow of foreign direct investment. Thus our study is more comprehensive than the other studies.

The second contribution is that our research considers a wide variety of econometric methods in analyzing the relationship between financial development and economic growth. Previous studies tend to focus on the VAR or VECM model in the study of the finance-growth nexus, such as the studies by Demetriades and Hussein (1996) and Rousseau and Vuthipadadorn (2005). In this research, we not only use VAR and VECM models but also use the instrumental variable method as well as static and dynamic panel estimation methods to study the relationship between financial development and economic growth. We introduce two new instruments, the interest rate spread and stock market turnover value, in this study which may be able to avoid the problem of feedback in the causality study. We also use the more advance dynamic panel estimation method by Arellano and Bond (1991) in our panel estimation. Thus our study is more conclusive than the existing studies.

The third contribution of this study is that it focuses on economies at different stages of economic growth and traces the relationship between financial development and economic growth relative to the stage of development. Previous studies tend to focus only on one or a few economies and the economies selected have similar economic growth. For example, the study by Wachtel and Rousseau (1996) focused on the United

States of America, United Kingdom and Canada, and the study by Ahmed and Ansari (1998) focused on India, Pakistan and Sri Lanka. Alternatively, some studies use a larger sample of economies without distinguishing their levels of economic development, such as the study by King and Levine (1993a, 1993b) which uses 80 economies with different levels of economic growth. All these studies did not consider the possibility of differences in the finance and growth relationship due to differences in the level of economic development. Our research has the advantage that we distinguish between low income economies, middle income economies, newly industrialized economies and high income economies to allow the causal relationship between financial development and economic growth to be different for different economies and yet testing for whether similar relationship exists between different economies of similar level of economic development. Our results show that bank credit market is important to promote economic growth in high income economies. The development of stock market and inflows of foreign direct investment are important to promote economic growth in low income economies. The middle income economies and newly industrialized economies appear to have growth enhancing effect from the development of insurance market.

The results from the dynamic panel models also indicate that analysis of the causal relationship between finance and growth is conditioned upon existing income levels of the economies. It is important to consider the existing state of development of the economies to study the causal relationship between finance and growth. Using lagged GDP to measure income level, the coefficients of the lagged GDP term for all the four panels are positive, and the coefficients are significant up to 1% level in both the bank

credit market and the stock market analyses. The magnitudes of the coefficients are also different for economies at different income levels, range from 0.68 to 0.91. The difference is larger for bank credit market but smaller for stock market. Ignoring the effect of income levels will bias the comparison of causal relationship between financial development and economic growth among economies. The studies of causal relationship between finance and growth without considering the existing state of development of the economies are likely to have positive bias which overstates the importance of financial development to economic growth.

The final contribution of this research is that the sample selected has a heavy emphasis on the emerging economies in Asia. Previous studies tend to focus more on the more developed economies, possibly due to long time series data are available only in these economies. For example, the study Arestis and Demetriades (1997) focused on the United States of America and Germany, and the study by Schich and Pelgrin (2002) focused on the OECD economies. There are very few studies on Asian economies, even though Asian economies, especially China and India, are increasingly playing a more significant role in the world production of output. This study focuses on 20 economies with 15 of them located in Asia and hence it contributes to the understanding of the finance growth nexus in the Asia economies, not just among the developed economies.

8.3 Suggestions for Future Research

The scope between financial development and economic growth is very wide and there are still many areas that require further research. This section explores some of the gaps

in the current literature concerning data, research methodology and also policy implications that may be promising area for future research.

In the area of data or indicators used, most of the empirical studies use highly aggregated indicators of financial intermediation, such as the ratio of M1, M2, M3 or total domestic credit to GDP. As mentioned by Pagano (1993), this neglects the fact that the effect of financial development can vary depending on the specific market where it occurs. A finer disaggregation is needed to distinguish the role of the stock market, the bond market, the insurance market and the market for household credit. This is consistent with the studies in Chapters 4, 5, 6 and 7 where we consider the effects of commercial bank credit, stock market capitalization, insurance companies' assets and also foreign direct investment in economic growth. However, data availability problems tend to reduce the number of variables and number of countries in the analysis. In the future when more such data are available to many economies, researchers can put in a more concerted effort to distinguish the contribution of each financial market to economic growth.

The use of panel analysis is increasingly important in this field of study. As mentioned by Edison et al. (2002), panel analysis has the advantages of exploiting time-series nature of the relationship, enable control of country-specific effect bias and controls for potential endogeneity of explanatory variables. This research focuses more on the Asian economies but the extensive heterogeneity among the economies may have affected the efficiency of the estimated result. More economies under similar geographical or institutional conditions, such as the European Union, North America, Latin America,

Middle East countries, OECD countries and Sub-Saharan African countries can be studied to enhance our understanding of the long term relationship between financial development and economic growth.

Finally, researchers may also consider using the more advanced estimation methods, such as Generalized-Methods-of-Moments (GMM) estimators and incorporate into dynamic panel data as suggested by Holtz-Eakin et al. (1990) and Arellano and Bond (1991). Xu (2000) has mentioned that this dynamic panel method can overcome the problem of simultaneity in the finance and growth studies. The study by Beck et al. (2000), Levine et al. (2000) and Edison et al. (2002) use Arellano and Bond (1991) method with a slight modification to improve the efficiency of estimation. More study can be done in this area to free some of the biases which continue to plague the study of the finance-growth nexus. For example, the simultaneous-equation model reported in Hsiao (2005) can be considered. Future research also needs to be relevant to policy makers, as mentioned in Wachtel (2001).

8.4 Conclusion

The relationship between financial development and economic growth is a controversial one. Economic theories can not sufficiently explain the relationship between financial development and economic growth and the empirical evidence is also full of conflict. While there is some empirical evidence supporting the proposition that financial development leads to economic growth (Schumpeter's view), there are also evidence that indicates the reverse (Robinson's view) and bi-directional causality (Patrick's view). The

reasons for such a conflict could be due to inappropriate indicators, unsuitable research methodologies or biased samples used in this type of study.

To study the relationship between financial development and economic growth, this research uses four financial development variables: commercial bank credit to private sector, stock market capitalization; insurance companies' assets and foreign direct investment), two instrumental variables: interest rate spread and stock market turnover value) and three economic growth variables: real GDP per capita, real gross fixed capital formation per capita and total factor productivity. Various methodologies are applied to analyze this relationship. These include the Granger causality test in an error correction model framework, variance decomposition, instrumental variable method and also static and dynamic panel data analysis. The data used are mainly annual data from 1965 to 2004, involving 20 economies at various stages of economic development but with an emphasis on Asian economies.

The empirical results show that there is a long term stable relationship between financial development and economic growth. But the exact relationship depends on the financial development indicator, the growth indicator and also the level of development of the economies. The development of the stock market appears to be more important than the bank credit market in promoting growth, especially for the low and middle income economies. The development of insurance markets appears to be beneficial only if an economy achieves a certain level of economic development. Foreign direct investment

is more likely to follow economic growth rather than promote economic growth for most of the high income economies.

Using real gross fixed capital formation per capita as the growth indicator, results in the most number of cases of causality being detected. But when total factor productivity is used as the growth indicator we often have the least number of cases of causality. The results support the capital accumulation channel for financial sector in promoting growth. There is very little evidence supporting the efficiency channel of financial sector in promoting economic growth. The evidence from the panel analysis also indicates a significant positive relationship between stock market turnover value and economic growth. The effect of bank credit on economic growth is only positive for high income economies and its effect is weaker than the stock market. The results tend to support the capital accumulation channel for finance in promoting growth. More research in the area is needed before more conclusive statements can be made regarding the role of financial development in economic growth.

Appendix 1 - Unit Root Tests of Finance and Growth Variables

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
Bangladesh					
GFCF	1974-2003	-3.01	-5.31***	-3.03	-4.74***
TFP	1974-2003	-0.57	-7.76***	-1.63	-7.57***
GDP	1974-2003	-0.42	-5.70***	-1.26	-7.27***
BANK	1974-2003	-1.59	-4.56***	-1.67	-4.52***
STOCK	1976-2003	-1.48	-4.33**	-1.73	-4.33**
FDI	1986-2003	-1.13	-4.41***	-0.88	-5.82***
India					
GFCF	1965-2004	-0.32	-5.46***	-3.17	-10.85***
TFP	1965-2004	-1.79	-7.49***	-1.68	-7.49***
GDP	1965-2004	-2.16	-7.36***	-2.07	-7.36***
BANK	1965-2004	-1.50	-6.79***	-1.54	-6.83***
STOCK	1981-2004	-0.81	-4.19***	-0.81	-4.18***
Indonesia					
GFCF	1978-2003	-1.51	-3.95**	-1.09	-3.17
TFP	1978-2003	-1.69	-4.31**	-1.69	-4.30**
GDP	1967-2003	-1.21	-3.65**	-1.21	-3.67**
BANK	1980-2003	-1.03	-4.90***	-0.99	-4.92***
STOCK	1978-2003	-1.41	-3.38**	-1.40	-3.36**
INSUR	1988-2004	-0.75	-3.88**	-0.83	-3.90**
FDI	1967-2003	-1.22	-6.50***	-1.05	-7.25***
Pakistan					
GFCF	1965-2004	-1.76	-4.11**	-2.02	-3.68**
TFP	1965-2004	-2.27	-6.72***	-1.97	-6.67***
GDP	1965-2004	-1.79	-5.93***	-1.99	-6.01***
BANK	1965-2004	-2.87	-4.40***	-2.32	-4.55***
STOCK	1981-2004	-0.73	-4.72***	-0.73	-4.72***
FDI	1976-2003	-1.49	-4.89***	-2.96*	-4.67***

Appendix 1 - Unit Root Tests of Finance and Growth Variables (Continued)

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
Sri Lanka					
GFCF	1965-2003	-2.02	-5.45***	-1.95	-5.50***
TFP	1965-2003	-2.69	-7.04***	-2.43	-7.44***
GDP	1965-2003	-2.56	-6.82***	-2.29	-7.40***
BANK	1965-2003	-2.49	-5.89***	-2.60	-5.89***
STOCK	1985-2003	-1.37	-3.69**	-1.30	-3.67**
FDI	1977-2003	-1.26	-6.54***	-1.26	-5.03***
Brazil					
GFCF	1965-2004	-3.55**	-7.22***	-3.01	-8.38***
TFP	1965-2004	-0.99	-5.87***	-1.03	-5.95***
GDP	1965-2004	-1.39	-4.98***	-1.42	-4.92***
BANK	1965-2004	-2.14	-6.44***	-2.12	-10.73***
STOCK	1981-2004	-1.29	-5.02***	-1.58	-6.62***
FDI	1975-2004	-1.11	-5.45***	-1.05	-5.47***
China					
GFCF	1977-2003	-0.32	-3.37**	-0.13	-2.64**
TFP	1977-2003	-2.76	-3.84**	-2.05	-3.37*
GDP	1977-2003	-1.29	-3.92***	-0.36	-3.02**
BANK	1977-2003	-1.92	-4.49***	-2.12	-4.49***
FDI	1982-2003	-1.34	-3.54**	-2.02	-2.08*
Malaysia					
GFCF	1970-2004	-2.13	-4.04**	-1.78	-3.98**
TFP	1970-2004	-3.24*	-6.73***	-3.28*	-9.34***
GDP	1970-2004	-2.61	-4.63***	-2.39	-4.64***
BANK	1970-2004	-2.16	-3.97**	-1.31	-3.69**
STOCK	1979-2004	-2.30	-5.22***	-2.30	-5.33***
INSUR	1978-2003	-0.16	-2.99*	-0.30	-2.62
FDI	1974-2003	-1.60	-2.82*	-2.14	-6.94***

Appendix 1 - Unit Root Tests of Finance and Growth Variables (Continued)

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
Philippines					
GFCF	1965-2004	-2.56	-4.35***	-1.89	-4.23***
TFP	1965-2004	-2.35	-3.81**	-1.77	-3.80**
GDP	1965-2004	-2.64	-3.83**	-1.82	-3.34*
BANK	1965-2004	-2.65	-3.34*	-1.83	-3.34*
STOCK	1970-2004	-0.02	-6.96***	0.11	-6.93***
FDI	1977-2004	-2.23	-6.56***	-2.14	-7.63***
Thailand					
GFCF	1965-2004	-1.33	-3.46**	-1.55	-3.27**
TFP	1965-2004	-0.75	-5.16***	-0.72	-5.18***
GDP	1965-2004	-0.70	-3.70***	-1.00	-3.70***
BANK	1965-2004	-1.44	-3.01**	-1.56	-2.96**
STOCK	1975-2004	-1.37	-4.32***	-1.37	-4.31***
FDI	1975-2004	-1.58	-5.67***	-1.58	-5.67***
Turkey					
GFCF	1987-2004	-1.93	-4.37***	-1.94	-4.37***
TFP	1987-2004	-0.51	-5.51***	-0.20	-5.64***
GDP	1987-2004	-0.78	-5.39***	-0.51	-5.50***
BANK	1987-2004	-1.58	-1.93	-1.12	-1.99
STOCK	1987-2004	-2.85*	-5.76***	-2.86*	-5.76***
FDI	1987-2004	-1.26	-5.07***	-3.63**	-10.71***
Hong Kong					
GFCF	1980-2004	-1.11	-3.30**	-1.06	-3.30**
TFP	1980-2004	-1.74	-4.61***	-1.62	-4.67***
GDP	1980-2004	-1.36	-4.43**	-1.27	-4.39**
BANK	1980-2004	-1.21	-2.25	-0.27	-2.25
STOCK	1976-2004	-2.52	-5.12***	-2.37	-7.57***

Appendix 1 - Unit Root Tests of Finance and Growth Variables (Continued)

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
Singapore					
GFCF	1965-2004	-2.98	-3.60**	-1.34	-3.63**
TFP	1965-2004	-2.13	-5.23***	-2.09	-5.13***
GDP	1965-2004	-1.59	-4.38***	-1.61	-4.28***
BANK	1965-2004	-1.08	-4.19**	-0.13	-4.13**
STOCK	1980-2004	-1.64	-7.17***	-1.64	-7.60***
INSUR	1968-2004	-2.03	-4.19**	-1.60	-3.18***
FDI	1972-2003	-1.75	-6.40***	-1.78	-8.76***
South Korea					
GFCF	1965-2004	-1.89	-4.94***	-2.76	-9.86***
TFP	1965-2004	-2.26	-6.51***	-2.33	-6.99***
GDP	1965-2004	-1.37	-5.84***	-1.43	-5.87***
BANK	1965-2004	-3.35*	-3.56**	-3.90**	-3.60**
STOCK	1971-2004	-2.18	-4.68***	-2.30	-4.62***
INSUR	1983-2004	-0.94	-2.88	-0.96	-2.88
FDI	1976-2004	-0.69	-4.40***	-0.72	-5.95***
Taiwan					
GFCF	1965-2004	-1.93	-4.61***	-1.83	-4.58***
TFP	1965-2004	-2.13	-4.78***	-2.89*	-4.77***
GDP	1965-2004	-2.86*	-4.36***	-3.31**	-4.37***
BANK	1965-2004	-3.31**	-3.69***	-3.09**	-3.31**
STOCK	1965-2004	-0.34	-6.26***	-0.22	-6.88***
INSUR	1971-2004	-2.37	-3.99***	-2.20	-3.96***
FDI	1965-2004	-1.33	-7.08***	-1.31	-7.06***

Appendix 1 - Unit Root Tests of Finance and Growth Variables (Continued)

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
Australia					
GFCF	1965-2004	-3.03	-5.60***	-2.00	-6.26***
TFP	1965-2004	-2.45	-5.10***	-2.44	-6.14***
GDP	1965-2004	-1.98	-4.56***	-2.21	-4.96***
BANK	1965-2004	-1.65	-3.79**	-1.18	-3.69**
STOCK	1981-2004	-1.62	-7.05***	-0.77	-7.05***
FDI	1965-2004	-1.01	-11.62***	-1.77	-19.22***
Italy					
GFCF	1965-2003	-4.32**	-4.84***	-5.23***	-5.60***
TFP	1965-2003	-0.06	-4.57***	-4.30***	-10.24***
GDP	1965-2003	-2.11	-6.56***	-4.80***	-6.94***
BANK	1965-2003	-2.49	-3.19**	-0.47	-3.49*
STOCK	1974-2003	-0.97	-3.92	-0.96	-3.77***
FDI	1970-2003	-2.04	-6.97***	-1.74	-14.29***
Japan					
GFCF	1965-2004	-3.02	-3.61**	-2.62	-3.69**
TFP	1965-2004	-3.58**	-4.88***	-3.05*	-4.88***
GDP	1965-2004	-2.57	-3.75**	-2.91	-3.75**
BANK	1965-2004	-0.31	-2.74	-0.94	-1.50
STOCK	1965-2004	-1.24	-6.28***	-1.23	-6.46***
INSUR	1981-2004	-1.91	-2.08	-0.41	-2.23
FDI	1977-2003	-2.80*	-8.59***	-2.69*	-8.59***
UK					
GFCF	1965-2003	-0.58	-0.56	-0.58	-0.74
TFP	1965-2003	-2.78	-5.25***	-2.04	-5.06***
GDP	1965-2003	-3.65**	-5.25***	-2.55	-4.25***
BANK	1965-2003	-0.44	-4.48***	-1.00	-4.48***
STOCK	1972-2003	-0.60	-6.47***	-0.51	-6.90***
FDI	1970-2003	-2.09	-7.03***	-2.01	-7.07***

Appendix 1 - Unit Root Tests of Finance and Growth Variables (Continued)

Economy	Period	ADF test statistics		PP test statistics	
		Level	1 st Difference	Level	1 st Difference
USA					
GFCF	1965-2004	-3.97	-5.31***	-0.21	-4.92***
TFP	1965-2004	-0.55	-6.04***	-0.82	-13.31***
GDP	1965-2004	-0.58	-5.38***	-0.99	-10.72***
BANK	1965-2004	-2.37	-3.65***	-2.57	-3.52**
STOCK	1981-2004	-0.77	-5.06***	-0.77	-5.06***
FDI	1970-2004	-1.57	-4.76***	-1.60	-4.68***

Appendix 2 - Cointegration Tests between BANK and Growth Variables

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Bangladesh	GFCF and BANK	4	26.98***	6.26**	20.72***	6.26**
	TFP and BANK	1	16.98**	3.84	14.26**	3.84
	GDP and BANK	3	19.68**	3.46	16.22**	3.46
India	GFCF and BANK	1	18.02**	1.02	16.99**	1.02
	TFP and BANK	5	26.23**	3.30	22.94**	3.30
	GDP and BANK	5	23.63**	2.78	20.85**	2.78
Indonesia	GFCF and BANK	4	31.97**	0.56	31.42**	0.56
	TFP and BANK	4	20.79***	4.37**	16.43**	4.37**
	GDP and BANK	4	19.50**	5.01**	14.49**	5.01**
Pakistan	GFCF and BANK	8	31.96***	5.60**	26.37***	5.60**
	TFP and BANK	9	33.55***	2.50	31.05***	2.50
	GDP and BANK	5	19.80**	0.63	19.17***	0.63
Sri Lanka	GFCF and BANK	9	24.02***	3.90**	20.12***	3.90**
	TFP and BANK	3	22.41***	1.55	20.86***	1.55
	GDP and BANK	3	23.64***	1.59	22.04***	1.59
Brazil	GFCF and BANK	7	19.74**	3.65	16.09**	3.65
	TFP and BANK	5	29.12***	8.57***	20.56***	8.57***
	GDP and BANK	5	32.30***	8.49***	23.81***	8.49***
China	GFCF and BANK	6	57.41***	9.59***	47.83***	9.59***
	TFP and BANK	5	21.20***	6.71***	14.49**	6.71***
	GDP and BANK	6	38.15***	3.98***	34.16***	3.98***
Malaysia	GFCF and BANK	7	15.65**	0.82	14.83**	0.82
	TFP and BANK	7	28.94***	3.66	25.28***	3.66
	GDP and BANK	8	19.61**	0.99	18.61***	0.99

Appendix 2 - Cointegration Tests between BANK and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Philippines	GFCF and BANK	10	43.55***	2.64	40.91***	2.64
	TFP and BANK	9	41.33***	6.74***	34.59***	6.74***
	GDP and BANK	11	54.29***	2.95	51.34***	2.95
Thailand	GFCF and BANK	1	16.77**	1.81	14.96**	1.81
	TFP and BANK	6	18.28**	2.50	15.78**	2.50
	GDP and BANK	6	21.28*	5.30**	15.98**	5.30**
Turkey	GFCF and BANK	3	18.96**	1.57	17.40**	1.57
	TFP and BANK	4	23.20***	0.96	22.23***	0.96
	GDP and BANK	4	24.24***	0.03	24.20***	0.03
Hong Kong	GFCF and BANK	1	26.49***	9.68***	16.81**	9.68***
	TFP and BANK	4	17.80**	1.27	16.53**	1.27
	GDP and BANK	5	21.26***	4.08**	17.18**	4.08**
Singapore	GFCF and BANK	6	23.35***	3.78	19.57***	3.78
	TFP and BANK	2	18.13**	1.69	16.44**	1.69
	GDP and BANK	8	27.43***	7.20***	20.23***	7.20***
South Korea	GFCF and BANK	10	34.50***	2.97	31.53***	2.97
	TFP and BANK	2	16.36**	1.31	15.04**	1.31
	GDP and BANK	1	26.85***	3.51	23.35***	3.51
Taiwan	GFCF and BANK	5	24.69***	5.40**	19.30***	5.40**
	TFP and BANK	8	23.35***	2.24	21.12***	2.24
	GDP and BANK	6	29.79***	4.58**	25.20***	4.58**
Australia	GFCF and BANK	10	26.02***	5.76**	20.25***	5.76**
	TFP and BANK	10	21.07***	0.95	20.12***	0.95
	GDP and BANK	10	21.68***	0.39	21.29***	0.39

Appendix 2 - Cointegration Tests between BANK and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Italy	GFCF and BANK	11	50.11***	0.03	50.08***	0.03
	TFP and BANK	1	23.56***	7.59***	15.97**	7.59***
	GDP and BANK	10	48.71***	3.59	45.12***	3.59
Japan	GFCF and BANK	2	17.94**	3.25	14.69**	3.25
	TFP and BANK	2	16.97**	1.16	15.80**	1.16
	GDP and BANK	2	16.42**	1.26	15.17**	1.26
UK	GFCF and BANK	6	26.02***	0.47	25.55***	0.47
	TFP and BANK	8	31.68***	2.19	29.48***	2.19
	GDP and BANK	9	23.32***	1.45	21.87***	1.45
USA	GFCF and BANK	5	16.53**	2.09	14.45**	2.09
	TFP and BANK	9	29.98***	0.69	29.29***	0.69
	GDP and BANK	9	31.28***	1.93	29.36***	1.93

Appendix 3 - Cointegration Tests between STOCK and Growth Variables

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Bangladesh	GFCF and STOCK	2	18.28**	0.42	17.86**	0.42
	TFP and STOCK	5	23.00***	3.03	19.97***	3.03
	GDP and STOCK	2	17.59**	3.01	14.58**	3.01
India	GFCF and STOCK	5	17.29**	0.47	16.82**	0.47
	TFP and STOCK	3	19.80**	1.93	17.88**	1.93
	GDP and STOCK	3	19.67**	1.69	17.98**	1.69
Indonesia	GFCF and STOCK	6	38.81***	10.92***	27.88***	10.92***
	TFP and STOCK	3	15.77**	0.48	15.29**	0.48
	GDP and STOCK	5	18.84**	2.28	16.56**	2.28
Pakistan	GFCF and STOCK	5	19.10**	2.51	16.59**	2.51
	TFP and STOCK	2	19.93**	4.33**	15.60**	4.33**
	GDP and STOCK	3	31.78***	12.32***	19.46**	12.32***
Sri Lanka	GFCF and STOCK	4	62.51***	1.11	61.39***	1.11
	TFP and STOCK	1	16.69**	0.07	16.61**	0.07
	GDP and STOCK	4	12.88	0.01	12.88	0.01
Brazil	GFCF and STOCK	1	22.24***	5.52**	16.71**	5.52**
	TFP and STOCK	5	20.83***	1.77	19.06***	1.77
	GDP and STOCK	5	20.77***	3.19	17.58**	3.19
Malaysia	GFCF and STOCK	6	17.94**	2.29	15.64**	2.29
	TFP and STOCK	6	44.69***	7.79***	36.89***	7.79***
	GDP and STOCK	6	36.89***	4.15**	32.75***	4.15**
Philippines	GFCF and STOCK	6	17.44**	0.45	16.99**	0.45
	TFP and STOCK	6	17.44**	0.02	17.42**	0.02
	GDP and STOCK	7	20.09***	0.96	19.14***	0.96

Appendix 3 - Cointegration Tests between STOCK and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Thailand	GFCF and STOCK	4	17.23**	0.13	17.10**	0.13
	TFP and STOCK	5	18.75**	0.40	18.35**	0.40
	GDP and STOCK	4	18.08**	2.17	15.91**	2.17
Turkey	GFCF and STOCK	4	15.58**	1.60	13.99	1.60
	TFP and STOCK	4	49.76***	0.97	48.79***	0.97
	GDP and STOCK	1	17.79**	2.61	15.18**	2.61
Hong Kong	GFCF and STOCK	7	18.84**	0.15	18.69***	0.15
	TFP and STOCK	5	24.95***	4.55**	20.41***	4.55**
	GDP and STOCK	5	27.91***	6.07**	21.84***	6.07**
Singapore	GFCF and STOCK	5	16.04**	1.12	14.92**	1.12
	TFP and STOCK	6	46.47***	6.98***	34.47***	6.98***
	GDP and STOCK	6	44.09***	7.12***	36.96***	7.12***
South Korea	GFCF and STOCK	2	18.19**	2.35	15.84**	2.35
	TFP and STOCK	7	27.61***	0.26	27.35***	0.26
	GDP and STOCK	6	19.25**	1.43	17.82**	1.43
Taiwan	GFCF and STOCK	1	22.17***	2.02	20.15***	2.02
	TFP and STOCK	1	21.58***	5.19**	16.39**	5.19**
	GDP and STOCK	11	32.65***	0.18	32.47***	0.18
Australia	GFCF and STOCK	4	19.64**	2.55	17.09**	2.55
	TFP and STOCK	4	29.58***	0.59	28.99***	0.59
	GDP and STOCK	4	20.78***	0.21	20.57***	0.21

Appendix 3 - Cointegration Tests between STOCK and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Italy	GFCF and STOCK	4	26.90***	2.81	24.10***	2.81
	TFP and STOCK	1	27.09***	6.19**	20.89***	6.19**
	GDP and STOCK	1	26.05***	4.88**	21.18***	4.88**
Japan	GFCF and STOCK	1	24.02***	5.47**	18.56***	5.47**
	TFP and STOCK	1	17.36**	3.04	14.32**	3.04
	GDP and STOCK	8	23.41***	3.46	19.95***	3.46
UK	GFCF and STOCK	2	19.94**	0.31	19.63***	0.31
	TFP and STOCK	2	17.90**	0.27	17.63**	0.27
	GDP and STOCK	2	21.70***	2.91	18.79***	2.91
USA	GFCF and STOCK	5	21.16***	0.21	20.95***	0.21
	TFP and STOCK	2	16.87**	0.42	16.45**	0.42
	GDP and STOCK	4	18.66**	0.19	18.46**	0.19

Appendix 4 - Cointegration Tests between INSUR and Growth Variables

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Indonesia	GFCF and INSUR	1	15.63**	0.55	15.90**	0.55
	TFP and INSUR	2	21.03***	1.63	19.40***	1.63
	GDP and INSUR	2	19.70**	1.24	18.46**	1.24
Malaysia	GFCF and INSUR	1	18.27**	0.08	18.19**	0.08
	TFP and INSUR	1	19.01**	0.00	19.01***	0.00
	GDP and INSUR	4	16.85**	0.18	16.67**	0.18
Singapore	GFCF and INSUR	10	61.27***	0.07	61.20***	0.07
	TFP and INSUR	6	17.19**	0.006	17.18**	0.006
	GDP and INSUR	6	21.39***	0.054	21.34***	0.054
South Korea	GFCF and INSUR	3	35.09***	4.65**	30.44***	4.65**
	TFP and INSUR	2	17.98**	2.37	15.61**	2.37
	GDP and INSUR	2	20.75***	5.75**	15.00**	5.75**
Taiwan	GFCF and INSUR	5	22.23***	7.11**	15.13**	7.11**
	TFP and INSUR	2	16.58**	2.23	14.34**	2.23
	GDP and INSUR	3	18.29**	1.96	16.34**	1.96
Japan	GFCF and INSUR	4	29.02***	2.82	26.20***	2.82
	TFP and INSUR	4	35.58***	3.57	32.01***	3.57
	GDP and INSUR	4	32.16***	1.59	30.57***	1.59

Appendix 5 - Cointegration Tests between FDI and Growth Variables

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Bangladesh	GFCF and FDI	3	28.96***	2.22	26.74***	2.22
	TFP and FDI	3	32.83***	1.84	30.99***	1.84
	GDP and FDI	3	27.22***	1.45	25.78***	1.45
Indonesia	GFCF and FDI	5	21.87***	3.14	18.72***	3.14
	TFP and FDI	5	42.42***	3.29	39.13***	3.29
	GDP and FDI	7	19.32**	3.91**	15.41**	3.91**
Pakistan	GFCF and FDI	1	22.05***	2.66	19.39***	2.66
	TFP and FDI	7	33.60***	1.90	31.70***	1.90
	GDP and FDI	7	49.99***	3.01	46.99***	3.01
Sri Lanka	GFCF and FDI	1	28.71***	2.86	25.86***	2.86
	TFP and FDI	1	30.53***	0.00	30.53***	0.00
	GDP and FDI	1	31.59***	0.22	31.36***	0.22
Brazil	GFCF and FDI	2	22.74***	0.73	22.02***	0.73
	TFP and FDI	8	77.95***	3.75	74.20***	3.75
	GDP and FDI	7	17.84**	1.41	16.43**	1.41
China	GFCF and FDI	4	22.75***	5.31**	17.45**	5.31**
	TFP and FDI	3	24.25***	0.04	24.21***	0.04
	GDP and FDI	3	23.15***	0.57	22.58***	0.57
Malaysia	GFCF and FDI	4	19.87**	3.08	16.79**	3.08
	TFP and FDI	3	22.03***	0.00	22.02***	0.00
	GDP and FDI	3	28.18***	0.73	27.46***	0.73
Philippines	GFCF and FDI	6	40.47***	2.82	37.65***	2.82
	TFP and FDI	2	23.17***	1.72	21.45***	1.72
	GDP and FDI	2	19.72**	3.49	16.24**	3.49

Appendix 5 - Cointegration Tests between FDI and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Thailand	GFCF and FDI	5	21.54***	2.29	19.25***	2.29
	TFP and FDI	3	16.76**	2.12	14.64**	2.12
	GDP and FDI	3	19.79**	2.47	17.32**	2.47
Turkey	GFCF and FDI	2	20.50***	3.18	17.33**	3.18
	TFP and FDI	4	25.88***	0.16	25.72***	0.16
	GDP and FDI	4	42.56***	1.81	40.76***	1.81
Singapore	GFCF and FDI	2	19.58**	2.50	17.08**	2.50
	TFP and FDI	8	31.02***	10.39***	20.63***	10.39***
	GDP and FDI	1	17.82**	2.79	15.03**	2.79
South Korea	GFCF and FDI	6	22.13***	2.89	19.24***	2.89
	TFP and FDI	4	29.24***	5.75**	23.49***	5.75**
	GDP and FDI	4	28.60***	6.89***	21.71***	6.89***
Taiwan	GFCF and FDI	6	22.32***	1.88	20.44***	1.88
	TFP and FDI	6	27.52***	5.47**	22.05***	5.47**
	GDP and FDI	3	24.14***	8.94***	15.21**	8.94***
Australia	GFCF and FDI	7	19.37**	0.76	18.60***	0.76
	TFP and FDI	9	37.91***	9.89***	28.03***	9.89***
	GDP and FDI	9	28.85***	8.07***	20.78***	8.07***
Italy	GFCF and FDI	2	19.22***	0.49	18.73***	0.49
	TFP and FDI	5	38.69***	2.21	36.48***	2.21
	GDP and FDI	5	41.62***	2.32	39.30***	2.32

Appendix 5 - Cointegration Tests between FDI and Growth Variables (Continued)

Economy	Cointegrating System	Lag	Trace		Maximum eigenvalue	
			r = 0	r = 1	r = 0	r = 1
Japan	GFCF and FDI	7	36.69***	16.23***	20.46***	16.23***
	TFP and FDI	7	28.97***	13.09***	15.87**	13.09***
	GDP and FDI	7	34.21***	6.41**	27.80***	6.41**
UK	GFCF and FDI	8	27.07***	4.16**	22.91***	4.16**
	TFP and FDI	2	19.33**	2.60	16.73**	2.60
	GDP and FDI	2	15.70**	0.96	14.75**	0.96
USA	GFCF and FDI	9	36.95***	0.57	36.37***	0.57
	TFP and FDI	7	24.95***	15.50	23.86***	15.50
	GDP and FDI	7	21.16***	0.00	21.16***	0.00

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