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Derivative Markets and Economic Growth: Is there a Relationship?

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Abstract

The spread of capital markets during the half century to-date is a notable global phenomenon in economic development. Derivative markets spread globally in the last quarter century spreading form just two to some 50 in 2007. But the role of derivative markets to economic development has yet been studied. This paper reports new findings on the relationship between derivative market development and (a) economic growth and (b) spot market factors. The results provide very scant support to a positive functional contribution hypothesis by some scholars about derivative markets. However, a negative relationship between the liquidity level of derivative markets and economic growth in the cases of developed countries indicates that the risk transfer function of the derivative markets is a contribution to economic growth. We find the liquidity level of underlying spot market is a crucial factor for the success of derivative markets. This is a new finding that explains why emerging markets with illiquid spot capital markets had very limited success in sustaining the growth of derivative markets. All other economic and financial demand determinants were found to be insignificant. The study suggests that if there is sufficient liquidity in the underlying spot market, derivative trading can be sustained.

Key words: Futures markets; economic determinants; spot markets; causality; market development; liquidity

JEL Classification: E44; G15

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1. Introduction

Inspired by the increasing attention given to the advent of derivative trading exchanges globally more and more in the emerging economies since 1984, this study was conceived with two main objectives. First, it attempts to empirically test the economic contribution of derivative markets in the development process of countries, both developed and emerging. While the relationship between financial intermediation and economic growth has been meticulously studied for a while both theoretically and empirically, this is the first study to analyse the relationship of derivative market development and economic growth.

Generally for a while now, a focus of work by researchers and policy makers is about identifying the determinants of economic growth and then testing the relationship between financial development and economic growth. Schumpeter (1911), a pioneer of theory on economic development, argued that by mobilising funds, providing transaction facilities and monitoring loans, financial intermediaries play a crucial role in technological advancement and economic growth. Following him, a vast and expanding array of endogenous growth literature (Bencivenga *et al.*, 1991; Boyd *et al.*, 1986; Greenwood *et al.*, 1990; R.G *et al.*, 1993a; Romer, 1986) reiterated the importance of the financial sector for economic development. Numerous empirical studies were conducted to test the correlation, strength and even the channel of relationship between financial development and economic growth (De Gregorio *et al.*, 1995; Goldsmith, 1969; Greenwood *et al.*, 1990; Levine *et al.*, 1993; Mckinnon, 1973). However, most of the earlier studies focused on the contribution of financial intermediation or financial institutions especially banks. Attention to spot stock markets (Zervos *et al.*, 1998) started only recently on the economic development process. The economic functions of the derivative markets have never been accounted for in previous studies, which is the topic of this paper with a modest aim to contribute tot his literature.

According to Cappon (1998), successful economies should evolve towards direct capital market model where savings are intermediated through financial market securities and risk is thus effectively managed in derivative market. A secure liquid capital market and

a strong base of institutional investors are key ingredients for economic development. Markets are deemed to be incomplete if they are operating only on spot basis or without the futures price discovery element of the derivative markets.

Some researchers even argued that derivatives should be included in the definition of broad money to make the monetary policies of the central banks more effective (Savona *et al.*, 1998). Derivative markets are integral part of developed financial markets in some 40 economies whereas most emerging markets – there are about 60 of them – have started to develop derivative markets for hedging purposes. The price discovery and risk allocation functions of derivative hedge instruments in emerging markets could help reduce price distortions by lowering transactions and agency costs and information asymmetry in the spot capital markets, resulting in efficient allocation of resources and economic growth (Merton, 1995). The bourgeoning growth in the OTC and exchange traded derivative during the recent fifteen years is a testimony to this belief in the globalisation process being witnessed since the 1990s in completing the price discovery process to futures prices. A key element of developed financial markets is that they all are operating successful derivative exchanges while this is not the case globally in emerging markets.

Following Levine's (1997) functional approach for the analysis of economic development and the role of financial markets (so far the spot markets), we develop a testable model to study the impact of these economic functions of the derivative markets from three possible direction. First, a direct liquidity impact relationship between derivative market development and economic growth is tested for 11 markets, 5 developed and 7 emerging ones, with time series data covering 17 years (1990-2006). Second, the study aims to check the impact of derivative market activities on the fixed physical capital formation in a country in which a direct channel through which financial system can have an influence on economic development process. Lastly, the effect of derivative market on economic growth is investigated with an indirect approach of evaluating its impacts on the liquidity and efficiency of underlying cash market. Price discovery function of the derivative market implies that prices in the future and spot market factors are systematically related, as indeed the theories would have us believe. Derivative market provides information to

the investors regarding future direction of the spot market enabling investors to manage their spot market exposure more effectively: there is evidence of the prices in derivative markets Granger-causing price changes in spot markets. Derivative markets also incorporate new information more quickly than the underlying cash market because of lower cost of transactions and leveraged trading attributes (So *et al.*, 2004). Therefore, by augmenting the liquidity and efficiency of cash market, derivative market development results in productive investments and economic growth.

This study also examines economic and financial parameters which would be critical for the successful operations of the derivative exchanges in emerging markets. The study proposes that there are certain critical economic and capital market variables that are correlated with the success of derivative exchanges and that minimum levels of these variables determine the readiness of the market for the debut of derivative exchanges. Preferably, direct indicators of derivative market's economic functions of transaction efficiency, risk transfer facility and efficient allocation of resources should have been utilised to gauge the economic contribution of derivative markets. A broad set of 3 economic and 4 financial development indicators are included as demand determinants of derivative market development. Financial deepening ratio, total bank credit to GDP, total bank credit to private sector and spot market liquidity are utilised as financial system indicators creating a demand for derivative market.

This study also goes one step forward and utilizes Granger's (1969) causality to ascertain whether derivative markets follow a Demand following or Supply leading patterns of development (Patrick, 1966) by analyzing the direction of causation of these demand factors with derivative markets. Demand following pattern implies that the real economic sector is the source of demand for financial products. As the real sector develops, it breeds the demand for financial products which is followed by a supply of these products by financial institutions. This demand following pattern of development suggests the right time for the introduction of derivative exchanges or the readiness of the emerging markets is determined by these economic and spot capital markets factors. On the contrary, a Supply Leading pattern of development advocates that the financial system development precedes the demand for its services. By assisting in mobilising savings and

channelling scarce capital resources according to the relative returns of investments, financial sector induces economic growth in a country: this is largely the driver for the globalisation of derivative markets. This pattern is also analogous to the innovative financing concept of Schumpeter (1911), which is pushed vigorously by international institutions (IMF, World Bank) to fast-track the development of spot bond and spot share markets along with strengthening financial institutions in underdeveloped countries euphemistically named as financial system structural adjustments programs.

The rest of this paper is organized in four main sections. Section 2 presents a critical analysis of the literature on financial development and economic growth while section 3 details the methodology and data sources of the study. Section 4 contains a discussion of the results with policy implication sketched in the final section that concludes this paper.

2. Financial Development and Economic Growth: A Critical Review of Literature

2.1 Theories of Financial Development and Economic Growth

Generally, the idea of a possible testable relationship between economic activities and financial structure is not new as it goes back to Schumpeter's theory of innovative financing (1911). However, there is still no consensus among economists and researchers whether economic growth is driven by the financial development or financial system induces economic development of a country. As categorized by King and Levine (1993a), there are two points of view about the linkage between financial system development and economic growth, a traditional and a new view. The traditional view considers financial markets as 'handmaiden of industry' with a small impact on the development process while the more recent newer view considers financial markets as catalyst of economic development, a view pushed by IMF and World Bank. Perhaps, this latter view is justified when one considers the role of capital in a modern economy. Capital is made available by investors participating in financial markets, both formal and informal (bank-like institutions).

The traditional view, based on the theoretical and empirical work of Solow (1956), is that financial markets and financial intermediaries only passively pool the savings of the households, and play no role in the process of physical capital accumulation, which is considered to be the endogenous determinant of economic growth in any country. He substantiated his growth model with an empirical study (1957) using time series data of US aggregate output levels for the period of 1909-49. He analyzed the changes in output per unit of labour (y/ℓ), capital per unit of labour (k/ℓ) and total capital (k) within a production function:

$$y = f(k, \ell) \qquad (1)$$

$$r = (k/\ell) = s\, f(r, 1) - nr \qquad (2)$$

where (n) is the population growth rate and (s) is the marginal propensity to save. He argued that, because of high diminishing returns of capital, the (r) marginal productivity of capital converges to zero as the capital (k) increases. He concluded that, because of high diminishing returns, capital formation has no effect on the aggregate output level and that the technological change was net of capital formation as old technologies were replaced with new plant and machinery.

Thus, a traditional view is held that financial markets and financial intermediation should have negligible effects on economic growth, i.e., the level of economic development, which actually determines the demand for financial services. Financial development is the after effect of economic development. Therefore any observed correlation of output and capital has been assumed to be a casual relationship from development to finance, not the other way round. This view prevailed for long thus stifled researchers from understanding the fast globalisation of market development ahead of economic growth in the second half of the last Century.

However, the new development economists (Boyd *et al.*, 1986; Greenwood *et al.*, 1990; Romer, 1986) questioned the basic assumption of the traditional model of growth. Romer presented a new model of long-run growth in contrast to earlier models based on the diminishing returns to capital in the production process. The proposed model suggested that with increasing returns to scale, the output per capita can increase without any bound, with an increasing rate, over time, as has been amply demonstrated by the rise of

new-growth economies on the back of capital injections from within and outside a country. The rate of investment and the rate of return on capital may increase with increases in total capital stocks as we depart from the assumption of diminishing return. In terms of production function, as described by King and Levine (1993), $Y = AK^{\alpha}$, Romer's model would have a coefficient (α) higher than 0.5 showing an increasing marginal productivity of capital in production process.

Similarly, Boyd and Prescott (1986) model rests on the role of intermediaries in the allocation of resources in a country. They argued that financial intermediaries invest only in high return projects or invest their money in risk-free investments otherwise. Therefore, the existence of intermediaries results in better screening of projects, the delegated monitoring of banks *a la* (Diamond, 1984), and ensures efficient allocation of resources in a country. Likewise, Bencivenga and Smith's (1991) model was focused on the role of banks (not exchanges) in the development process. His model shows that, with introduction of banks in the endogenous growth model, composition of savings changes and shifts towards capital accumulation. Thus, countries, with competitive financial institutions and efficient capital markets, channelling savings toward productive investments, will grow faster than countries without such institutions. Herein lies the rationale behind the contemporary push by national central banks and international institutions to fast-track the development of bond and share markets and strengthen the financial institutions of emerging countries.

Greenwood and Jovanovic (1990) concentrated on the information producing aspects of financial intermediaries. They argued that information is valuable for investors to learn the aggregate technology and boost the production level. Financial intermediaries collect and analyse information which allows investors to invest in most profitable avenues. Hence, financial intermediaries play a key role in economic development process. Here again, these produce a direct set of information to investors.

Patrick (1966) explained two possible views about casual relationship between real and financial sector, and asserted that the direction of the relationship changes over the course of development. Accordingly, under Demand-Following Phenomenon, economic growth

induces demand for financial services, which brings about a supply response in the growth of financial system. The more rapid the real sector growth rate, the higher will be the demand for external funds and therefore more will be the demand for financial intermediation and growth of markets to mobilise savings and transfer funds from low return investments to high rate industries. Thus as a consequence of economic growth, the financial system develops, expands and becomes more efficient. Financial sector is passive in the growth process as per the Demand-Following pattern of financial development.

On the other hand, the second pattern, under Supply-Leading Phenomenon, the financial system development precedes the demand for its services. By mobilising savings and channelling scarce capital resources according to the relative returns of investments, financial sector induces economic growth in an otherwise less developed country. Supply-Leading is an active approach to promote economic growth. With creation and development of financial institutions and markets (supply of finance), the resources will be transferred from low growth traditional units to relatively high growth modern sectors of the economy.

In short, there has been an extensive theoretical underpinning regarding financial development and economic growth but without a consensus on causal relationship between these two phenomena.

2.2 Empirical Studies of Financial development and Economic growth

The empirical studies regarding the relationship between financial development and economic growth also remained controversial on the measurement issues of economic and financial development as well as their interpretations. Particularly, the proxies used for the level of financial development rendered more interpretation problems, as financial development is a qualitative issue in its nature and thus it can differ from country to country depending on the specific legal set up and overall economic structure of different countries.

The first cross-country empirical study of Goldsmith (1969), included 36 countries and covered a period over 1860-1963. It showed a strong positive correlation between economic growth and financial sector development. Nevertheless, Goldsmith did not claim that his analysis established any casual relationship between economic growth and financial system development. Similarly, Maddison's survey (1987), which included 6 advanced economies, could not provide conclusive explanation about growth nor economic downturn of these countries. The survey utilised a number of explanatory variables for financial development but the degree of explanation varied across countries and within each county between different time periods.

On the other hand, Jung's study (1986) investigated not only casual relationship but also examined the temporal behavior of financial development and economic growth. The study tested Patrick's Demand-Following and Supply-Leading approaches, using at least 15 annual observations from 56 countries (including 19 developed economies) with Granger's test of causality. It employed currency to narrow money (M1) ratio and broad money (M2) to GDP ratio, financial deepening, as proxies for financial development. The results of the study are consistent with Patrick's hypothesis that the direction of casual relationship between financial development and economic growth changes over the course of development. For developing countries, the relationship run from financial to economic development while it showed a reverse pattern in the cases of developed countries.

Working on the same issue, King and Levine's (1993) study, using various measures of financial development with data from 80 countries over a period from 1960 to 1989, found that higher levels of financial development are associated significantly and robustly with (a) economic development, (b) physical capital accumulations and (c) economic efficiency improvements. Their working model was based on Schumpeter's hypothesis (1911) that financial intermediaries, as part of financial market mechanism, facilitate the development process by funding productivity-enhancing investment of creditworthy entrepreneurs. That model implies that countries with better functioning financial system will be growing at higher rate than countries with poor financial system.

This is a rejection of the earlier traditional view, and places financial development as a causal factor, at least partly, for economic development to take place.

Unlike prior studies, King and Levine also examined the sources of development and the channel through which financial system is linked with economic development. They used four indicators namely, total liquid liabilities to GDP ratio, Deposit Taking Institution credits, credit to non-financial private institutions to total credit ratio and credit to non-financial private institution to GDP ratio to measure the development level of financial system: note this study is about intermediation not financial markets. The study used different control variables to exclude other specific policy and extreme value effects of different countries. The study also attempted to test the relationship of future economic development with financial system and found that predetermined component of financial development is a good predictor of long term growth over the next 10 and 30 years from the time of study.

Gregorio and Guidotti (1995) argued that only the ratio of bank credit to private sector to GDP, utilised in their study, is a better proxy as it measures more accurately the contribution of financial sector to economic growth.. The results showed a high correlation between financial development and economic growth for middle and low-income countries. They explained that, in high-income countries, financial development occurs outside the banking sector while the proxy used in the study, mainly measured the bank credit therefore the relationship is observed to be weak. The study also suggests that the effect of financial intermediation on economic development is mainly due to higher efficiency of investment rather than volume which is consistent with the project screening hypothesis (Boyd *et al.*, 1986). However, for Latin American countries, the study found significant negative relationship between financial development and economic growth contrary to the earlier findings. They argued that uncontrolled liberalisation of financial sector in these countries resulted in efficiency loss in investment. Consequently, a negative relationship is observed between financial development and economic growth in these countries.

Unlike most of the earlier studies, Cheo and Moosa (1999) examined the relationship of overall financial development with economic growth. Their study included both financial intermediaries *and* spot capital markets and analysed their effects on the portfolio behaviour of households and business sector in South Korea. They argued that as household sector is the main supplier of surplus funds to finance the deficit business sector, the financial assets (Currency, deposits, bonds and stock) of household sector to GDP ratio and financial liabilities (bank loans, bonds and stock) of business sector to GDP ratio are two suitable proxies of financial development. The results show a strong relationship of financial development leading to economic growth with financial intermediaries having a stronger impact in development process than capital markets. The relative importance of financial intermediation is consistent with the hypothesis that emerging markets, like South Korea, with immature entrepreneurs, financial intermediaries play a crucial role in the management of information for the allocation of capital resources in the economy.

Recently, Loaza and Ranciere (2002) attempted to reconcile the differences of the two point of views about the effects of financial deepening on economic activities. According to growth literature (Bencivenga *et al.*, 1991; Greenwood *et al.*, 1990) financial deepening as a measure of financial development results in efficient allocation of resources leading to economic growth. On the contrary, crisis literature considers premature financial liberalisation and over-lending as major reasons that predicates economic crisis (Fisher, 1933).

Finally, Liu and Calderon (2002) study also backed up the fact that longer the sampling interval the larger the impact of financial development on economic growth. The study employed a new statistical technique, Geweke decomposition test, on a pooled data of 109 developing and developed countries with 34 years of data to examine the direction of the relationship between financial development and economic growth.

To summarise, most of the studies revolve around the issue of the causal relationship between financial development and economic growth validating their results based on proxies, type of data and econometric methodology utilised in the studies. However, there

is still no consensus regarding the nature, channel and direction of the relationship between the financial development and economic growth in these studies. The studies utilising cross-sectional data assumed a uni-directional relationship from financial development to economic growth. On the contrary, studies using time series data attempted to verify both sides of relationship with causal relationship models. However, the subjective nature of financial development in general and heterogeneity of financial and economic systems in particular are the reasons for the discrepancies in the results of these studies.

2.3 Development of Derivative Markets and Economic Growth

The bulk of the literature about derivative markets is mainly focused on the pricing issues of derivative products (Bick, 1982; Black *et al.*, 1973), the information content of derivatives products (Chiras *et al.*, 1978), the risk management functions of the derivatives (Hunter *et al.*, 2002) and the regulations of derivative markets (Lazzarini *et al.*, 2001). However, economic functions of derivative markets theories have remained very much sparse and no empirical study has so far been conducted to establish a direct relationship between development of derivative markets and economic growth. Although there are studies of liquidity and efficiency relationship between derivative and spot markets, the market structure and development issues received little attention.

Merton (1992) in his study narrated the economic functions of derivative markets. He argued that the recent phenomenal growth in derivative markets is the driving force behind the global financial system towards the goal of greater economic efficiency and growth. Derivatives can improve efficiency by increasing the opportunities for risk sharing, lowering transaction costs and reducing the moral hazards of asymmetric information in the financial markets. However, he tried to substantiate his point with the illustration of recent financial innovative products and their effects on financial markets and overall economic growths.

The first empirical study to relate the development of derivative markets with economic and financial development was conducted by George Tsetsekos (2000). The study focused mainly on the qualitative aspects of market structure but also made an attempt to

establish certain indicators related to economic and capital market conditions for the development of derivative markets. Under economic parameters, they included changes in consumer prices (CPI), prime interest rates, government bond yields, industrial production, real GNP growth, the level of GNP, and the share of investments in GNP. The market proxies utilised were stock market turnover, the stock market capitalisation, the variance in stock market capitalisation, the total market traded value, the volatility in value traded and the number of listed companies in the stock exchange. The differences of the means of economic and capital market proxies were analysed using F statistics and p-value to determine the extent of difference between emerging and developed derivative markets conditions. The results of the study do not provide any conclusive results about the degree of market readiness for developing a derivatives exchange and authors suggested further study in this area.

All other studies in this area are country specific feasibility reports or study conducted by using different emerging markets as model. Yu-Kyung Kim (1998), director securities research Korea Stock Exchange, studied the issue of market readiness of Korean Stock Exchange to offer futures products. He included market size, price volatility, standardization requirements and the degree of market liberalization, as key parameters for introducing stock futures and options on various underlying spot securities of financial markets in South Korea. Fernandez (2003) attempted to explain the heterogeneity of derivative market development level in different countries in the context of Latin American markets with particular emphasis on Chilean derivative market. The study proposed that institutional and legal factors are the reasons of the heterogeneity among derivative markets. The results show that legal constraints on institutional investors have been a major obstacle in the development of derivative markets in Chile.

To conclude, these few studies can be categorised as feasibility studies of specific emerging markets using a comparative analysis to judge the readiness of these markets to start derivative products. No causal relationship between the derivative market development and economic growth is established in any studies. This expected causal relationship is the focus of this study.

3. Data and Test Methodology

3.1 Data

There are 58 organized derivative exchanges operating successfully both in developed and developing countries in the world.[1] The study selected 11 countries, including 5 developed and 6 emerging markets, and their derivative exchanges based on the criteria of the availability of data and geographical diversification. Markets are classified as developed or emerging markets as per the definition of S&P emerging market data base (EMDB).[2] The EMDB is basically a classification of equity markets, but we have considered derivative markets as emerging where their underlying equity markets are classified as emerging markets.

Most of the derivative exchanges in emerging markets are at their early stages of development as they started their operations in the 1990s. This attribute of short life span of some of the emerging derivative exchanges have put a limit on our data period. For markets which started their operations in late 90s, the data period is limited to inception of the market operations till year 2004. The minimum data period, in our sample countries, is 26 quarterly observations for the National Stock Exchange of India (NSX) while the data period for developed markets comprises of 68 quarterly observations starting from year 1990 till 2006.

This study included quarterly data stream for economic and capital market parameters, firstly to avoid the noise factor of time series daily or monthly data of capital markets and secondly to overcome the problem of limited data periods of some of the emerging markets in the sample. Further, an attempt is also made to mitigate this issue of limited data period by taking pooled panel data in three categories of emerging markets, developed markets and all the markets in the sample of emerging and combined data of

[1] Data Source: Futures Industry Association Magazine March, April 2004 and http://www.futuressindustry.org/fimagazi-1929.asp?a=910.

[2] The S&P Emerging Market Indices, Methodology, Definitions and Practices February 2000 Standard & Poor's ,The McGraw-Hill Companies http://www2.standardandpoors.com/servlet/Satellite?pagename=sp%2FPage%2FSiteSearchResultsPg&l=EN&r=1&b=10&search=site&vqt=emerging+markets+data+base (30-06-2005).

the study. Time invariant differential intercept dummies are used with fixed effect assumption, taking into account the individuality of each market by including in all categories of emerging, developed and combine markets panel data

Multiple sources are utilised to collect the data for this study. Most of the country specific economic and financial fundamental data are taken from International Monetary Fund's (*IMF*) online data base of International Financial Statistics (*IFS*) for all countries in the study except for Taiwan (ROC). The data for Taiwan are obtained from the financial statistics section of the Central Bank of China, Taiwan. Moreover, educational data are acquired from online data base of UNESCO[3] and World Bank Education statistics site of Edstate.[4]

3.2 Empirical Hypothesis, Variables and Test Methodologies

Research Hypothesis

The functional approach of Levine (1997) shows the links through which financial services provided by the financial markets and financial intermediaries facilitates economic growth. Derivative markets (which still have not been tested) are integral part of developed financial markets and increasingly also of emerging economies. The price discovery and risk allocation functions reduce price distortions, transactions and agency costs in the capital markets, resulting in efficient allocation of resources and economic growth (Merton, 1992; R.G *et al.*, 1993a; Zervos *et al.*, 1998).

Based on Levine's (1997) functional approach, this study hypothesizes a positive relationship between derivative market development with economic growth through increased capital formation over a period of time. In other words countries with well functioning derivative markets should have a higher growth rate than countries without one.

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3 UNESCO data base http://stats.uis.unesco.org/ReportFolders/reportfolders.aspx (12-08-2005).
4 Bank edstate http://devdata.worldbank.org/edstats/query/default.htm (12-08-2005).

Relationship Models

In order to assess the relationship of economic growth and derivative markets, we evaluate the robustness of the correlation of derivative market indicators with economic growth in following single regression equation (Kormendi *et al.*, 1985)

$$Y_i = \alpha + \beta X_i + \gamma Z_i + \acute{\varepsilon} \qquad (1)$$

where Y_i is the economic growth rate indicator, X_i are the derivative market development indicators while Z_i show the various control variables associated with economic development and $\acute{\varepsilon}$ is the error term. The real per capita income growth rate **(*GRP*),** a standard proxy, is used as an indicator of economic growth while market liquidity measure of total market value traded as a ratio of GDP ***(DM)*** is used as a proxy for derivative market development. It measures market liquidity level which is inversely related to the transactions cost, an impending factor in economic development process.

The market value traded measure is a raw measure of market liquidity and it has the price effect problem as an indicator of market efficiency (Zervos *et al.*, 1998). The value traded figure may rise with profit making expectations of the market without any substantial rise in number of contract or actual liquidity of the market. Further, the price effect problem can also undermine this indicator of market development because of speculative demands particularly in the initial years of operations in emerging markets. However, this study includes only exchange traded derivative markets which have many trading limits and control measures in place to avoid speculative trading in the markets, the price effect will not introduce bias in case of these markets.

Further as in earlier studies, there is no consensus regarding control variables in assessing the relationship of economic growth and financial development. A number of variables used in studies were found to have insignificant effects with a sensitivity analysis of cross-country regressions (Renelt *et al.*, 1992). Therefore, this study followed Levine and

King (1993a) and Skaden (2000) by taking only broad variables of total government spending as percentage of GDP **(*GEXP)***, total exports plus imports as percentage of GDP ***(OR)***, inflation rate ***(CPI)*** and log of gross enrolments of secondary schools ***(SSE)*** as control variables in the model. Levine and King (1993a) also used initial values of both economic growth and financial development indicators to avoid convergence problem i.e. countries with low initial income grow faster than countries with initial high growth rate in cross sectional regression analysis. However, as this study utilises time series data rather than cross sectional data, initial value variables are not included in the following model.

$$GRP_i = \alpha + \beta\, DM_i + \gamma_1\, GEXP_i + \gamma_2\, OR_i + \gamma_3 CPI_i + \gamma_4\, SSE_i + \acute{\varepsilon} \quad (2)$$

The model (2) captures the liquidity impact of the derivative markets with economic growth. However, as most of the emerging markets included in this study are at their infancy level, their direct relationship may not be substantial with economic activity in these countries. Further, derivative products are auxiliary instruments of their underlying spot markets. Therefore, the liquidity and efficiency impacts of derivative markets on economic growth are also routed through their underlying spot markets.

In order to capture this indirect relationship of derivative markets with economic growth, first the effects of spot market on the economic growth is analysed by taking total spot market value traded as a percentage of GDP ***(SM)*** as an indicator in the direct liquidity impact model with following equation:

$$GRP_i = \alpha + \beta\, SM_i + \gamma_1\, GEXP_i + \gamma_2\, OR_i + \gamma_3 CPI_i + \gamma_4\, SSE_i + \acute{\varepsilon} \quad (3)$$

Second, to substantiate the expected positive effects of derivative markets through their underlying spot market, the liquidity impact of derivative markets on their respective spot market are tested with following model

$$SM_i = \alpha + \beta DM_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \acute{\varepsilon} \quad (4)$$

In liquidity impact model, discussed above, it is assumed that capital formation is a channel through which derivative markets positively effect the economic growth. In order to test this growth linked with derivative markets, Gross Fixed Capital formation as percentage of GDP ***(CAP)*** is used as a proxy of capital formations in Kormendi (1985) model with same control variables with Liquidity indicators of derivative and spot markets.

$$CAP_i = \alpha + \beta\, DM_i + \gamma_1\, GEXP_i + \gamma_2\, OR_i + \gamma_3 CPI_i + \gamma_4\, SSE_i + \acute{\varepsilon} \quad (5)$$

$$CAP_i = \alpha + \beta\, SM_i + \gamma_1\, GEXP_i + \gamma_2\, OR_i + \gamma_3 CPI_i + \gamma_4\, SSE_i + \acute{\varepsilon} \quad (6)$$

Demand Determinant Models of Derivative Market

In relationship models, an attempt was made to gauge the contribution of derivative markets in the development process by testing the relationship between overall economic activities and the derivative market liquidity level in the sampled countries. Second objective of this study is to explain the possible sources of demand for derivative markets. As mentioned earlier, derivative products have a derived demand which is not only linked with real economic sector but is also directly related to overall financial development level and with their underlying assets in the spot capital markets. Therefore, both economic and financial variables are analysed as the critical factors creating the demand for derivative markets.

As discussed earlier, liquidity ratio of the total market value as percentage of GDP ***(DM)*** and GDP growth rate **(*GDPR)*** are used as proxies for derivative market development and economic growth respectively. Two other economic variables, gross ***OR***-openness ratio (total imports plus exports as percentage of GDP), and total net foreign equity portfolio investments to GDP ratio ***(Port)*** are also tested to check the economic source of demand for derivative markets. The openness ration ***(OR)*** shows the external trade which is a

direct demand source for foreign exchange derivative products offered by any derivative exchange while ***(Port)*** covers the inflow of foreign funds in these markets.

Four different financial development indicators are utilised to test the casual relationship between derivative markets and overall financial development in a country. Financial Deepening (M3 to GDP ratio-***M3***) is used as a measure of overall financial development level while total claims of the banks as percentage of GDP ***(BNK)*** shows the role of financial intermediaries in the financial system of the countries. To capture the input of private corporate sector in development of derivative markets, total bank credit to private sector as percentage of GDP ***(PVT)*** is also included in this study.

Due to the complexity of the derivative products, general awareness level of derivative products can be a crucial factor for the success of derivative exchanges in a country. Generally, in emerging markets, the utilisation of the derivative products is limited to private corporate sector; therefore ***(PVT)*** is also used as an indicator of the general awareness level of derivatives in a country. Lastly, spot market total traded value to GDP ratio ***(SM)*** is used to measure the effect of underlying spot capital market liquidity and depth on derivative markets development with same economic control variables used in equation (4).

$$DM_i = \alpha + \beta\, FI_{i+} \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \acute{\varepsilon} \quad (7)$$

Four financial indicators ***(FI)*** discussed above are tested in equation (7) explain possible sources of demand for the derivative market and also to determine the readiness of the financial system to launch a derivative exchange.

All the above discussed equations are regressed with time series data for each market in a sample of 11 countries, pooled data of 6 emerging and 5 developed markets and with combined pooled data for all countries. The equations are run using OLS with white covariance estimator to adjusted for heteroskedasticity error corrections in the models. Moreover, to avoid the spurious and biased results of single-equation regressions with non-stationary variables, growth rate of all variables are taken in the model. Unit root test

using Phillips Perron (PP) procedure is conducted to check the stationary of the variables and appropriate adjustments will be made to correct the non-stationary variables. As PP test includes a non-parametric allowance for serial correlation and heteroskdasticity, it is preferred over other unit root tests in this study with quarterly data of relatively volatile emerging derivative markets.

Granger's Causality Test

Both liquidity and capitalisation impact models, discussed earlier, implicitly assume a one-way casual relationship from financial development to economic growth based on economic endogenous growth literature (Bencivenga *et al.*, 1991; Greenwood *et al.*, 1990; 1993; Skaden, 2000). This direction of relationship is categorized as Supply-Leading pattern of causation between economic growth and financial development by Patrick (1966). However, as Robinson (1952) asserted "…where enterprise leads finance follows", economic growth or real sector development can create demand for financial products which is called Demand-Following pattern relationship. The demand determinant model, discussed above, is based on this direction of relationship between economic growth and derivative market development.

Table 1 : Economic and Financial Sources of Demand for Derivative Markets

Variables	*Descriptions*
GRP (Per capita growth rate)	Overall Economic source of demand
OR (Exports+ Imports to GDP)	External Trade Source
PORT (Portfolio Investments to GDP)	Foreign Sources of Funds (Capital Inflows)
M3 (M3 to GDP ratio)	Financial Deepening Level
BNK (Total Banks claims to GDP)	Role of Financial Intermediaries(Banks)
PVT(Bank credit to Pvt. Sector to GDP)	Role of Corporate Sector
SM (Spot Market liquidity ratio)	Spot Market Liquidity Level

As derivative products have a derive demand from their underlying spot market, the model included both economic and financial system sources of demand for the derivative

market. Further, these regression models may produce spurious correlations among variables giving a false impression of causation among them.

In order to avoid the problem of contemporaneous correlations, Granger's causality test (1969) is utilised in this study to check the direction of both economic growth and financial development indicators with derivative markets liquidity level (Table 1). The direction of relationship also determines whether the derivative markets follow a Demand-Following or Supply-Leading pattern of development of derivative markets in the sample countries

The Granger (1969) test of causality is a statistical tool to check whether ***X*** causes ***Y*** by testing how much of the current of ***Y*** can be explained by past values of ***X*** and then to see whether by adding lagged values of ***X*** can improve the explanation or not. ***Y*** is said to be Granger-caused by ***X*** if ***X*** helps in prediction of ***Y***, and lag variables of ***Y*** are not significant**.** With the same pattern, it also tests whether ***Y*** causes ***X*** by running the following regressions assuming that ***X*** and ***Y*** is a pair of linear stationary time series variables:

$$X_i = \alpha_i + \Sigma\beta_1 Y_{t-i} + \Sigma\gamma_1 X_{t-i} + \acute{\varepsilon}_i \qquad (8)$$

$$Y_i = \alpha_i + \Sigma\beta_1 X_{t-i} + \Sigma\gamma_1 Y_{t-i} + \acute{\varepsilon}_i \qquad (9)$$

where (i) is the lag values of both ***X*** and ***Y***.

As mentioned earlier, the basic assumption in Granger's causality test is that the pair of variables is linear independent and stationary time series. If the variables are non-stationary or I (1) without co-integration or higher degree integrated I (n) nature, then the test results will not be valid (Demetriades *et al.*, 1996). In order to avoid the non-stationary problem of data, growth rate of each variable is used in the study and Phillips Perron (PP) unit root test is conducted for each variable before applying them in the causality test.

The definition of causality in Granger's model is based on the predictability of a series ***Y*** by the past values (lag values) of another series. Therefore, the lag length used in the model is very important. Ideally, the lag length should be infinite in the model (Granger, 1969). Practically, due to finite nature of data, the lag length depends on the length of data series utilised in the study. Most of the earlier studies (Amano, 2005; Choe *et al.*, 1999; Jung, 1986) used lag length varying from 2 to 3 years on different criteria of SIC, Engle-Granger's co-integration and is general to specific method. This study with quarterly data series and limited life span of emerging markets, utilizes lag lengths as per Akaike's criterion (AIC) for each pair of variables for all markets in the sample.[5]

4. Analysis of Results and Discussion

4.1 Relationship Models

Liquidity Impact Model

The results of liquidity impact model for are summarized in Table 2. The coefficient of derivative markets liquidity ***(DM)***, showing the contribution derivative market have on economic growth, has the expected positive sign for 3 out of 6 emerging markets. Only in case of Malaysia, the expected sign is found to be positive and significant both at 5% and 1% critical level while it is insignificant for all other countries.

Further, in the case of Brazil, one of the oldest and largest emerging derivative markets, the coefficient is negative and insignificant. However, this negative coefficient of derivative market for economic growth is consistent with the results of Gregorio and Guidotti (1995) arguing that uncontrolled liberalisation of capital markets in Latin American countries resulted in efficiency loss of investment and high NPLs for banks. The results of this market may also be affected by this factor that Brazil's economy suffered a hyper inflation in early the 1990s. Similarly, in the case of South Korea the coefficient is also negative as the country was facing the crunch of Asian Financial Crisis when derivative trading started in Korea Exchange in 1997.

[5] Eviews version 4 software package.

On the contrary, Malaysian derivative market started its operations at about the same time period (1996) and under similar circumstances as South Korean market, the relationship is found to be significant and positive. However, the magnitude of negative effects was significantly diminished with timely financial and monetary repression policies of the Malaysian regulators. These mixed and inconsistent results in case of emerging markets also support the market

Table 2: Liquidity Impact Model Results

	Emerging Derivative Markets Direct Relationship Model											
	Brazil		Taiwan		Malaysia		Romania		South Korea		India	
	1990-2004		1999-2004		1996-2004		1997-2003		1996-2004		2000-2004	
	$GRP_i = \alpha + \beta DM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$											
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	0.0040	0.7828	0.0094	0.2912	**0.0217**	**0.0083****	**0.1451**	**0.0006****	0.0204	0.4870	-0.0082	0.9148
DM	-0.0253	0.3122	0.0233	0.5581	**0.0243**	**0.0038****	-0.0019	0.9555	-0.0761	0.1601	0.0009	0.5031
GEXP	0.0344	0.7410	-0.0095	0.7270	**0.1056**	**0.0000****	-0.0617	0.5207	0.1631	0.3461	**-1.0860**	**0.0000****
OR	**-0.3246**	**0.0022****	**-0.4299**	**0.0008****	**0.2926**	**0.0183****	**-0.7786**	**0.0000****	-0.2635	0.4022	-0.1088	0.3228
CPI	**-0.4064**	**0.0000****	2.3595	0.1784	**-4.1168**	**0.0056****	-0.7005	0.1835	-0.3647	0.8818	0.0000	0.9975
SSE	**-0.8126**	**0.0057****	0.9211	0.7550	-0.1277	0.7255	-6.1677	0.2159	**-2.9209**	**0.0287****	**1.3029**	**0.0001****
Adj R^2	85.86%		47.49%		74.01%		92.32%		33.76%		98.05%	
DW	1.889		1.610		1.715		1.592		2.750		2.164	
N	46		23		31		25		28		17	

	Developed Derivative Markets Direct Relationhip Model									
	UK		Austria		Australia		Denmark		Switzerland	
	1990-2004		1997-2004		1990-2004		1990-2004		1995-2004	
	$GRP_i = \alpha + \beta DM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$									
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	**0.0214**	**0.0000****	**0.0112**	**0.0001****	**0.0082**	**0.0000****	0.0066	0.0511	**0.0044**	**0.0003****
DM	**-0.0599**	**0.0000****	0.0016	0.8215	0.0009	0.8582	**-0.0122**	**0.0027****	-0.0042	0.1226
GEXP	-0.0243	0.8545	**-0.8104**	**0.0000****	0.0370	0.5304	**-1.1588**	**0.0000****	**-0.3194**	**0.0211****
OR	-0.0961	0.1589	0.0400	0.2272	**0.0653**	**0.0024****	**-0.1320**	**0.0152****	0.0130	0.5217
CPI	**-1.3872**	**0.0000****	**-1.7233**	**0.0016****	**-0.6545**	**0.0003****	0.0027	0.9963	**-1.0499**	**0.0005****
SSE	**-0.0874**	**0.0043****	**0.2136**	**0.0350****	-0.0032	0.7779	0.0203	0.9208	0.0351	0.3935
Adj R^2	41.17%		97.11%		38.81%		85.55%		31.46%	
DW	2.3678		2.0380		1.8440		2.5506		1.3590	
N	51		27		36		51		37	

**** Significant at 5% critical level**

heterogeneity hypothesis (Fernandez, 2003) that each market is different as it operates in a different financial system, with differing economic structure and legal environment.

The derivative market coefficient is unexpectedly negative in 3 out of 5 developed markets showing a negative relationship between derivative market development levels with economic growth in these countries. The coefficient is significant and negative at 1% level of confidence in the cases of United Kingdom and Denmark while for all other developed markets it is insignificant.

The overall results of liquidity impact model show a negative relationship between derivative market and economic growth is prevalent in our sample countries as against the expected positive relationship of functional hypothesis of derivative markets. A negative coefficient is found in 6 out of 11 markets, particularly in the cases of developed and matured markets.

The functional relationship hypothesis is based on the price discovery and risk transfer functions which supposedly increase the overall market efficiency by reducing the transaction costs and information asymmetry leading to enhanced productivity and growth. However, the positive impact of price discovery is a short term matter. As market matures, the risk transfer function of the derivative market becomes predominant and the market liquidity will be dependent on the hedging activities of the investors. As may be argued risk transfer or hedging function is a zero sum game, i.e. the profits of one investor are offset by the losses of another. Resultantly, in markets where hedging is the predominant use of derivatives instruments, as in cases of developed markets, the relationship between derivative market liquidity with economic may not be positive as described in functional hypothesis.

However, Allan Greenspan[6] (1999) argued that derivative markets enable the investors to differentiate risk and allocate it to those investors who are willing to take the risk. This risk transferring function improves the ability of the market to bring about a set of product and asset prices which are adjusted to the risk preferences of consumers.

He further elaborated, "These product and asset prices signals enable entrepreneurs to finely allocate real capital facilities to produce those goods and services most valued by consumers, a process that has undoubtedly improved national productivity growth and standards of living." With this perspective of the risk transfer function of the market, the relationship between the derivative market development and economic growth should be positive even for matured and developed market.

[6] Chairman Fed Reserve U.S.A.

Nonetheless, the negative relationship shown in the results of the study can be explained with the timing argument of hedging activities. The investors generally hedge their positions when they expect an economic downturn or recession. Therefore, the market activity level, measured as market traded value as percentage of GDP, will be higher in countries suffering low growth or during economic slumps.

Furthermore, management decision to use derivatives is argued to be based on the shareholders' wealth maximization hypothesis that firms should engage in risk management solely to benefit the shareholders of the firm through (1) minimization of cost of financial distress (2) minimization of taxes and (3) avoiding underinvestment problem (Mayers *et al.*, 1982). Empirical studies on this hypothesis found that minimizing the cost of the financial distress is one of the primary objectives that firms use derivative instruments (Nguyen *et al.*, 2002). It is a proven fact that the probability of financial distress for firms is much higher during periods of economic recessions. Consequently the firms' use of derivative products during that time will be higher than during booming economic times. The liquidity impact model of this study captures the links of market activity level with economic growth rate. Therefore, a negative relationship between derivative market and economic growth rate is found in most of the developed markets. But the coefficient is significant in only 2 cases of U.K. and Denmark.

Capitalisation Impact Model

Table 3 reveals the result of capitalisation model for emerging and developed markets. The results show a positive and significant relation at 1% level of confidence in the case of Brazil while the relationship is not significant for the rest of the 5 emerging markets. Further, a positive coefficient is found in 5 out of 6 cases (84%) of emerging markets supporting the positive capitalisation effect hypothesis of derivative markets.

The results for developed markets also show a positive and significant coefficient only for U.K. while remaining markets have insignificant coefficients. As in the cases of

emerging markets, the derivative market coefficient has the expected positive sign in 4 out of 5 cases of developed markets. In the case of Swiss market, the relationship is found to be negative with very low adjusted R^2 of only 1.8%.

The low adjusted R^2 implies the model is possible misspecified as unknown factors which may affect the capitalisation process may have been missed in the model in case of Switzerland. Further, the Switzerland Stock Exchange is not a conventional derivative products market of futures and option. It is the largest market for non-traditional warrants in Europe. Warrants are options on stocks issued by the corporation rather than a trade on the listed firms in the Exchange itself. The model may be in appropriate with this unique feature of Swiss market.

Table 3 : Capitalisation Impact Model Results

	Emerging Derivative Markets Capitalisation Model											
	Brazil		Taiwan		Malaysia		Romania		South Korea		India	
	1990-2004		1999-2004		1996-2004		1997-2003		1996-2004		2000-2004	
	$CAP_i = \alpha + \beta DM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$											
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	-0.0106	0.4567	-0.0025	0.9053	0.0129	0.6433	0.0666	0.5271	-0.0074	0.8038	-0.3975	0.1307
DM	**0.0644**	**0.0086****	0.0374	0.4296	0.0125	0.5837	0.0726	0.3398	-0.0342	0.4894	0.0002	0.9572
GEXP	0.2445	0.1662	-0.0405	0.3124	-0.0445	0.4227	-0.1111	0.7211	**-0.5720**	**0.0038****	0.1294	0.4716
OR	**0.1622**	**0.0458****	**1.2923**	**0.0000****	0.2464	0.4959	-0.3483	0.2956	**-1.0198**	**0.0011****	0.1365	0.5191
CPI	-0.0052	0.8675	**7.7000**	**0.0104****	-4.2628	0.3593	0.3269	0.8293	3.5887	0.2126	0.0014	0.1345
SSE	0.1607	0.3343	**24.7231**	**0.0001****	-1.3812	0.2509	-12.7297	0.3133	0.7174	0.5374	-0.2372	0.8087
Adj R^2	29.99%		82.17%		9.24%		37.03%		35.10%		15.46%	
DW	2.856579		1.940953		2.254284		2.575002		2.818521		2.419862	
N	46		23		31		25		28		17	

	Developed Derivative Markets Capitalisation Model									
	UK		Austria		Australia		Denmark		Switzerland	
	1990-2004		1997-2004		1990-2004		1990-2004		1995-2004	
	$CAP_i = \alpha + \beta DM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$									
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	*-0.0101*	*0.0903**	-0.0038	0.2461	**0.0114**	**0.0299****	-0.0215	0.1402	-0.0031	0.1123
DM	**0.0498**	**0.0066****	0.0052	0.5679	-0.0059	0.5086	0.0029	0.8678	-0.0034	0.5119
GEXP	-0.0727	0.4052	**0.7405**	**0.0000****	-0.0320	0.8250	**-1.2303**	**0.0021****	0.1016	0.5492
OR	**0.2036**	**0.0168****	-0.0078	0.8402	-0.0121	0.8341	0.1397	0.5005	0.0375	0.3311
CPI	-0.0126	0.9748	*1.3075*	*0.0600**	**-1.5618**	**0.0016****	**5.1432**	**0.0224****	-0.1239	0.8247
SSE	0.0997	0.2108	**-0.3774**	**0.0209****	**-0.0691**	**0.0023****	-0.8441	0.5119	**0.3227**	**0.0310****
Adj R^2	20.65%		94.93%		16.30%		43.30%		1.80%	
DW	1.6655		2.3048		1.572967		2.4476		2.1788	
N	51		27		36		51		37	

**** Significant at 5% critical level**

** Significant at 10% critical level*

The overall results of capitalisation impact model, with only two significant coefficients but correct signs on coefficients, cannot be said to substantiate the positive effect

hypothesis of derivative markets on the capital formation level in countries included in the study.

Indirect Relationship Model

The liquidity and efficiency impacts of derivative markets on economic growth are also routed through their underlying spot markets. The indirect relationship model covers this perspective of derivative market relationship with economic growth by analysing the effects of derivative markets on their underlying spot market and subsequently the effects of spot market on overall capital formation process and economic growth rate in the sample countries. The results presented in Table 4 show a positive and significant relationship of derivative markets with their underlying spot market in 2 out of 6 cases of emerging markets. In the cases of Malaysia, South Korea and India, where the study found no significant relations between the derivative market and their underlying spot market, the model appears to be misspecified.

Table 4 : Spot and Derivative Market Relationship Model Results

	Emerging Markets											
	Brazil		Taiwan		Malaysia		South Korea		Romania		India	
	1990-2004		1999-2004		1996-2004		1996-2004		1997-2004		2000-2004	
	$SM_i = \alpha + \beta\, DM_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$											
C	0.0628	0.1364	0.0881	0.4753	0.0348	0.7612	0.2181	0.4012	0.2855	0.1693	0.0261	0.8673
DM	**0.3435**	**0.0034****	**1.0877**	**0.0088****	0.2599	0.3635	0.7169	0.4563	-0.1368	0.1111	0.0061	0.8948
GDPR	-0.7087	0.1540	-3.3141	0.1520	3.1679	0.3027	4.7673	0.3433	-1.2542	0.2583	-0.6455	0.6749
OR	*-0.7468*	*0.0743**	-1.6373	0.1374	*4.2481*	*0.0624**	*6.2879*	*0.0901**	0.1891	0.8808	-0.6263	0.7371
Port	0.0119	0.1146	**0.0160**	**0.0212****			0.0057	0.3166	0.0017	0.3130	0.0056	0.2793
Adj R^2	34.70%		27.14%		3.25%		3.06%		58.27%		-26.67%	
DW	2.6765		2.4099		2.7211		1.2369		2.1681		1.6804	
N	59		23		34		31		23		17	

	Developed Markets									
	UK		Australia		Austria		Denmark		Switzerland	
	1990-2004		1990-2004		1997-2004		1990-2004		1995-2004	
	$SM_i = \alpha + \beta\, DM_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$									
C	0.0313	0.5203	0.0300	0.6452	0.0855	0.1498	0.0571	0.2169	0.0434	0.1192
DM	*0.2705*	*0.0859**	0.0866	0.3181	**0.7756**	**0.0000****	0.0537	0.4351	**0.5376**	**0.0006****
GDPR	-0.4097	0.1890	0.8803	0.8445	-0.8455	0.6355	*-2.1153*	*0.0888**	-3.0768	0.2326
OR	-0.3729	0.5780	-0.4157	0.3543	0.4708	0.7132	1.5863	0.2794	-0.4076	0.4212
Port	0.0045	0.3254	0.0007	0.7578	-0.0367	0.3272	-0.0028	0.4430	-0.0004	0.7471
Adj R^2	1.56%		-2.41%		32.97%		12.71%		55.22%	
DW	2.8385		2.6714		2.8270		2.3981		2.1492	
N	57		36		30		34		21	

**** Significant at 5% critical level** * Significant at 10% critical level

The developed markets portray a similar picture about the derivative markets relationship with their underlying spot market. The effects are positive and significant only for 2 markets, Austria and Switzerland while Denmark and the U.K. markets did not fit well in the model.

Most of the previous studies gauged the positive effects of derivative market by using the trading volume of derivative market in correlation with the price volatility of the spot market. However, earlier studies also documented mixed evidence about the impact of derivative products on their underlying cash markets. A study (Kyriacou *et al.*, 1999) found a positive and significant effect of futures trading on FTSE 100 spot volatility in U.K market while Lee and Ohk (1999) noticed an high volatility of spot market after the introduction of futures trading on Nikkei 250 index in Singapore International Monetary Exchange (SIMEX). Dennis and Sim (1999) on the other hand , found no significant effect of futures trading on spot market in Australia, Brazil, Mexico and Hungary. Bae and Park (2004) observed that futures trading enhanced the market efficiency of the spot market by reducing the market frictions (transactions costs) with higher volatility as a spill over effects.

Unlike earlier studies, this study tested the liquidity effects of derivative markets on their spot markets taking the total traded value to GDP ratio as a measure of efficiency of the market. The overall results show a positive and significant impact of derivative markets in 4 out of 11 cases while a positive coefficient as per theory is noted in all but one country.

The second leg of this indirect relationship analysis is to test the relationship between the underlying spot markets with economic growth. The positive volume or efficiency enhancement effects of derivative market can only be substantiated if these positive effects are reflected as economic growth through spot markets. The results of this analysis are rather puzzling for both emerging and developed markets compiled in Table 5. The results show no significant relationship between spot market liquidity with economic growth in all countries. The results also reveal a negative relationship even in

the case of Malaysia, where a direct positive and significant relationship between derivative market and economic growth was found in the direct liquidity impact model.

Furthermore, results show an unexpected negative coefficient for spot market in 7 out of 11 markets analysed in this study. However, earlier two studies ,(Skaden, 2000; Zervos *et al.*, 1998) also found no conclusive results in this regard. Levine and Zervos (1998) investigated whether the stock market size, volume and volatility are correlated with productivity, capital accumulation and economic growth. The study based on cross sectional data of 47 countries noticed a positive relationship of the market liquidity indicators with economic growth while no robust relationship was found with market size and volatility indicators.

Table 5: Spot Market Liquidity Impact Model Results

	Emerging Spot Markets Direct Relationship Model											
	Brazil		Taiwan		Malaysia		Romania		South Korea		India	
	1990-2004		1999-2004		1996-2004		1997-2004		1997-2004		2000-2004	
	$GRP_i = \alpha + \beta SM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$											
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	0.0043	0.7699	0.0109	0.2657	**0.0276**	**0.0029****	**0.0905**	**0.0002****	-0.0036	0.9194	0.0020	0.9792
SM	-0.0616	0.1422	0.0017	0.9111	-0.0055	0.4351	0.0022	0.9688	0.0138	0.1331	-0.0020	0.8635
GEXP	0.0084	0.9386	-0.0227	0.2823	**0.1075**	**0.0004****	0.0098	0.8102	0.0660	0.6896	**-1.0863**	**0.0000****
OR	**-0.3247**	**0.0015****	**-0.4050**	**0.0001****	**0.2277**	**0.0549****	**-0.8772**	**0.0000****	-0.5493	0.1651	-0.1032	0.3095
CPI	**-0.4021**	**0.0000****	2.2290	0.1723	**-4.4544**	**0.0045****	0.0557	0.7984	0.1100	0.9653	0.0000	0.9023
SSE	**-0.8111**	**0.0033****	0.1355	0.9563	-0.052608	0.8971	-3.1276	0.1503	**-2.5312**	**0.0119****	**1.2981**	**0.0001****
Adj R^2	86.38%		45.73%		68.37%		96.10%		30.72%		98.03%	
DW	1.9143		1.5785		1.3201		1.732445		2.6560		2.2460	
N	46		23		30		23		26		17	

	Developed Spot Markets Direct Relationship Model									
	UK		Austria		Australia		Denmark		Switzerland	
	1990-2004		1997-2004		1990-2004		1990-2004		1995-2004	
	$GRP_i = \alpha_1 + \beta SM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$									
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	**0.0141**	**0.0045****	**0.0111**	**0.0001****	**0.0081**	**0.0000****	0.0133	0.0848	**0.0042**	**0.0004****
SM	-0.0106	0.4369	-0.0031	0.5175	-0.0031	0.7517	0.0021	0.8631	-0.0053	0.3696
GEXP	-0.0832	0.6184	**-0.8022**	**0.0000****	0.0092	0.8598	**-1.4750**	**0.0000****	**-0.2726**	**0.0345****
OR	-0.0606	0.4220	0.0352	0.2813	**0.0601**	**0.0011****	**-0.2708**	**0.0348****	0.0119	0.5752
CPI	**-0.8487**	**0.0047****	**-1.6793**	**0.0007****	**-0.6279**	**0.0001****	-0.9668	0.4603	**-0.9971**	**0.0006****
SSE	**-0.1504**	**0.0006****	**0.230102**	**0.0290****	-0.0041	0.7214	0.2664	0.7654	0.0395	0.5104
Adj R^2	17.32%		97.15%		37.51%		83.82%		28.36%	
DW	2.3800		1.995509		1.7554		2.7482		1.3389	
N	51		27		47		27		37	

**** Significant at 5% critical level**

Skaden (2000) tested the same model with time series data of 20 countries from 1960-1995 and found no significant effects of capital market on the economic growth rate of the countries. In case of some countries Skaden also noticed a negative coefficient for the market liquidity indicator consistent to the results of this study. Singh (1997) on the

other hand related this negative relationship to the liberalisation of capital markets which induces pressure of speculative trading in these markets. These noise/speculative traders magnify the volatility of the market resulting in mispricing of stocks and poor allocation of investments and reducing long term growth.

Further, a theoretical debate over the spot market liquidity level and issues of corporate control provides a possible explanation of the negative relationship between spot market liquidity and economic growth observed in this and other earlier studies. Shleifer and Vishny (1986) and Amar Bhide (1993) argued that with high market liquidity, firms can find it easier to sell shares in the market which will results in a larger number of passive shareholders in their ownership structure. In such firms, the incentive to monitor the actions of management is lost; consequently there will be agency costs in the firms. With poor corporate control, firms will eventually results in inappropriate allocation of resources and lower economic growth. Thinking in similar line, the negative coefficients of the spot market liquidity found in this study are also in line with the theory of market liquidity and corporate control.

The spot equity market indicator of market liquidity is measured total traded value of the market composite index of the respective market rather the total traded value as in case of derivative market. Besides that there is no leverage effect on trading volume of spot market. Therefore the total traded value of spot market as percentage of GDP may not be sizable enough to capture the effects of the spot market on economic growth especially in emerging markets. To avoid this problem with the direct liquidity impact model of spot market, this study also tested the effects of spot market liquidity on the gross capital formation in countries.

Table 6: Spot Market Capitalisation Model Results

	Emerging Spot Markets Capitalisation Model											
	Brazil		Taiwan		Malaysia		Romania		South Korea		India	
	1990-2004		1999-2004		1996-2004		1997-2004		1996-2004		2000-2004	
	$CAP_i = \alpha + \beta SM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$											
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	-0.0094	0.5382	-0.0043	0.8307	0.0095	0.7194	0.0095	0.9173	-0.0263	0.4087	-0.3877	0.1173
SM	**0.0973**	**0.0143****	**0.0462**	**0.0528****	0.0235	0.2674	0.0885	0.4098	*0.0182*	*0.0789**	0.0040	0.8882
GEXP	0.3041	0.1026	**-0.0753**	**0.0073****	-0.0800	0.1631	-0.0551	0.8089	**-0.6012**	**0.0034****	0.1239	0.4998
OR	*0.1339*	*0.0931**	**1.2871**	**0.0000****	0.1529	0.6593	**-0.4488**	**0.0126****	**-1.2420**	**0.0003****	0.1412	0.4810
CPI	-0.0042	0.8139	**8.5778**	**0.0075****	-3.9268	0.3665	1.0986	0.3935	**4.4439**	**0.0309****	0.0014	0.1234
SSE	0.1895	0.3075	**24.3298**	**0.0000****	-1.4830	0.2026	-10.8137	0.0823	1.2942	0.1799	-0.2374	0.8092
Adj R^2	25.99%		83.78%		13.87%		38.68%		45.24%		15.51%	
DW	2.557571		1.895424		2.418024		2.165599		2.432629		2.413173	
N	46		23		30		23		26		17	

	Developed Spot Markets Capitalisation Model									
	UK		Austria		Australia		Denmark		Switzerland	
	1990-2004		1997-2004		1990-2004		1990-2004		1995-2004	
	$CAP_i = \alpha + \beta SM_i + \gamma_1 GEXP_i + \gamma_2 OR_i + \gamma_3 CPI_i + \gamma_4 SSE_i + \varepsilon$									
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	-0.0042	0.4910	-0.0043	0.1930	**0.0130**	**0.0135****	-0.0077	0.5801	-0.0030	0.0803
SM	0.0094	0.1698	0.0049	0.4128	-0.0344	0.1558	0.0186	0.4863	-0.0084	0.5646
GEXP	-0.0241	0.8397	**0.7450**	**0.0000****	-0.0485	0.7596	**-0.9926**	**0.0027****	0.1362	0.3869
OR	*0.1742*	*0.0833**	-0.0107	0.7768	-0.0326	0.4918	-0.1220	0.5700	0.0343	0.3394
CPI	-0.4537	0.2242	*1.3082*	*0.0500**	**-1.2903**	**0.0250****	1.9053	0.4305	-0.0866	0.8775
SSE	*0.1520*	*0.0764**	**-0.4070**	**0.0190****	**-0.0765**	**0.0000****	2.2000	0.1981	**0.3302**	**0.0298****
Adj R^2	8.08%		95.01%		10.69%		28.04%		2.25%	
DW	1.8623		2.3008		1.530537		1.8203		2.1769	
N	51		27		47		27		37	

**** Significant at 5% critical level**

** Significant at 10% critical level*

The results of capitalisations model of spot market are presented in Table 6 for emerging and developed markets. The results of capitalisation impact model (spot markets) show a positive and significant relationship between stock market liquidity and capital formation in 3 out of 5 cases in emerging markets. The coefficient is significant at 5% critical level in Brazil and Taiwan while at 10% level in South Korea. However, no relationship is found to be significant in developed markets. Nevertheless, the positive sign is found for the liquidity indicator with capital formation indicator in 8 out of 10 cases. This is consistent with Ross Levine (1991) hypothesis that stock markets alter the incentives for investors in the direction of productive investment resulting in capital formation and steady economic growth.

To summarize, the overall findings of the indirect relationship model does not provide conclusive evidence for a positive effects of derivative markets on economic growth through enhanced liquidity level of their underlying spot markets. However, the results do provide some evidence about the positive relationship in some cases between derivative markets with their underlying spot markets.

4.2 Demand Determinant Models

The results show that only the spot market liquidity affects the derivative market demand as its coefficient is positive and significant at 1% critical in the cases of Brazil and Taiwan in emerging markets (see Table 7) and for Austria and Switzerland among developed markets (see Table 8). The role of financial intermediaries (Banks) in derivative market development is found to be significant at 1% confidence level in the case of U.K. Generally, the financial intermediaries especially banks play a dominant role in financial system of the country where capital markets are not developed i.e. in developing countries. Insignificant coefficients are observed for all other financial indicators in the rest of the markets where the respective variables are either redundant.

The overall results show that trading activity level at spot market is a critical demand factor for derivative market. The study could not find any evidence to substantiate the relationship of derivative products with any other economic and financial development indicator tested in the model. The study included only limited set of broad quantifiable economic and financial development variables to determine the driving factors behind derivative demand.

Table 7: Demand Determinants Model Results Emerging Markets

	Emerging Markets											
	Brazil		Taiwan		Malaysia		South Korea		Romania		India	
	1990-2004		1999-2004		1996-2004		1996-2004		1997-2004		2000-2004	
	$DM_i = \alpha + \beta SM_i + \gamma_1 GDPR_i + \gamma_2 OR_i + \gamma_3 Port + \varepsilon$											
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	0.0883	0.2209	0.0202	0.6856	0.1420	0.1392	**0.1710**	**0.0292****	0.1489	0.7085	0.6882	0.1131
SM	**0.9377**	**0.0002****	**0.3082**	**0.0017****	0.1330	0.4591	0.0406	0.2989	**-0.5461**	**0.0308****	0.2342	0.8790
GDPR	0.3811	0.6361	1.4922	0.2985	1.8019	0.4469	-1.1215	0.1983	-0.2146	0.9414	0.5158	0.9183
OR	0.2415	0.7205	1.1187	0.1004	*-4.7027*	*0.0677**	0.5244	0.6794	1.1418	0.6873	7.1756	0.5433
Port	0.0107	0.3711	**-0.0044**	**0.0093****			-0.0012	0.5621	0.0034	0.2883	-0.0390	0.2911
Adj R^2	29.97%		24.90%		6.65%		4.83%		-1.63%		-20.81%	
DW	2.0702		2.0162		1.3642		2.3332		2.6957		1.7143	
N	59		23		34		31		23		17	
	$DM_i = \alpha + \beta Bnk_i + \gamma_1 GDPR_i + \gamma_2 OR_i + \gamma_3 Port + \varepsilon$											
C	**0.2118**	**0.0125****	-0.0426	0.6863	0.0003	0.9979	**0.2233**	**0.0481****	-0.2788	0.6942	1.4437	0.2433
BNK	0.2414	0.8045	5.5221	0.2619	**5.9269**	**0.0087****	-0.8068	0.7011	1.1594	0.6779	-16.0618	0.4519
GDPR	-0.2916	0.7384	6.3987	0.2750	**7.3622**	**0.0218****	-1.8513	0.4433	2.5562	0.6033	-13.3122	0.4401
OR	-0.6026	0.3748	0.7331	0.3349	*-4.4139*	*0.0518**	0.8480	0.4823	1.6513	0.4388	8.8576	0.5204
Port	0.0322	0.1045	0.0010	0.8257			-0.0014	0.4779	0.0029	0.3897	-0.0425	0.3552
Adj R^2	-3.19%		-4.95%		16.99%		4.15%		-7.52%		-17.57%	
DW	1.8401		2.0556		1.5152		2.2993		2.5638		1.8189	
N	55		23		35		33		25		17	
	$DM_i = \alpha + \beta Pvt_i + \gamma_1 GDPR_i + \gamma_2 OR_i + \gamma_3 Port + \varepsilon$											
C	**0.1970**	**0.0150****	0.0796	0.1834	0.1128	0.4137	*0.2108*	*0.0448**	-0.7732	0.3081	1.3889	0.1563
Pvt	1.0894	0.4459	-1.5850	0.6878	2.1490	0.6518	-0.5475	0.7564	2.4231	0.2636	-18.7004	0.3232
GDPR	0.1581	0.8679	-0.8042	0.8506	4.3259	0.3845	-1.5609	0.4673	5.6757	0.2768	-12.4384	0.3348
OR	-0.3865	0.5782	1.0546	0.2105	*-4.4686*	*0.0552**	0.8246	0.4966	3.0903	0.2507	11.5965	0.4503
Port	*0.0308*	*0.0804**	0.0008	0.8558			-0.0012	0.5179	0.0030	0.3099	-0.0368	0.3696
Cap												
Adj R^2	-1.09%		-12.01%		7.00%		3.99%		0.98%		-13.27%	
DW	1.8217		1.9156		1.3054		2.3137		2.7760		1.8155	
N	59		23		35		33		25		17	
	$DM_i = \alpha + \beta M3_i + \gamma_1 GDPR_i + \gamma_2 OR_i + \gamma_3 Port + \varepsilon$											
C	**0.1732**	**0.0421****	0.1129	0.2297	-0.0053	0.9633	*0.1754*	*0.0773**	**-1.0394**	**0.0033****	1.6900	0.1432
M3	1.0626	0.4640	-3.7879	0.5893	7.5346	0.1199	0.2037	0.9104	**7.0389**	**0.0093****	-23.4125	0.2899
GDPR	0.3603	0.7594	-3.2702	0.6714	*9.7431*	*0.0849**	-0.7239	0.7205	**7.9975**	**0.0074****	-21.2046	0.2673
OR	-0.2950	0.6957	0.8112	0.2641	*-4.6984*	*0.0596**	0.8398	0.5191	1.2253	0.4382	7.7840	0.5296
Port	*0.0279*	*0.0880**	-0.0016	0.7877			-0.0009	0.6596	**0.0065**	**0.023****	-0.0448	0.3334
Adj R^2	-1.29%		-11.14%		11.77%		3.85%		13.90%		-14.54%	
DW	1.8465		1.9995		1.5140		2.3557		2.5423		1.7097	
N	59		23		35		33		25		17	

**** Significant at 5% critical level** ** Significant at 10% critical level*

A number of other issues like legal system, market mechanism, and market participants are also crucial for the development and successful operation of a derivative exchange. Viviana Fernandez(2003) observed that institutional and legal factors are the reasons of the heterogeneity among derivative markets in Latin America.

Table 8 : Demand Determinants Model Results Developed Markets

	Developed Markets									
	UK		Australia		Austria		Denmark		Switzerland	
	1990-2004		1990-2004		1997-2004		1990-2004		1995-2004	
	$DM_i = \alpha + \beta\, SM_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$									
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
C	**0.0879**	**0.0127****	0.0642	0.5816	-0.0277	0.3917	0.0234	0.8209	*-0.0734*	*0.0618**
SM	0.1847	0.3724	*0.4866*	*0.0746**	**0.4315**	**0.0093****	0.2414	0.5321	**1.1813**	**0.0000****
GDPR	-1.1371	0.2565	1.1113	0.9132	*-2.0010*	*0.0573**	*-4.9231*	*0.0586**	6.1884	0.1284
OR	*-1.3314*	*0.0519**	-0.1828	0.7950	-0.5846	0.4618	3.5455	0.1054	0.5722	0.5055
Port	-0.0054	0.3340	0.0109	0.3317	0.0082	0.6426	0.0024	0.6815	0.0020	0.3527
Adj R^2	12.67%		-3.87%		40.19%		13.89%		58.02%	
DW	2.3775		2.0077		1.7139		1.9885		2.1627	
N	57		36		31		34		21	
	$DM_i = \alpha + \beta\, Bnk_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$									
C	**0.0650**	**0.0294****	0.1885	0.1519	0.0284	0.5798	0.0821	0.2911	-0.0679	0.3164
BNK	**4.2902**	**0.0002****	-6.1679	0.4407	-0.1439	0.2064	-0.0476	0.7260	4.5593	0.3241
GDPR	**-0.9165**	**0.0035****	-3.2594	0.6623	**-4.1645**	**0.0263****	**-6.2762**	**0.0127****	10.1375	0.1752
OR	**-1.6700**	**0.0107****	0.2051	0.8461	-0.6930	0.4234	*2.3126*	*0.098**	0.0605	0.9483
Port	-0.0016	0.6448	0.0148	0.2770	-0.0157	0.3225	0.0077	0.3358	**0.0043**	**0.0129****
Adj R^2	37.64%		-4.77%		11.63%		16.52%		-1.31%	
DW	2.1805		1.9642		1.7493		1.9086		2.3542	
N	57		36		31		58		21	
	$DM_i = \alpha + \beta\, Pvt_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$									
C	**0.0617**	**0.0282****	0.2253	0.1735	0.0314	0.5453	0.0823	0.2880	-0.0631	0.3568
Pvt	**4.8098**	**0.0000****	-7.5189	0.4192	-0.1909	0.1437	-0.0389	0.5391	4.1478	0.3322
GDPR	**-0.9277**	**0.0008****	-3.6923	0.6343	**-4.2588**	**0.0241****	**-6.2691**	**0.0124****	9.1403	0.1835
OR	**-1.5236**	**0.0134****	0.2223	0.8467	-0.6957	0.4211	*2.3386*	*0.0965**	0.2388	0.7873
Port	-0.0017	0.5840	0.0160	0.2287	-0.0166	0.2972	0.0078	0.3328	**0.0041**	**0.0114****
Adj R^2	42.43%		-3.10%		12.24%		16.55%		-0.19%	
DW	2.1601		1.9967		1.7595		1.9118		2.3445	
N	57		36		31		58		21	
	$DM_i = \alpha + \beta\, M3_i + \gamma_1\, GDPR_i + \gamma_2\, OR_i + \gamma_3\, Port + \varepsilon$									
C	**0.0946**	**0.0174****	0.0924	0.4718	0.0629	0.3801	0.0606	0.4449	-0.0705	0.3344
M3	0.4931	0.6250	-0.8501	0.7450	-2.8816	0.3006	1.6853	0.2217	**1.8099**	**0.0377****
GDPR	-1.2860	0.1791	1.1632	0.9125	-6.7321	0.1131	-4.5551	0.1267	9.0425	0.2717
OR	**-1.6457**	**0.0101****	-0.3122	0.6410	-0.1772	0.8543	2.0817	0.1197	0.3385	0.6895
Port	-0.0043	0.5072	0.0123	0.2671	-0.0108	0.4792	0.0073	0.2717	**0.0047**	**0.0144****
Adj R^2	9.64%		-8.28%		16.92%		17.80%		-5.81%	
DW	2.4173		1.8642		1.6147		1.9584		2.2109	
N	57		36		30		58		21	

**** Significant at 5% critical level** * Significant at 10% critical level

Granger's Causality Test

Granger's causality test (1969) is utilised in this study to avoid the problem of contemporaneous correlations in single regression equation and to test whether derivative markets follow a Demand-Following or Supply-Leading patterns of development (Patrick, 1966) in the sample countries. Table 9 contains a summary of the direction of relationship (→) between derivative markets liquidity level with both economic growth and financial development indicators for emerging and developed markets respectively.

In the cases of emerging markets, the results suggest that derivative market activity level is independent of economic growth and financial development level in the sample countries. Only in the case of Brazil, the derivative market appears to follow a Demand-Following pattern of development as unidirectional causation is running from economic growth to derivative market development. A bilateral causation is also observed between the level of financial intermediation and derivative market in Brazil while in the case of India, financial intermediation, i.e. especially banks, seems to be a major factor for the development of derivative market.

While mixed causation results are observed between spot market development levels and derivative markets, the granger causation is running from derivative market to spot markets in Brazil and South Korea while the reverse pattern is significant at 10% critical levels in the cases of Malaysia and Korea.

The results are relatively better, depicting some pattern of development of derivatives markets, in the cases of developed countries. The causation is running from economic growth to derivative markets activities in the cases of U.K and Denmark, consistent with the Demand-Following hypothesis of Patrick for developed countries. Considering the derivative market liquidity level as an indicator of financial development, the results are also consistent with Patrick's hypothesis (1966) and also with the results of an earlier study that the causation of relationship changes over the course of development stage of countries (Jung, 1986). The causation runs from financial development to economic growth in developing countries while the reverse pattern (Demand-Following) is observed in cases of developed countries. Further, the results for developed countries also clarify that spot market liquidity level as being critical a factor for derivative market development as it is uni-directionally granger-causing the derivative market liquidity in 3 out of 5 developed markets.

Table 9 : Granger's Causality Test Results

	Emerging Markets												Developed Markets									
	Brazil		Taiwan		Malaysia		Romania		South Korea		India		U.K		Austria		Denmark		Switzerland		Australia	
Data Period	1990-2004		1999-2004		1996-2004		1997-2003		1996-2004		2000-2004		1990-2004		1997-2004		1990-2004		1995-2004		1996-2004	
Variables	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value	F-stats	P-value
GRP→DM	**3.8353**	**0.0041****	0.0817	0.9900	1.2707	0.3543	1.2325	0.4482	0.5955	0.7601	0.8811	0.5473	**5.1528**	**0.0006****	0.1504	0.8611	**4.6459**	**0.0139****	1.5102	0.2506	1.2404	0.3275
DM→GRP	0.7673	0.6000	0.3079	0.8855	2.1814	0.1234	1.6789	0.3240	1.9038	0.1907	0.2984	0.8658	1.2567	0.3002	2.3797	0.1141	0.1046	0.9008	0.6419	0.7304	0.1111	0.9886
OR→DM	0.3608	0.9339	2.9885	0.4189	1.5983	0.2101	0.5400	0.5903	1.2843	0.3660	4.7145	0.3355	**3.0873**	**0.0146****	*3.1834*	*0.0877**	1.6197	0.2078	1.7967	0.1737	0.9457	0.5037
DM→OR	0.8317	0.5811	3.2201	0.4053	**3.4639**	**0.0243****	0.1046	0.9011	1.3723	0.3325	10.5055	0.2299	1.6409	0.1627	4.0041	0.0540	0.5170	0.5993	1.2806	0.3373	1.6058	0.2133
Port→DM	0.5098	0.8405	54.2538	0.1042	0.6142	0.6714	0.6001	0.7248	0.5426	0.7972	2.1409	0.4753	1.4641	0.2225	2.6896	0.1223	0.0386	0.9622	1.6696	0.4208	1.2404	0.3275
DM→Port	0.2677	0.9722	20.5101	0.1685	0.6775	0.6363	1.2998	0.3792	0.3350	0.9286	0.5062	0.7811	0.8681	0.5108	*3.2132*	*0.0861**	1.0963	0.3418	**23.0268**	**0.0422****	0.1111	0.9886
M3→DM	2.1967	*0.0633**	0.2490	0.9038	2.3561	0.1023	0.2198	0.9476	0.3016	0.9258	0.5759	0.7553	1.7650	0.1417	1.0937	0.4395	**3.4627**	**0.0102****	1.4402	0.2514	0.8076	0.5578
DM→M3	3.6239	**0.0057****	0.9579	0.4711	1.2011	0.3853	1.2214	0.3533	1.9628	0.1400	0.2604	0.8927	1.9380	0.1088	0.5106	0.8062	1.1177	0.3654	1.6262	0.2002	1.7339	0.1729
BNK→DM	**2.2893**	**0.0443****	0.9004	0.5296	2.4478	*0.0928**	0.4671	0.6329	0.2996	0.9269	**7696.4300**	**0.0086****	**7.7605**	**0.0000****	0.3701	0.9027	1.7938	0.1250	1.2282	0.3610	1.1911	0.3325
DM→BNK	**3.7001**	**0.0033****	0.9946	0.4838	0.8070	0.6119	0.3932	0.6796	1.3987	0.2822	0.3338	0.8560	1.3214	0.2742	1.0595	0.4857	**6.4401**	**0.0000****	0.8587	0.5735	1.0583	0.3837
PVT→DM	1.6684	0.1424	0.5306	0.7483	3.1472	**0.0465****	0.4365	0.6518	0.3626	0.8906	6.0395	0.2991	**8.9628**	**0.0000****	0.3630	0.9068	1.2178	0.3175	1.1094	0.4204	0.6655	0.5808
DM→PVT	**3.8009**	**0.0027****	1.5904	0.2780	2.5012	*0.0878**	0.2847	0.7550	1.5062	0.2466	2.4569	0.4484	0.5585	0.7310	1.3697	0.3607	**7.8052**	**0.0000****	0.7406	0.6572	1.4214	0.2591
SM→DM	1.3452	0.2574	0.5535	0.7537	*2.3474*	*0.0843**	0.6664	0.7204	*2.5933*	*0.0921**	1.1341	0.6092	**2.7812**	**0.0716****	**3.9285**	**0.0183****	0.6890	0.6949	**3.3211**	**0.0230****	2.1967	0.1125
DM→SM	**2.9240**	**0.0154****	0.3790	0.8613	1.6479	0.2021	0.9752	0.5986	**5.2101**	**0.0127****	1.4361	0.5580	1.7353	0.1868	1.8465	0.1639	0.6406	0.7300	1.9713	0.1250	1.9005	0.1543

**** Significant at 5% critical level**

** Significant at 10% critical level*

4.3 Panel Data Results

The results for emerging markets panel data show that derivative markets development is dependent on the financial system development level of these countries. All four indicators, financial deepening, financial intermediation and spot market liquidity indicators are positive and significant for emerging markets. In the case of developed markets, spot market liquidity and overall financial deepening indicators are significant showing especially the spot market liquidity as a crucial factor of derivative demand. Both financial intermediation proxies for bank total credit and total credit private sector are found to be insignificant which is consistent with the fact that, in developed economies, banks do not have a dominating role in financial intermediation process. The results of developed markets panel data reveal a strong contribution of derivative markets to economic development process of these countries as the coefficient of market liquidity is found to be positive and significant in both direct relationship and capital formation model. The indirect relationship is also evident in the results.

The combine panel data for all markets are showing a similar picture as of the emerging markets panel data. In all three categories of pooled data, the models are estimated with fixed effect approach to differentiate each market with time invariant dummy variables. In the case of combine panel data, dummy variable is used to discriminate developed markets from emerging markets in the panel. However, results show that all dummy variables are found to be insignificant in all models showing that the markets are more are less behaving in a similar fashion or that the market microstructure and trading mechanism are same. The differences lay in the size of the underlying market, market participants, trading restriction and legal and economic infrastructure faced by these markets. These differentiating factors may not be covered by the dummy variables utilised in the models.

5. Summary and Conclusion

The concept of economic growth and financial development has been a major area of interest for economists and researchers. Various theoretical models have been developed

and empirically proven that a sound financial system is vital for economic growth. But most of the studies concentrated on the role of financial intermediaries such as banks in the economic development process of the countries. On the other hand, global financial deregulations and advanced communication led the economies towards capital markets as key source of financial intermediation. This shift of economies towards capital market is mainly complemented since the 1990s by the advent of the markets for the derivative financial instruments with phenomenal growth during the last two decades. Derivative markets are the integral part of a developed financial system. Derivatives reduce market frictions by providing opportunities for risk sharing, lowering transaction costs and reducing the moral hazards of asymmetric information in the financial markets resulting in efficient allocation of resources and economic development.

This study is the first empirical attempt to gauge the economic functions of derivative markets by testing all proposed relations in the literature. The relationship between derivative market development and economic growth is tested from three perspectives of direct liquidity, capitalisation channel and indirectly with the effects of derivative markets on their underlying spot market development. This study also attempted to analyse critical economic and financial factors creating the demand for derivative markets indicating the readiness of these markets to start derivative products.

Although, the results of the study do not provide conclusive evidence of direct economic contribution of the derivative markets in all 11 cases, it does provide some insight into the relationship between derivative markets development and economic growth as well as the dependence of the derivative markets as a risk-reducing agent for the spot markets/economy. The results appear to suggest that the relationship is dependent on the purpose of utilisation of the derivative markets. A negative relationship between derivative market and economic growth is observed to be prevalent as against the positive functional hypothesis (Zervos *et al.*, 1998). This negative relationship is particularly evident in the cases of developed and matured markets as supporting the hedge function of the market during economic decline periods. These puzzling results are consistent with the argument that as price discovery function of the derivative market has a one-time

impact on the market, the risk transfer function of the derivative market becomes predominant as market matures with passage of time. The market liquidity, then, will be dependent on the hedging activities of the investors in the market.

The results show spot market liquidity is the only significant critical demand factor driving the operations of the derivative markets in both emerging and developed markets. All other economic and financial indicators are found to be insignificant. Each market (operating within a different economic and financial structure) faces a specific set of demand variables, some of which may have not been covered in this study. The results of the Granger's causation model suggest that developed and matured markets follow a Demand-leading pattern of development (in the case of derivative markets) while study could not find any clear direction of causation between economic and financial system indicators with derivative markets development in emerging markets.

Based on the overall observation of economic and financial heterogeneity of each country and critical importance of spot market, the study recommends that emerging markets should follow the Supply-Leading pattern of development, launching derivative products on their most liquid spot market financial products with proper institutional and legal arrangements. Supply-Leading is an active approach of promoting economic growth by establishing the financial infrastructures in a country. The emerging markets can benefit from the pointed development of derivative markets.

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