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DOES FINANCIAL DEVELOPMENT CAUSE ECONOMIC GROWTH? THE CASE OF INDIA

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Does Financial Development cause Economic Growth? The Case of India

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Abstract:

This paper examines the question whether financial development has 'caused' economic growth in India since 1996. The dynamic interactions between the growth of real GDP and indicators of financial development are investigated using the concept of Granger Causality after testing for cointegration using both the Engle-Granger and Johansen techniques. The empirical results suggest the existence of a stable long-run relationship between stock market capitalization, bank credit and growth rate of real GDP. However, causality runs from the growth rate of real GDP to stock market capitalization. The sector-wise rates of growth of the industrial and services sectors are found to be cointegrated with the stock market development as well as banking sector development. The direction of causality for both the sectors run from the rate of growth to stock market capitalization. Furthermore, volatility in stock prices is cointegrated with each growth rate - of GDP, of industrial sector output, and of the service sector output. However, the estimated cointegrating relationship shows that there exists a negative relationship between stock price volatility and the rate of growth of the industrial sector. The overall implication is that economic growth has 'caused' financial development in India. However, the estimated coefficients are small in magnitude, suggesting that the relationship between financial development and economic growth is rather weak.

I Introduction:

The relationship between economic growth and developments in the financial sector has been one of the most discussed areas in economics for a long time; and the direction of causality – whether financial development causes economic growth or vice versa – is by no means a settled issue. Schumpeter (1912), in his effort to analyse the importance of technological innovation in long-run economic growth, emphasised the crucial role that the banking system would play in facilitating investment in innovation and productive investment by the entrepreneur. Joan Robinson (1952), however, maintained that it was economic growth which would create the demand for various types of financial services to which the financial system would respond. In other words, Schumpeter and Robinson point to the mutually opposite directions of causality. The literature on the nature of relationship between economic growth and financial development has since grown enormously and arguments supporting either view on the direction of causality are as strong as their counterparts.[1]

Whether financial development influences economic growth is not just a matter of intellectual curiosity – it is a crucial policy issue as well. Financial development may be either of the bank-based type or stock market-based type. It is a crucial policy question which type of development should the government actively promote. The relative importance of these two types of financial structures in economic growth has been debated for over a century (Allen and Gale, 1999; Stiglitz, 1985). The proponents of the bank-based type argue that banking development plays a crucial role in economic growth and can avoid the shortcomings of the market-based financial systems. The agency problem due to asymmetry of information between the actors in the bank-based system is less severe than in the

[1] Even if we go back to David Hume (1752), we find the discussion about the operation of "cash credit" which Hume calls "bank credit" or "paper credit", in an opulent economy.

market-based type. The stock market-based view, on the other hand, highlights that a well-functioning stock market fosters growth and profit incentives and helps in risk management more efficiently than the bank-based system does (Levine, 2002; Beck and Levine, 2002). The financial structure changes as a country goes through different stages of development, and it is argued that at the advanced stages of development the stock market-based structures are more effective than the bank-based ones in fostering economic growth in a country (Boyd and Smith, 1998). Bencivenga et al.(1996) demonstrates theoretically that a more developed stock market may provide liquidity that lowers the cost of the foreign capital essential for development, especially in low-income countries that cannot generate sufficient domestic savings.

The issue has been addressed empirically as well, in some recent works. Several studies show that it is the bank based financial structure that spurs economic growth (King and Levine, 1993, Boyd and Prescott, 1986). The other group of studies shows that stock market development has played a crucial role in some economies in promoting economic growth (Levine and Zervos, 1996, 1998; Demirguc-Kunt and Levine, 1996a; Atje and Jovanovic, 1993). The latter group argues that a well-developed stock market should increase saving and efficiently allocate capital to productive investments which would lead to an increase in the rate of economic growth. The stock markets, as the argument goes, play a key role in allocating capital to the corporate sector, which would have a real effect on the economy on aggregate. Finally, a third group of studies shows that causality runs in both the directions i.e. economic growth causes the financial development and vice versa (Arestis, Demetriades and Luintel, 2001, Demetriades and Hussein, 1996, Luintel and Khan, 1999). Thus the finance-growth nexus so far remains a rather controversial issue.

[2] causality is highly contested issue in the literature on social science methodology. Here we confine ourselves to the narrower view of causality that econometricians share.

The objective of this paper is to examine whether financial development has *caused*[2] economic growth in India in the post liberalization period. This is an important question which cannot be answered by simply observing the ups and downs in the stock market indicators and the rates of growth in GDP. The financial sector in India since the early nineties has been transforming through various changes in the banking system, liberalization of the rules pertaining to foreign participation in the financial market, and concomitantly, a strong growth in the stock market. Even though apparently these developments in the financial market have been followed by good economic growth, one required an appropriate technique which would meaningfully relate these developments to the growth in GDP during the same period. By applying the cointegration technique to the Indian data for the relevant period, this paper seeks to contribute to the debate on the role of financial reforms in stimulating growth in the Indian economy.

The paper is organized as follows: Section II reviews the empirical evidence on the relationship between financial development and economic growth. Section III discusses methodology and data. Section IV presents the empirical analysis of stock market capitalization, turnover and bank credit, and Section V presents empirical analysis of stock price volatility. Section VI concludes.

II Review of empirical evidence:

Arestis, Luintel and Luintel (2005) observe six developing countries viz., Greece, India, South Korea, the Philippines, South Africa and Taiwan over a period of 30(minimum) to 39 (maximum) years. They define 'financial structure' (STR) as the ratio of market capitalization to bank lending. Thus higher STR means a system that is more of the market-based variety while a lower STR means more of a bank-based type. Based on a Cobb-Douglas production function specification relating output-labour ratio to capital-labour ratio and financial structure, their time-series results show that for the majority of the sample countries financial structure significantly explains economic growth. The results from the dynamic heterogeneous panels also confirm the significance of the financial structure.

Levine and Zervos (1998) argue that banking development, stock market liquidity and stock market capitalization are good predictors of economic growth whereas stock market volatility is insignificantly correlated with economic growth. Based on 47 countries' experience for the period 1976-1993, the paper investigates whether measures of stock market liquidity, size, volatility and integration with world capital markets are robustly correlated with current and future rates of economic growth, capital accumulation, productivity improvements and saving rates. The role of banking is also brought into this analysis. The results suggest a strong and statistically significant relationship between stock market development and economic growth after controlling for initial income, initial investment in education, political stability, fiscal policy, openness to trade and macroeconomic stability. The level of banking development also turns out to be significant in explaining growth.

Beck and Levine (2004) use panel econometric techniques to assess the relationship between stock markets, banks and economic growth over the period 1976-1998 in a panel of 40 countries. They specifically examine whether both measures of stock market and bank development, have a positive relationship with economic growth after (i) controlling for simultaneity bias, omitted variable bias and the routine inclusion of lagged dependent variables in growth regressions (ii) moving to data averaged over five-years instead of quarterly or annual data (iii) assessing the robustness of the results using several variants of the system estimator and (iv) controlling for many other growth determinants. Their study shows that the turnover ratio and bank credit both enter significantly and positively in the growth regressions using the two-step estimator. The one-step estimator, however, indicates that bank credit does not always enter with a p-value below 0.10. Specifically, bank credit does not enter significantly when either trade openness or inflation is

controlled for. However, even with the one-step estimator the financial indicators always enter jointly significantly. Using the alternative system estimator, it is found that both the stock market liquidity and bank development enter the growth regressions significantly except when controlling for trade openness. In the regression controlling for trade openness, bank credit enters with a p-value below 0.05 but turnover is insignificant. Even in this regression, however, they enter jointly significantly.

Arestis, Demetriades and Luintel (2001) demonstrate that while stock markets may be able to contribute to long-term output growth their influence is at best a small fraction of that of the banking system. Utilizing time-series methods and data from five developed economies the study examines the relationship between stock market development and economic growth after controlling for the effects of the banking system and stock market volatility. The five countries included in this study are Germany, USA, Japan, UK and France. Output is indicated by the logarithm of real GDP, stock market development by the logarithm of the stock market capitalization ratio, banking system development by the logarithm of the ratio of domestic bank credit to nominal GDP and stock market volatility is measured by an eight-quarter moving standard deviation of the end-of-quarter change of stock market prices. The results are found to be country-specific. While both stock markets and banks seem to have made important contributions to output growth in France, Germany and Japan, the link between financial development and growth in UK and USA was found to be statistically weak and the relationship runs from growth to financial development. Thus the findings support the view that bank-based financial systems may be more able to promote long-term growth than capital-market based ones. The study also observes that stock market volatility has negative real effects in Japan, France and UK, whereas the same effect was found to be insignificant in Germany. Thus although in principle the presence of volatility in stock prices may reflect efficient functioning of stock markets, the findings of this study do not support this hypothesis.

Singh (1997) argues that stock market development is unlikely to help in achieving quicker industrialization and faster long-term economic growth in most developing countries. Three reasons are cited. First, the inherent volatility and arbitrariness of the stock market pricing process under developing country conditions make a poor guide to efficient investment allocation. Second, the interactions between the stock and currency markets in the wake of unfavourable economic shocks may exacerbate macroeconomic instability and reduce long-term growth. Third, stock market development is likely to undermine the existing group-banking systems in developing countries, which, despite their many difficulties, have not been without merit in several countries, not least in the highly successful East Asian economies.

Levine and Zervos (1996) are among those few studies which considered the relationship between stock market development and economic growth without considering the role of the banking sector. The study uses pooled cross-country time series regressions considering the data on 41 countries over the period 1976-1993. The paper uses an aggregate index of overall stock market development constructed by Demirguc-Kunt and Levine (1996b) which combines information on stock market size, liquidity and integration with world capital markets. While assessing the relationship between stock market development and economic growth the paper includes a large number of control variables viz., the logarithm of initial per capita GDP, the logarithm of initial secondary school enrollment rate, the number of revolutions and coups, the ratio of government consumption expenditures to GDP, the inflation rate and the black market exchange rate premium. Using the instrumental variable method of estimation the study observes that the stock market development is positively correlated with economic growth even after controlling for other factors associated with long-run growth.

Demetriades and Hussein (1996) examine the causal relationship between financial development and economic growth from a time-series perspective considering data from 16 countries over 27 years and demonstrate that the relationship is country-specific. Financial development has been measured by two ratios viz., ratio of bank deposit liabilities to nominal GDP and ratio of bank claims on the private sector to nominal GDP. They find from the Engle-Granger results that at least one of the financial indicators is cointegrated with real GDP per capita in five countries viz., Honduras, South Africa, Sri Lanka, Turkey and Venezuela. On the other hand, based on the Johansen cointegration test, cointegration was determined between at least one indicator of financial development and real GDP per capita in 13 out of 16 countries. The evidence seems stronger in the case of the first financial indicator as this indicator is observed to be cointegrated with real GDP per capita in 13 countries. Countries which show no evidence of cointegration between financial development and economic growth according to Johansen results are Pakistan, Spain and Sri Lanka. Causality tests show that a bi-directional causal relationship exists in six countries viz., Honduras, India, Korea, Mauritus, Thailand and Venezuela. There are only three countries viz., Honduras, Spain and Sri Lanka in which financial indicator causes economic growth. The study also finds clear evidence of reverse causation in six countries viz., El Salvador, Greece, Pakistan, Portugal, South Africa, and Turkey, which refutes the hypothesis that finance is a leading sector in these countries.

Employing the Geweke decomposition test on pooled data of 109 developing and industrialised countries from 1960 to 1994 Calderon and Liu (2003) show that financial development enhances economic growth for all countries. The study divides the countries into two sub-samples viz., developing countries and industrial countries, and uses two measures of financial development viz., the ratio of broad money (M2) to GDP and the ratio of credit provided by financial intermediaries to the private sector to GDP. The study also includes a set of controlling variables namely initial human capital, initial income level, a measure of government size, black market exchange rate premium and regional dummies for Latin America, East Asia and Africa. Some interesting results are obtained from this study. First, the evidence of bi-directional causality is observed when the sample is split into developing and industrial countries. Second, financial depth contributes more to the causal relationships in developing countries, which has the implication that financial intermediaries have larger relative effects in less developed economies than in more developed ones. Third, it is found that financial development may enhance economic growth through more rapid capital accumulation as well as technological changes, though it appears that the productivity channel is stronger.

Based on annual data from 56 countries of which 19 are developed, industrialized countries, Jung (1986) empirically investigates the relationship between financial development and economic growth. The study uses two measures of financial development, viz., currency ratio defined as the ratio of currency to the narrow definition of money (M1) and the monetization variable i.e., the ratio of M2 to nominal GNP. When currency ratios are used, LDCs are found to be characterized by the causal direction running from financial to economic development and DCs by the reverse causal direction. The monetization variable does not appear to distinguish DCs from LDCs in terms of the direction of causality.

The relationship between financial depth and economic growth is investigated by Khan and Senhadji (2000). They examine a panel of 159 countries over the period 1960-1999. The study considers four alternative indicators of financial depth viz., (i) domestic credit to the private sector as a share of GDP (fd1) (ii) fd1 plus the stock market capitalization as a share of GDP (fd2) (iii) fd2 plus the private and public bond market capitalization as a share of GDP (fd3) and (iv) stock market capitalization. The study regresses the growth rate of real GDP

on each indicator of financial depth along with a set of control variables which include investment as a share of GDP, the growth rate of population, the growth rate of terms of trade and the log of initial income. In all the regressions the coefficient of the financial depth indicator is observed to be positive and highly significant suggesting a positive relationship between financial depth and growth.

Luintel and Khan (1999) demonstrate that bi-directional causality exists between financial development and economic growth. The study examines the long-run causality between financial development and economic growth in a multivariate vector autoregression setting using data from 10 countries. In this paper financial development is proxied by a measure of financial depth which is measured as a ratio of total deposit liabilities of deposit banks to one period lagged nominal GDP. The finding of this study is, therefore, different from those reported in the existing bi-variate time-series studies (Jung, 1986 and Demetriades and Hussein, 1996).

III. The Methodology and Data

1. The Methodology:

(a) Series Stationary Test:

To examine whether two time-series are co-integrated with each other, we have to test the stationarity of the series. In this regard, unit root test is usually used to confirm the stationarity of a sequence. In this paper we use the Augmented Dicky-Fuller (ADF) test as well as the Phillips-Perron test to examine whether a sequence is stationary or not. Suppose $\{y_t\}$is an AR(p) process, the testing is as follows:

$$\nabla y_t = \gamma y_{t-1} + \xi_1 \nabla y_{t-1} + \xi_2 \nabla y_{t-2} + \ldots\ldots \xi_{p-1} \nabla y_{t-p+1} + \varepsilon_t,$$

where p is the lag length of the process. The value of p can be determined by Akaike information criterion (AIC) or Schwarz criterion (SC). The hypothesis is $H_0 : \gamma = 0$

$H_1 : \gamma < 0.$

If H_0 is accepted, then the sequence has a unit root, which indicates nonstationarity. On the other hand, if H_0 is rejected, then the sequence does not have a unit root, which means it is stationary.

The augmented Dickey-Fuller test is based on the assumption that the errors are statistically independent and have a constant variance. While relaxing these assumptions we can use an alternative test, namely, Phillips-Perron test. This test allows the disturbances to be weakly dependent and heterogeneously distributed. To explain this procedure consider the following regression equations:

$$y_t = \alpha^* + \beta^* y_{t-1} + \mu_t \text{ and}$$

$$y_t = \alpha_0 + \beta_0 y_{t-1} + \gamma_0(t-T/2) + \mu_t$$

where T= number of observations and the disturbance term μ_t is such that $E(\mu_t) = 0$, but there is no requirement that the disturbance term is serially uncorrelated or homogeneous. Phillips-Perron characterize the distribution and derive test statistics that can be used to test hypotheses about the coefficients α^*, β^*, α_0, β_0 and γ_0 under the null hypothesis that the data are generated by $y_t = y_{t-1} + \mu_t$. Thus the Phillips-Peron test statistics are modifications of the Dickey-Fuller t-statistics that take into account the less restrictive nature of the error process.

If the two time sequences are all integrated of order one i.e., I (1) either following the augmented Dicky-Fuller test or the Phillips-Perron test we can perform co-integration test with them.

(b) Co-integration Test:

Suppose $\{x_t\}$ and $\{y_t\}$ are integrated with order one. To examine whether $\{x_t\}$ and $\{y_t\}$ are co-integrated or not Engle and Granger (1987) proposed

a method of residual based test for co-integration which is known as Engle-Granger method. In this method, at first we have to regress y_t on x_t so that we get $y_t = \alpha + \beta x_t + \varepsilon_t$. Then we denote $\alpha^\wedge$ and $\beta^\wedge$ as the estimated regression coefficients vectors. Secondly, we estimate $\varepsilon^\wedge = y_t - \alpha^\wedge - \beta^\wedge x_t$. If $\varepsilon^\wedge$ is integrated of order zero i.e. $\varepsilon^\wedge$ is stationary, then $\{x_t\}$ and $\{y_t\}$ are co-integrated. In this context, $(1, -\beta^\wedge)$ is called the co-integrating vector and $y_t = \alpha + \beta x_t + \varepsilon_t$ is called the co-integrating equation, which stands for a long-run equilibrium relationship between $\{x_t\}$ and $\{y_t\}$.

Let us suppose that the time sequences $\{y_1\}$ and $\{y_2\}$ are stationary. The Granger approach to the question of whether y_1 causes y_2 is to check how much of the current y_2 can be explained by the past values of y_2 and then to see whether adding lagged values of y_1 can improve the explanation. y_2 is said to be Granger-caused by y_1 if past information on y_1 helps to improve the prediction of y_2. In other words, if the coefficients on the lagged y_1s are statistically significant, y_2 is said to be Granger-caused by y_1.

Granger causality test runs on the basis of bivariate regressions of the form:

$y_{1t} = c_1 + \Sigma\alpha_i y_{1t-I} + \Sigma\beta_j y_{2t-j} + \varepsilon_{1t}$ ....Unrestricted equation (1)

$y_{1t} = c_1 + \Sigma\alpha_I y_{1t-I} + \upsilon_{1t}$ ....Restricted equation (2)

Equation (1) and (2) can be obtained by Ordinary Least Squares (OLS). The F-statistics are the Wald statistics for the joint hypothesis: $\beta_j = 0$ (j=1,2,3, ...q) for each equation. The null hypothesis is that y_2 does not Granger-cause y_1 in the second regression.

2. Data:

The empirical analysis is carried out using quarterly data for India during the period 1996.III to 2005.I. Three empirical models have been analysed. While the first model is concerned with the whole economy, the second model relates the growth of the industrial sector to the financial sector development and the third one relates the growth of the service sector to the financial sector development. Economic growth is measured as the growth rate of gross domestic product at factor cost at 1993-94 prices (RGDP) and estimated from the data published by the Reserve Bank of India (2004-05). Real rate of growth of the industrial sector (RIND) and real rate of growth of the services sector (RSERV) are also estimated on the basis of data published by the same source. Two stock market development indicators are used. The first one is the total market capitalization variable at the National Stock exchange (TCAP) defined as the value of listed domestic shares at NSE as percentage of GDP and the second one is the turnover at National Stock Exchange as percentage of GDP (TURN). Stock market data is obtained from the publication of the Reserve Bank of India (2004-05). We have also estimated stock market volatility. Following Arestis and Demetriades (1997) stock market volatility is measured by the nine quarter moving standard deviation of the S&P CNX NIFTY prices (VOLATILITY). The banking system development indicator is the total bank credit variable (TBC), defined as the total domestic credit claims on private sector as percentage of GDP. Bank credit data is obtained from several issues of International Financial Statistics (IMF). In the empirical analysis, all variables

except RGDP,RIND,RSERV are expressed in logarithms (LTCAP, LTURN, LTBC). Following Maddala and Kim (1998) we do not prefilter the data. Hence our variables are not seasonally adjusted.

IV. Empirical Results: Stock Market Capitalization, Turnover and Bank Credit

Test Results for Unit Roots

Both the augmented Dicky-Fuller (ADF) and Phillips-Perron unit root tests are used to test stationarity of each variable. The null hypothesis tested is that the variable under investigation has a unit root against the alternative that it does not. The second and third columns of Table 1 report the test results for unit roots. It appears that all the variables are nonstationary at the level i.e. each variable has a unit root according to either of the test criteria. However, the first differences of the variables are found to be stationary according to both the test criteria. Therefore, it appears that all the six variables are integrated of order one.

Test Results for Cointegration

Model 1: All sectors:

Table 2 presents results of cointegration tests using the Engle-Granger procedure for GDP. Each row reports coefficients from two regressions. First we regress y_t on x_t and obtain the estimated coefficients a and b. Then we estimate the residuals from this regression and test if the residual series is stationary. From the latter test we get ρ and test for the presence of unit root in the residual series. From the Engle-Granger procedure it appears that only RGDP and LTCAP are cointegrated. No cointegration exists between RGDP and LTURN and between RGDP and LTBC. However, substantial bias occurs in the estimation method of Engle-Granger procedure which is based on OLS method

(Banerjee et. al., 1986). Therefore, we also applied Johansen method, which uses maximum-likelihood method of estimation.

Tables 3-5 report the results from Johansen method. Johansen cointegration tests include both eigenvalue and likelihood ratio or trace statistics. The first row in each of the Tables 3, 4 and 5 tests the hypothesis of no cointegration, the second row tests the hypothesis of one cointegrating relation, and so on, all against the alternative hypothesis of full rank i.e., all series in the VAR are stationary. In Table 3, the trace statistic indicates the presence of two cointegrating equations at 5% significance level, which implies that RGDP and LTCAP are cointegrated. In Tables 4 and 5 the trace statstic does not reject any of the hypotheses at the 5% level, which implies that there exists no cointegration between RGDP and LTURN and between RGDP and LTBC.

Therefore, we get similar findings from both the Engle-Granger procedure and Johansen method. In both the cases the test results suggest that the rate of growth of real GDP and market capitalization at the stock exchange are cointegrated. This means that they have a stable long-run equilibrium relationship. On the other hand, the rate of growth of real GDP is not cointegrated either with the turnover ratio at the stock market or with the banking sector development indicator.

We have also tested for cointegration considering all the three variables, viz., RGDP, LTCAP and LTBC together. The results are reported in Table 6. The trace statistic indicates the presence of one cointegrating relation. The estimated cointegration relationship is

$$RGDP = 1.92 - 0.05\ LTCAP + 0.07LTBC + Z_t$$

The estimated equation shows that an upward shock in the stock market due to a rise in market capitalization is associated with a decrease in the rate of growth of real GDP whereas an increase in bank credit boosts real economic activity. The estimated cointegrating vector among the three variables suggests that real economic activity is affected by changes in market capitalization and bank credit in the long run. However, the magnitude of the estimated coefficients is quite small indicating that stock market capitalization and bank credit partially determine the magnitude of real economic activity.

Model II: Industry

Table 7 reports results for testing for cointegration in the industrial sector using the Engle-Granger procedure. From the Engle-Granger procedure it appears that RIND and LTCAP and RIND and LTURN are cointegrated. No cointegration exists between RIND and LTBC.

Tables 8-10 report the results from Johansen method. In each of tables 7 and 8 the trace statistic indicates the presence of two cointegrating equations at 5% significance level. This implies that RIND and LTCAP and RIND and LTURN are cointegrated. In Table 9 also, the trace statistic indicates the presence of one cointegrating equation at 5% significance level, which implies that RIND and LTBC are cointegrated. Therefore, we get different findings from the Engle-Granger procedure and Johansen method. Johansensen test results indicate that a stable long-run equilibrium relationship exists between the rate of growth of the industrial sector, both with the stock market and the banking sector.

We have also tested for cointegration between RIND, LTCAP and LTBC together. The results are reported in Table 11. The trace statistic indicates the presence of one cointegrating relation. The estimated cointegration relationship is

$$RIND = 21.93 - 1.03\ LTCAP - 3.27\ LTBC + Z_t$$

The estimated equation suggests that the real rate of growth of industry is affected by the changes in market capitalization and bank credit in the long run. The magnitude of the estimated coefficients shows that both the stock market capitalization and bank credit contribute significantly to determining the magnitude of the real rate of growth of industry.

Model III: Service sector

Table 12 reports the results for cointegration in the service sector using the Engle-Granger procedure. It appears that RSERV and LTURN are cointegrated. No cointegration exists between RSERV and LTCAP and RESERV and LTBC.

Tables 13-15 report the results from Johansen method. In each of tables 13 and 14 trace statistic indicates the presence of two cointegrating equations at 5% significance level. These imply that RSERV and LTCAP and RSERV and LTURN are cointegrated. In Table 15 also, the trace statistic indicates the presence of one cointegrating equation at 5% significance level, which implies that RSERV and LTBC are cointegrated. Therefore, like Model II, we get different findings from the Engle-Granger procedure and Johansen method. Johansen test results indicate that a stable long-run equilibrium relationship exists between the rate of growth of the service sector both with the stock market and the banking sector.

We have also tested for cointegration between RSERV, LTCAP and LTBC together. The results are reported in Table 16. The trace statistic indicates the presence of one cointegrating relation. The estimated cointegration relationship is

$$RSERV = 18.36 + 0.42\ LTCAP - 3.69\ LTBC + Z_t$$

The estimated equation suggests that the real rate of growth of the service sector is affected by the changes in market capitalization and bank credit in the long run. However, the small magnitude of the market capitalization indicates that its influence on the rate of growth of the service sector is rather modest.

Test Results for Granger- causality

Model I: All sectors

Following the Engle-Granger hypothesis the cointegration test results presented above imply that per capita real GDP growth and financial development variables have a causal relationship. Table 17 reports the results considering two variables at a time.

From the test results we cannot reject LTCAP does not Granger cause RGDP. But we reject RGDP does not Granger cause LTCAP. It has the implication that causality runs from the rate of growth of real GDP to market capitalization at the stock market and not the other way around.

Model II: Industry

Table 18 reports the test results for Granger causality. From the test result we cannot reject LTCAP does not Granger cause RIND. But we reject RIND Granger causes LTCAP, which implies that causality runs from real rate of growth of industry to market capitalization. Another interesting finding is that a bi-directional causal relationship exists between RIND and LTBC, which implies that the real rate of growth of the industry and bank credit to the private sector causes each other.

Model III: The Service Sector

Table 19 reports the test results for Granger causality. From the test results we cannot reject LTCAP does not Granger cause RSERV. But we reject RSERV Granger cause LTCAP, which implies that the causality runs from real rate of growth of the service sector to market capitalization.

The analysis above and the empirical findings have an important implication for the conduct of economic policy regarding the role of finance in the Indian economy in the post-reform period. The findings imply that financial development does not cause economic growth in India. Rather, the relationship runs from growth to financial development. Our findings are broadly consistent with the view expressed by Singh (1997) who questions the positive role of stock market development in the long-run growth.

V. Further Results: Stock Market Volatility

Both the augmented Dicky-Fuller and Phillips-Perron unit root tests are used to test the stationarity of VOLATILITY. Test results are reported in Table 20. It appears that the variable has a unit root according to both the test criteria. Since the first difference of the variable appears to be stationary, it implies that the series is integrated of order one.

To test the presence of cointegration between VOLATILITY and the three growth indicators we have applied both the Engle-Granger procedure and the Johansen method. Table 21 reports results for testing cointegration using Engle-Granger procedure. It appears that the stock market volatility is cointegrated with each of the three growth indicators i.e. RGDP, RIND and RSERV. Tables 22-24 report the results from Johansen method. Trace statistic from all the three tables indicates the presence of two cointegrating equations at 5% significance level. Thus VOLATILITY is cointegrated with each of three variables viz., RGDP, RIND and RSERV. Therefore, we get similar findings from both the Engle-Granger procedure and Johansen method. In both the cases the test results suggest that the rate of growth of GDP and stock price volatility are cointegrated. Cointegration also exists between the rate of growth of the industrial sector and stock price volatility and between the rate of growth of the service sector and stock price volatility. However, the estimated cointegrating relationship shows that there exists a negative relationship between VOLATILITY and RIND. Thus an increase in stock price volatility is associated with a decrease in the rate of growth of industrial sector.

Table 25 reports the results of Granger causality. From the test results it is evident that stock price volatility has no causal relationship with the rate of growth of GDP or the rate of growth of the industrial sector or the rate of growth of the service sector.

VI. Conclusion

This paper has examined the question whether financial development has 'caused' economic growth in India since 1996. This question is important because during the nineties banking system was liberalized and foreign participation in the stock market was actively promoted in India. A large number of theoretical and empirical studies have analysed the finance-

growth nexus, of which a good number used cross-country data. But there has been strong evidence that this relationship is country-specific (Luintel and Khan, 1999, Demetriades and Hussein, 1996). Therefore, this study provides empirical evidence on finance-growth nexus in India based on the quarterly data for the period 1996 to 2005.

The paper employed four measures of financial development viz., total market capitalization at the stock market to nominal GDP, turnover at the stock exchange to nominal GDP, stock price volatility and total bank credit to nominal GDP. The dynamic interactions between the growth of real GDP and financial development are investigated using the concept of Granger causality, after testing for cointegration for which both the Engle-Granger and Johansen techniques were used.

The empirical results suggest the existence of a stable long-run relationship among stock market capitalization, bank credit and growth rate of real GDP. On the other hand, causality test results show that causality is running from growth rate of real GDP to stock market capitalization. This has the implication that economic growth has 'caused' financial development in India. However, the estimated coefficients are small in magnitude, suggesting that the relationship between financial development and economic growth is rather weak.

It has been found that a stable long-run equilibrium relationship exists between the rate of growth of the industrial sector both with the stock market capitalization and stock market turnover. Rate of growth of the industrial sector is also found to be cointegrated with the banking sector development. The rate of growth of the service sector is also observed to be cointegrated with the stock market capitalization and stock market turnover as well as bank credit.

Granger causality results suggest that causality runs from the rate of growth of the industrial sector to stock market capitalization and from the rate of growth of the service sector to stock market capitalization. Moreover, it is found that the rate of growth of the industrial sector and bank credit causes each other.

Our findings further suggest that the rate of growth of GDP and stock price volatility are cointegrated. Cointegration also exists between the rate of growth of the industrial sector and stock price volatility and between the rate of growth of the service sector and stock price volatility. However, the estimated cointegrating relationship shows that there exists a negative relationship between stock price volatility and the rate of growth of the industrial sector.

Before concluding we have to mention one caveat of this study. The frequency of the data on the rate of growth of GDP, rate of growth of the industrial sector and rate of growth of the service sector is quarterly. On the other hand, the data on stock market capitalization, turnover and stock price are reported monthly. Therefore, we have estimated the quarterly figures for these variables taking three months' average. Due to this adjustment mechanism some loss of information may have taken place.

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Table 1. Test Results for Unit Roots

	ADF test	Phillips-Perron test
RGDP	I(1) (7 lags, without C &T)	I(1) (without C & T)
	(-0.0447)	(-8.20)
LTBC	I(1) (9 lags, with C&T)	I(1) (with C&T)
	(-4.72)	(0.9871)
LTCAP	I(1) (5 lags, without C&T)	I(1) (with C&T)
	(-0.2184)	(-5.48)
LTURN	I(1) (2 lags, without C&T)	I(1) (with C)
	(0.1637)	(-5.65)
RIND	I(1) (4 lags, with C)	I(0) (without C&T)
	(-3.08)	(-6.43)
RSERV	I(1) (7 lags, without C&T)	I(0) (with C)
	(-0.64)	(-17.13)
DRGDP	I(0) (6 lags, without C&T)	I(0) (without C&T)
	(-6.63)	(-16.74)
DLTBC	I(0) (2 lags, with C)	I(0) (with C& T)
	(-9.74)	(-5.48)
DLTCAP	I(0) (5 lags, without C&T)	I(0) (without C&T)
	(-3.62)	(-5.33)
DLTURN	I(0)(1 lag, without C &T)	I(0)(without C&T)
	(-6.98)	(-6.98)
DRIND	I(0) (10 lags, without C&T)	I(0) (without C&T)
	(-3.49)	(-16.34)
DRSERV	I(0) (6 lags, without C&T)	I(0) (without C&T)
	(-4.49)	(-34.27)

Table 2. The Engle-Granger Cointegration Tests : All Sectors

Y_t	X_t	α	β	ρ	n
RGDP	LTCAP	-57.72	12.25	-3.048	8
		(-1.25)	(1.30)	(-2.656)*	
RGDP	LTURN	-2.02	1.87	-0.903	7
		(-0.18)	(0.41)	(-2.652)	
RGDP	LTBC	-36.28	8.07	-2.36	10
		(-0.63)	(0.67)	(-4.39)	

* indicates significance at 1% level.

Table 3. The Johansen Cointegration Test between RGDP and LTCAP

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.408261	22.16979	15.41	20.04	None**
0.192896	6.429076	3.76	6.65	At most 1*

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RGDP –3.42 LTCAP +14.26

Table 4. The Johansen Cointegration test between RGDP and LTURN

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.278836	14.86784	15.41	20.04	None
0.155242	5.061163	3.76	6.65	At most 1*

LR rejects any cointegration at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

Z = RGDP –0.47 LTURN –1.38

Table 5. The Johansen Cointegration test between RGDP and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.358525	13.3345	15.41	20.04	None
0.000353	0.010596	3.76	6.65	At most 1

LR rejects any cointegration at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RGDP –0.045 LTBC –2.27

Table 6. The Johansen Cointegration Test between RGDP, LTCAP and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.866273	63.54334	29.68	35.65	None**
0.225693	7.208685	15.41	20.04	At most 1
0.001665	0.046645	3.76	6.65	At most 2

LR test indicates 1 cointegrating equation at 5% significance level.

(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RGDP + 0.05 LTCAP – 0.07 LTBC –1.92

Table 7. The Engle-Granger Cointegration Tests:Industry

Y_t	X_t	α	β	ρ	n
RIND	LTCAP	0.45	0.16	-3.086	8
		(0.025)	(0.04)	(-2.65)*	
RIND	LTURN	5.93	-1.99	-3.19	5
		(1.47)	(-1.18)	(-2.64)*	
RIND	LTBC	9.64	-1.75	-3.21	10
		(0.44)	(-0.38)	(-4.39)	

* indicates significance at 1% level.

Table 8. The Johansen Cointegration test between RIND and LTCAP

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.715819	49.11075	15.41	20.04	None**
0.205515	7.592003	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5%(1%) significance level.

Z = RIND + 2.56 LTCAP –13.76

Table 9. The Johansen cointegration test between RIND and LTURN

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.691221	46.56262	15.41	20.04	None**
0.210107	7.783316	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5%(1%) significance level.

Z = RIND +0.90 LTURN –3.32

Table 10. The Johansen cointegration test between RIND and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.752424	48.74508	15.41	20.04	None**
0.077884	2.675783	3.76	6.65	At most 1

LR test indicates 1 cointegrating equation at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RIND +3.34 LTBC –17.19

Table 11.The Johansen Cointegration test between RIND, LTCAP and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.761626	61.19999	29.68	35.65	None*
0.298532	13.88080	15.41	20.04	At most 1
0.063917	2.179682	3.76	6.65	At most 2

LR test indicates 1 cointegrating equation at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RIND + 1.04 LTCAP + 3.27 LTBC –21.94

Table 12. The Engle-Granger Cointegration Tests: Service sector

Y_t	X_t	α	β	ρ	n
RSERV	LTCAP	5.39	-0.53	-0.72	10
		(0.14)	(-0.07)	(-2.66)	
RSERV	LTURN	13.99	-4.76	-2.89	6
		(1.70)	(-1.38)	(-2.64)*	
RSERV	LTBC	28.36	-5.34	-1.49	10
		(0.63)	(-0.57)	(-2.66)	

* indicates significance at 1% level.

Table 13. The Johansen Cointegration Test between RSERV and LTCAP

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.727107	50.46607	15.41	20.04	None**
0.205943	7.609800	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RSERV +5.06 LTCAP –27.56

Table 14. The Johansen cointegration Test between RSERV and LTURN

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.697638	47.41962	15.41	20.04	None**
0.214022	7.947272	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

Z = RESERV +1.52 LTURN –6.34

Table 15. The Johansen Cointegration Test between RSERV and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.834070	61.74404	15.41	20.04	None**
0.072109	2.469745	3.76	6.65	At most 1

LR test indicates 1 cointegrating equation at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = RSERV +4.01LTBC –21.96

Table 16. The Johansen Cointegration Test between RSERV, LTCAP and LTBC

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.841642	75.29257	29.68	35.65	None**
0.319090	14.47689	15.41	20.04	At most 1
0.052918	1.794180	3.76	6.65	At most 2

LR test indicates 1 cointegrating equation at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

Z = RSERV –0.42 LTCAP +3.69 LTBC –18.36

Table 17. Granger Causality Test Results: All Sectors

Null hypothesis	F-Statistic	Probability
LTCAP does not Granger cause RGDP	0.52821	0.71618
RGDP does not Granger cause LTCAP	4.80392	0.00614
LTURN does not Granger cause RGDP	1.28502	0.30616
RGDP does not Granger cause LTURN	1.50136	0.23614
LTBC does not Granger cause RGDP	1.77549	0.16978
RGDP does not Granger cause LTBC	11.4898	3.5E-05

Table 18. Granger Causality Test Results: Industry

Null hypothesis	F-statistic	Probability
LTCAP does not Granger cause RIND	0.21635	0.92650
RIND does not Granger cause LTCAP	2.65855	0.05991
LTURN does not Granger cause RIND	0.06329	0.99208
RIND does not Granger cause LTURN	0.96349	0.44711
LTBC does not Granger cause RIND	3.17570	0.03341
RIND does not Granger cause LTBC	6.56006	0.00124

Table 19. Granger Causality Test Results: Service Sector

Null hypothesis	F-statistic	Probability
LTCAP does not Granger cause RSERV	0.32149	0.86051
RSERV does not Granger cause LTCAP	4.27954	0.01035
LTURN does not Granger cause RSERV	1.28583	0.30586
RSERV does not Granger cause LTURN	1.47926	0.24251
LTBC does not Granger cause RSERV	0.11032	0.97761
RSERV does not Granger cause LTBC	12.8332	1.5E-05

Table 20. Test Results for Unit Roots: Stock Price Volatility

	ADF test	Phillips-Perron test
VOLATILITY	I(1) (4 lags, with C)	I(1) (with C)
	(-2.62)	(-2.55)
DVOLATILITY	I(0) (1 lag, with C&T)	I(0) (without C&T)
	(-5.78)	(-4.42)

Table 21. The Engle-Granger Cointegration Tests: Stock Price Volatility

Y_t	X_t	α	β	ρ	n
VOLATILITY	RGDP	114.70	-0.10	-2.68*	4
		(12.01)	(-0.13)		
VOLATILITY	RIND	115.91	-1.17	-3.47*	1
		(11.99)	(-0.57)		
VOLATILITY	RSERV	115.93	-0.53	-3.40*	1
		(11.90)	(-0.53)		

Table 22. The Johansen Cointegration Test between VOLATILITY and RGDP

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.850680	72.59652	15.41	20.04	None**
0.257868	9.841544	3.76	6.65	At most 1 **

LR test indicates 2 cointegrating equations at 5% significance level.

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = VOLATILITY –71.54 RGDP +83.68

Table 23. The Johansen Cointegration Test between VOLATILITY and RIND

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.711586	51.60759	15.41	20.04	None**
0.274219	10.57674	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equations at 5% significance level.

(**) denotes rejection of the hypothesis at 5% (1%) significance level.

Z = VOLATILITY + 61.96 RIND –189.26

Table 24. The Johansen Cointegration Test between VOLATILITY and RSERV

Eigenvalue	Likelihood ratio	5 percent critical value	1 percent critical value	Hypothesized No. of Cointegrating equation
0.671886	47.16773	15.41	20.04	None**
0.270161	10.39274	3.76	6.65	At most 1**

LR test indicates 2 cointegrating equation at 5% significance level.

*(**) denotes rejection of the hypothesis at 5%(1%) significance level.

Z = VOLATILITY – 228.47 RSERV +517.06

Table 25. Granger Causality Test Results: Stock Price Volatility

Null Hypothesis	F-Statistic	Probability
RGDP does not Granger cause VOLATILITY	0.92756	0.46496
VOLATILITY does not Granger cause RGDP	1.88617	0.14866
RIND does not Granger cause VOLATILITY	0.12748	0.97087
VOLATILITY does not Granger cause RIND	1.65050	1.19732
RSERV does not Granger cause VOLATILITY	0.42942	0.78581
VOLATILITY does not Granger cause RSERV	0.36509	0.83080