The New Information Age the Stock Market Growth Puzzle

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Abstract

We investigate the nexus between developments in financial intermediation with the growth in capital market activity and implications for the retail investors in India, over the post-liberalization period ranging 1993-2004. The estimations using unrestricted VAR based on error correction models, both in the short term and the long term models illustrate the short run relationship the time-series properties of stock market development and the new information age nexus. The coherent picture which emerges from Granger-causality test based on vector error correction model (VECM) further reveals that in the long run, stock market development Granger-causes financial infrastructural growth. Our findings suggest that the evolution of financial sector and in particular the stock market tends to, or is more likely to stimulate and promote economic growth when monetary authorities adopt liberalized investment and openness policies, improve the size of the market and the de-regulate the stock market intone with the objectives of macroeconomic stability. This study provides robust empirical evidence in favor of finance-led growth hypothesis for the Indian economy.

Keywords: Stock Market, Growth, Investor, Infrastructure Development, Causality, Cointegration, VAR, VECM, India

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Introduction

World over, the investors today seem to gain by the growth in stock market activity due to the emergence of the new information age. The new information age has led to creation of well established financial systems ably backed by sophisticated financial infrastructure comprising of closely connected institutions, better regulations, faster transactions and transparent market practices. Conceptually, well-developed financial infrastructure is important for growth of the stock market activity in a given economy due the efficient underlying functions the financial institutions are expected to perform. The close observations on the subject suggest that improvements in such financial arrangements strongly correlate with better stock market performance. It thus follows from the above proposition that the evolution of financial infrastructure in such an age has a great impact on the operation of stock market and thus, interalia on the investors for any given nation. If it is true, then domestic financial infrastructure development is also expected to have significant liaisons with the economic growth.

Using set of econometric models this paper firstly explores the time-series properties of capital market developments and the nexus between developments of financial intermediation with the growth in capital market activity for India over the post-reform period, 1994 through 2004. Both over short-run and the long-run perspective the paper seeks answer; whether the financial infrastructure variables are complementary or a substitute for stock market performance? In what way Investors decisions are affected by financial and capital market developments? and finally to which extent has the thrust on creating capital market infrastructure specifically in the post-liberalisation period, affects the growth in the stock market activity. The principle question underhand is thus to re-examine the “infrastructure development & the stock market growth puzzle” from a developing economy perspective.

Objectives & Significance

The objective of the present study is to contribute to the existing debate on stock market development and the new information age nexus, by analyzing the time-series for India over a longer time-frame of 10 years. The present study aims at three-pronged objectives. This work is the foremost attempt to quantify the extent and the magnitude of select financial infrastructure development indicators on the stock market performance. Secondly, we test the time-series properties of those variables to analyze the dynamic co-integrating behavior of the time-series in the short run and the long run. Finally, we statistically detect the direction of causality (cause and effect relationship) in a multivariate setting when temporally there is a lead lag relationship between financial infrastructure development indicators with that of the development of stock market activity.

Understanding the causal relationship between financial development due to the new information age and economic growth is important in enhancing the efficacy of policy decisions for a developing country like India. The importance of the debate for developing countries comes from the fact it has important policy implications for priorities that should be given to reforms of the financial sector by public authorities. The pinpoint focus on creation of an efficient infrastructure network can ignite development in other sectors, while its shortage or over-expansion can raise costs and create disincentives. Moreover, the causality issue between financial intermediation activity and capital market growth in such countries is still very far from being settled. The aim of this paper is to shed more light and to look at the above issue empirically using the contemporary econometric techniques.

Our study is different from the rest in many ways. Earlier studies are based on cross-country analysis, moreover relate to developed countries alone. Related researches done in the past three decades mostly focused on the role of financial development in stimulating economic growth, without taking into account of the stock market development. Leaving aside the infrastructure-growth debate we proceed to deliberate on the specific effect of post-liberalization financial intermediary development on the stock market in the economic growth process. Thus, the investigated issue will be useful either for researchers and policy makers looking for optimal policies to institute competitive economic growth.

In the remainder of the paper, we review the available literature in section 2. Sections 3 & 4 describe the data and lay the econometric methodology respectively.

Section 5 presents and analysis through the results obtained from the different tests, while the final section (6) concludes.

2. Underlying Theories and Empirical Evidence

Theoretically, in the environment friendly, appropriate technology based, decentralized Alternative Development Model, finance is not a factor of crucial in economic development. In the convential model of modern industrialism however the perceptions in this regard vary a great deal, Bhole (1999). The theoretical literature and cross-sectional results on the topic can be loosely grouped into three main categories; Supply Leading approach, Demand Following approach and a Cautionary or Feedback approach. According to the first, financial activity is considered as a major determinant of real activity where well functioning financial systems are crucial for economic growth. The "finance-led growth" hypothesis postulates the "supply-leading" relationship between financial and economic development. The "growth-led finance" hypothesis states that a high economic growth may create demand for certain financial instruments and arrangements and the financial markets are effectively response to these demands and changes. In other words, this hypothesis suggests a "demand following" relationship between finance and economic developments. The third, "feedback" hypothesis suggests a two-way causal relationship between financial development and economic performance. In this hypothesis, it is asserted that a country with a well-developed financial system could promote high economic expansion through technological changes, product and services innovation. This in turn, will create high demand on the financial arrangements and services.

Though the relationship between financial development and economic growth has been extensively studied in the recent decades, the issue is not new in development economics and may go back at least to Schumpeter (1912) who stresses the importance of financial services in promoting economic growth. The literature by Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), Roubini and Sala-I-Martin (1992), Pagano (1993), King and Levine (1993b), Berthelemy and Varoudakis (1996), Greenwood and Smith (1997) support the view that financial development (repression) has positive (negative) effects on economic growth in the steady state. Boyd and Smith (1995), Demirguc-Kunt and Levine (1996), Demirguc-Kunt and Maksimovic (1996) and Levine and Zervos (1996) investigate the compatibility of stock market development with financial intermediaries and economic growth and find that the stock market development is positively correlated with the development of financial intermediaries and long-term economic growth. Demirguc-Kunt and Levine (1996) examine the interaction between stock market and financial intermediaries' development and find that across countries, the level of stock market development is positively correlated with the development of financial intermediaries. Recently, economists like Demetriades and Luitel (1996) has started to reject openly the amplified negative effects of financial repression policies and claims that intervention policies may have positive effects whenever they are able to successfully address market failure. Levine and Zervos (1998) on the other hand find that the stock market liquidity and banking development are both positively and robustly correlated with contemporaneous and future rates of economic growth.

Earlier Causality pattern based studies include that of Sims (1972), Gupta (1984), Jung (1986), Toda and Phillips (1993), Murende and Eng (1994), Demetriades and Hussein (1996), Arestis and Demetriades (1996) and Kul and Khan (1999) find that the causality pattern varies across countries and with the success of financial liberalization policies implemented in each country and with the development level of the financial sector generally.

3. Data Sources and Variables

The necessary secondary data for India (in Indian Rupees) for the period 1994-2004 is adjusted for inflation using the Wholesale Price Index (WPI) and emerge from number of sources namely, the Handbook of Statistics on the Indian Economy, published and the annual reports published by the Reserve Bank of India, the Handbook of Statistics on the Indian Securities Markets as well as the annual reports of the Securities Exchange Board of India, the website of the Bombay Stock Exchange, and the other regular publications on capital markets by the Centre for Monitoring of the Indian Economy (CMIE).

In order to examine the extent of the thrust of creating capital market infrastructure specifically in the post-liberalization period on the growth in the financial market activity we use variables relating the capital markets. Levine and Zervos (1996) argue that well-developed stock markets may be able to offer financial services of a different kind than by the banking system and may therefore provide a different kind of impetus to investment and growth than provided by the development of the banking system. Financial infrastructural development lies at the essence of stock market development after the post-1993 reforms. Shah and Thomas (1996), Shah (1998) and Bhole (1999) present an elucidate description of the institutional changes and its qualitative and quantitative effect on the financial sector and specifically on the stock market. We examine a broad array of stock market infrastructure development indicators. The creation of necessary institutional infrastructure through setting up of the National Stock Exchange, the Over The Counter Stock Exchange of India, Depositories, Clearing and Custodial Services, evolution of an array of hybrid derivative instruments for trading, inculcation of efficient market practices towards settlement of trades, electronic exchanges, ringless trading mechanisms, market based pricing and through setting up better regulatory infrastructure by relaxation of norms permitting foreign capital, amending archaic regulations and through promulgation of new codes allowing relating takeovers, buyback of shares *etc* have a significant bearing on the stock market activity.

The dependent variable in this case is the size of Stock Market Activity **(SMA)** proxied by the BSE market capitalization to GDP. Specifically, we examine the effect of the above stated infrastructural measures proxied by the measures like magnitude of Market Openness **(MO)** defined as the ratio of FII inflows to GDP, degree of Investor Protection **(IP)** as a percentage of investor grievance redressal rate by the SEBI, Sock Market Liquidity **(ML)** measured as total turnover in cash segment to GDP, the extent of Globalization on Indian corporatism **(GL)** as the size of Euro Issues by Indian corporates abroad to GDP, controlling for Corporate Fundamentals **(FN)** proxied by the price-earning ratio of the BSE Sensex companies.

4. Research Techniques

Unit Root testing

In the first stage, the order of integration is tested using the Augmented Dicky Fuller (ADF) and the Philip-Perron (PP) unit root tests. Unit Root tests are conducted to verify the stationarity properties (absence of trend and long-run mean reversion) of the time series data so as to avoid spurious regressions. A series is said to be (weakly or covariance) stationary if the mean and autocovariances of the series do not depend on time. Any series that is not stationary is said to be nonstationary. A series is said to be integrated of order d, denoted by I(d), if it has to be differenced d times before it becomes stationary. If a series, by itself, is stationary in levels without having to be first differenced, then it is said to be I(0). Consider the equation

$$y_t = \rho y_{t-1} + x_t' \delta + \varepsilon_t \qquad 1$$

Where x_t are optional exogenous regressors which may consist of constant, or a constant and trend, ρ and δ are parameters to be estimated, and ε_t is assumed to be white noise. If $|\rho| \geq 1$, y is a nonstationary series and the variance of y increases with time and approaches infinity if $|\rho|<1$, y is a (trend) stationary series. Thus, the hypothesis of (trend) stationarity can be evaluated by testing whether the absolute value of ρ is strictly less than one.

We use ADF test using MacKinnon (MacKinnon, 1991) critical values. This test constructs a parametric correction for higher-order correlation by assuming that the y series follows an AR(p) process and adding p lagged difference terms of the dependent variable y to the right-hand side of the test regression

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + v_t \qquad 2$$

This augmented specification is then used to test the hypothesis

$$H_0 : \alpha = 0, \text{ against } H_1 : \alpha < 0 \qquad 3$$

If we could not reject the null hypothesis H_0: $\alpha = 0$, it meant that $\alpha = 0$ and the series α contains a unit root. Where $\alpha = \rho - 1$ and evaluated using the conventional t-ratio for α

$$t_\alpha = \hat{\alpha} / (se(\hat{\alpha})) \qquad 4$$

Where $\hat{\alpha}$ is the estimate of α and $se(\hat{\alpha})$ is the coefficient standard error

An important result obtained by Fuller is that the asymptotic distribution of the t-ratio for α is independent of the number of lagged first differences included in the ADF regression. ADF tests are tried with constant and trend terms, and with constant only. Inclusion of a constant and a linear trend is more appropriate, since the other two cases are just special cases of this more general specification. However, including irrelevant regressors in the regression will reduce the power of the test to reject the null of a unit root. For considering appropriate lag lengths, we use the VAR process in conjunction with the Lag range selection test.

Phillips (1987) and Phillips-Perron (1988) suggest an alternative approach for checking the presence of unit roots in the data. They formulate a nonparametric test to the conventional t-test which is robust to a wide variety of serial correlation and time dependent hetroscedasticity. The PP unit root test requires estimation of the following equation (without trend).

$$X_t = \mu_t + \sum_{i=1}^{T} X_{i-T} + u_t \qquad 5$$

The bias in the error term results when the variance of the true population differs from the variance of the residuals in the regression equation. PP test statistic reduces to the DF test-statistic when auto correlation is not present.

$$\sigma_u^2 = \lim_{T\to\infty} T^{-1} \sum_{t=1}^{T} E(u_1^2) \qquad 6$$

Consistent estimators of σ^2 and σ_u^2 are

$$S_u^2 = T^{-1} \sum_{t=1}^{T} (u_t^2) \qquad 7$$

$$S_{Tk}^2 = T^{-1} \sum_{t=1}^{T} (u_t^2) + 2T^{-1} \sum_{t=1}^{k} \sum_{t=j+1}^{T} u_t u_{t-j} \qquad 8$$

Where k is the lag truncation parameter used to ensure that the auto-correlation is fully captured.

The PP test-statistic under the null-hypothesis is of I(0)

$$Z(t_\mu) = \langle S_u \mid S_{tk} \rangle t_\mu - \tfrac{1}{2}\left(S_{tk}^2 - S_u^2\right)\left[S_{tk} \left\{ T^2 \sum_{t=2}^{T} (Y_t - Y_{t-1})^2 \right\}^{1/2} \right] \qquad 9$$

Multivariate Cointegration

The Cointegration tests are applied to detect the presence of any long-term relationship between the variables. Engle and Granger (1987) points that a linear combination of two or more non-stationary series may be stationary and if such a stationary linear combination exists the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. For two series to be cointegrated, both need to be integrated of the same order, 1 or above. If both series are stationary or integrated of order zero, there is no need to proceed with cointegration tests since standard time series analysis would then be applicable. If both series are integrated of different orders, it is safely possible to conclude non-cointegration. Lack of cointegration implies no long-run equilibrium among the variables such that they can wander from each other randomly. Their relationship is thus spurious. For any *k* endogenous variables, each of which has one root, there will be 0 to *k*-1 cointegrating relationships. The Residual-based approach proposed by Engle and Granger (1987) and the maximum likelihood method developed by Johansen and Juselius (1990). This test helps ascertain the existence of a long-run equilibrium relationship between economic growth and select financial development indicators in multivariate setting.

As suggested above, a set of variables is said to be cointegrated if a linear combination of their individual integrated series l(d) is stationary. All the time series, are individually subjected to unit root analysis to determine their integrating order and if they are stationary of a given order, in order to estimate the cointegration regression equation, we regress EG on other financial indicators as follows

$$SMA_t = \beta_1 + \beta_2 MO_t + \beta_3 IP_t + \beta_4 ML_t + \beta_5 GL_t + \beta_6 FN_t + u_t \qquad 10$$

This can respectively, be written as

$$u_t = (SMA_t - \beta_1 - \beta_2 OP_t - \beta_3 IP_t - \beta_4 ML_t - \beta_5 GL_t - \beta_6 FN_t) \qquad 11$$

If the residuals, u_t from the above regressions are subject to unit root analysis are found l(0) i.e. stationary, then the variables are said to be cointegrated and hence interrelated with each other in the long run or equilibrium. If there exists a long term relationship between the above two series, in the short run there may be a disequilibrium. Therefore one can treat the error term u_t in the above equations as the "equilibrium error". This error term can be used to tie the short run behavior of the dependent variable to its long-run value.

The error correction mechanism (ECM) corrects for disequilibrium and the relationship between the two cointegrating variables can be expressed as ECM as under.

$$\Delta SMA_t = \alpha_0 + \alpha_1 \Delta OP_t + \alpha_2 \Delta IP_t + \alpha_3 \Delta ML_t + \alpha_4 \Delta GL_t + \alpha_5 \Delta FN_t + u_{t-1} + \varepsilon_t \qquad 12$$

Where, Δ denotes the first difference operator, ε_t is the random error term and u_{t-1} in equation 12, is the lagged term consisting of

$$u_{t-1} = (SMA_t - \beta_1 - \beta_2 MO_t - \beta_3 IP_t - \beta_4 ML_t - \beta_5 GL_t - \beta_5 FN_t) \qquad 13$$

The error correcting equation 12 state that the dependent variable depends not only on the specified independent variables but also on the equilibrium term. If the later is non zero, the model is out of equilibrium. If the concerned independent variable is zero and u_{t-1} is positive, the dependent variables are too high to be in equilibrium. That is, the respective dependent variable is above its equilibrium value of $(\alpha + \alpha_1 \text{independent variables}_{t-1})$. Since α_2 is expected to be negative, the term $\alpha_2 u_{t-1}$ is negative and, therefore, dependent variable will be negative to restore the equilibrium. That is, if the dependent is above its equilibrium value, it will start falling in the next period to correct the equilibrium error. By the same token, if u_{t-1} is negative, dependent variable is below its equilibrium value), $\alpha_2 u_{t-1}$ will be positive, leading dependent variable to rise in period *t*.

The post-regression diagnostic tests are conducted to detect probable bias (es) on account of the multicollinearity, autocorrelation and hetroskedastic variance in the variables understudy. The reported values of post–regression Durbin Watson, Variance Inflating Factor / Tolerance Limits (VIF & TOL) , and the Szroeter's test statistic detects autocorrelation, multicollinearity and presence of hetroscedasticity in the variables respectively. As a thumb rule it is assumed; Durbin Watson statistic value of around 2, assumes there is no first-order autocorrelation either positive or negative, the larger the VIF, or closer TOL is to one, greater the evidence that a variable is not collinear with the other regressors. The Szroeter's statistic test helps to test the null hypothesis of constant variance against alternate hypothesis of monotonic variance in variables while the Ramsey RESET omitted variable test using powers of the fitted values of regressions are used to check the null hypothesis that the model has no omitted variables. Since the Robust standard errors are reported in the regression results it should however be noted that the robust standard errors are much greater then the normal standard errors and therefore the robust *t* ratios are much smaller than normal *t* ratios.

In a multivariate system, the alternate cointegration procedure suggested by Johansen (1988), and Johansen and Juselius (1992) is very popularly followed in the recent literature. The Johansen and Juselius framework provides suitable test statistics {maximum eigen values and the trace test) to test the number of cointegrating relationship, as well as the restrictions on the estimated coefficients and involves an estimation of a vector error correction model (VECM) to obtain the likely-hood ratios (LR). The VECM runs in the following sequence

Consider a VAR of order p $y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \varepsilon_t$ 14

Where y_t is a k-vector of non-stationary I(1) variables, x_t is a d-vector of deterministic variables, and ε_t is a vector of innovations.

We may rewrite this VAR as

$$y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \varepsilon_t \qquad 15$$

$$\text{where } \Pi = \sum_{i=1}^{p} A_I - I, \text{ and } \Gamma_i = -\sum_{j=i+1}^{p} A_j \qquad 16$$

Granger's representation theorem asserts that if the coefficient matrix ρ has reduced rank r<k, then there exist $k \times r$ matrices α and β each with rank r such that $\alpha = \alpha\ \beta'$ and $\beta' y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the VEC model. Johansen's method is used to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π.We assume that the level data have no deterministic trends and the cointegrating equations have intercepts such as

$$H_1^*(r) : \Pi y_{t-1} + \beta x_t = \alpha(\beta' y_{t-1} + \rho_0) \qquad 17$$

In order to determine the number of r cointegrating relations conditional on the assumptions made about the trend, we can proceed sequentially from r = 0 to r = k-1 until we fail to reject. The trace statistic reported in the first block tests the null hypothesis of r cointegrating relations against the alternative of k cointegrating relations, where k is the number of endogenous variables, for r = 0,1,.....,k-1. The alternative of k cointegrating relations corresponds to the case where none of the series has a unit root and a stationary VAR may be specified in terms of the levels of all of the series. The trace statistic for the null hypothesis of r cointegrating relations whereas the max statistic tests the null hypothesis of r cointegrating relations against the alternative of r +1 cointegrating relations. The trace statistic (tr) and the max statistics (max) are computed as

$LR_{\text{tr}}(r \mid k) = -T \sum_{i=r+1}^{k} \log(1-\lambda_i)$ and $LR_{\max}(r \mid r+1) = -T\log(1\text{-}\lambda_{r+1})$, which can be transformed as $= LR_{\text{tr}}(r \mid k) - LR_{\text{tr}}(r+1 \mid k)$ for r = 0,1,.....,k-1. 18

Where λ_i is the i-th largest eigenvalue of the Π matrix in equation 16.

Causality using Unrestricted VAR

Ordinary linear regression or correlation methods cannot be used to establish a casual relation among variables. In particular it is well known that when two or more totally unrelated variables are trending over time they will appear to be correlated simply because of the shared directionality. Even after removing any trends by appropriate means, the correlations among variables could be due to causality between them or due to their relations with other variables not included in the analysis. Granger (1988) introduced a useful method to test for Granger causality between two variables. The basic idea is that if changes in *X* precede changes in *Y*, then *X* could be a cause of *Y*. This involves an unrestricted regression of *Y* against past values of *Y*, with *X* as the independent variable. The restricted regression is also required in the test, regressing *Y* against past values of *Y* only. This is to verify whether the addition of past values of *X* as an independent variable can contribute significantly to the explanation of variations in *Y*, Pindyck and Rubinfeld (1998). The test involves estimating the following pair of regressions

The causal relationship between economic growth and financial development indicators is examined with the help of Granger-Causality procedure based on Unrestricted Vector Auto Regression using the error correction term. This procedure is particularly attractive over the standard VAR because it permits temporary causality to emerge from firstly, the sum of the lagged differences of the explanatory differenced variable and secondly, the coefficient of the error-correction term. In addition, the VECM allows causality to emerge even if the coefficients lagged differences of the explanatory variable are not jointly significant, Miller and Russek (1990). It must be pointed out that the standard Granger-causality test omits the additional channel of influence. VAR model is estimated to infer the number of lag terms required (with the help of simulated results using VAR) to obtain the best fitting model and appropriate lag lengths were then used in causality tests yielding the F-statistics and respective p-values. For any F-statistic, the null hypothesis is rejected when the p-value is significant (less than 0.05 or 5% level of significance or those stated otherwise). A rejection of the null hypothesis would imply that the first series Granger-causes the second series and vice versa. The equations 18 is now transformed to include the error correction term as depicted in the following equations respectively

$$\Delta X_t = \phi_0 + \sum_{i=1}^{p} \phi_{1,m} \Delta X_{m,t-i} + \sum_{i=1}^{q} \phi_2 \Delta Y_{t-i} + \psi RES_t + \varepsilon_{1L} \qquad 19$$

Where the error terms is taken from the following cointegrating equation

$$\Delta X_t = \beta_0 + \beta_m (\Delta Y_{m,t}) + \varepsilon_t \qquad 20$$

The independent variables in the equations are first differenced. The null hypothesis ΔY doesn't Granger cause ΔX is rejected if the estimated coefficients $\phi_{1,m}$ as well as the estimated coefficient of error term are jointly significant.

5. Discussions

The decisive role of the financial system in mobilizing and allocating the resources for capital formation and economic growth has been well established by many empirical studies, Levine (1997). We attempt to point the desirability of policy measures that promote financial intermediation, in terms of the financial market opening process (MO) *i.e.* the magnitude to or the ease at which foreign institutional investments freely flow in the economy, the degree of efficacy of investor protection measures initiated by the SEBI in terms of grievance redressal rate (IP), the extent to market liquidity in the stock market (ML) determines the ease at which a security can be converted into liquid form, the extent of Globalization on Indian corporatism (GL) as the size of Euro Issues by Indian corporates abroad to GDP, controlling for Corporate Fundamentals (FN) proxied by the price-earning ratio of the BSE Sensex companies in order to ensure sustainable and organized growth in the dependent variable, stock market activity (SMA).

The variables are expressed in its year to year growth to avoid the non-stationary properties in the data. The following tables (1 & 2) express the stock market activity and its intermediation development as a percentage of GDP for the post-1993 periods. The equity markets in developing countries until the 1990's generally suffered from the classical defects of bank-dominated economies, that is, shortage of equity capital, lack of liquidity, absence of foreign institutional investors, lack of investor's confidence in the stock market and virtual absence of investor protection mechanisms. Since liberalization, the capital markets of the developing countries started developing with financial liberalization and the easing of legislative and administrative barriers coupled with adoption of tougher regulations to boost investor's confidence. With the beginning of financial liberalization in the developing countries, the flow of private foreign capital from the developed to the developing countries has increased significantly and such inflows of foreign capital have been mainly in the form of foreign direct investment and portfolio investment.

Table 1. Descriptive Statistics for Variables

	SMA	MO	IP	ML	GL	FN
Mean	53.29	2.14	76.58	26.59	0.32	22.45
Median	49.33	1.96	92.45	22.10	0.27	19.07
Maximum	84.19	5.17	95.40	83.43	0.79	41.24
Minimum	25.50	0.23	20.90	5.57	0.10	12.86
Std. Dev.	15.60	1.20	24.44	23.55	0.22	9.86
Jarque-Bera (JB)	0.81	4.16	2.14	4.26	2.22	1.96
Probability of JB	0.67	0.12****	0.34	0.12****	0.33	0.37

Note: **** denote 2-tailed significance at 15 percent level

Since the associated *P*-Values of JB statistic are reasonably high in the time-series the normality assumption in the above data is not rejected. India's equity market has transformed owing to the reforms of 1993–04. These reforms have transformed market practices, sharply lowered transactions costs, and improved market efficiency. The stock market activity (SMA) measured by the ratio of market capitalization to GDP marks the most impulsive movements and plunged southwards 7 times below its average of 53% reflecting the impulsive market trends. The intraday and interday SENSEX variability has been high between 1993-95 and 2001-03. The SMA has not become more stable and sustainable under the stabilization program.

Table 2. Pearson's Pair-wise Correlation Matrix amongst Variables

	SMA	MO	IP	ML	GL	FN
SMA	1.00	0.63*	0.26	0.10	0.12	0.17
MO	0.63*	1.00	0.02	0.15	0.34	0.35
IP	0.26	0.02	1.00	0.08	0.24	0.02
ML	0.10	0.15	0.08	1.00	0.25	0.46
GL	0.12	0.34	0.24	0.25	1.00	0.61**
FN	0.17	0.35	0.02	0.46	0.61**	1.00

Note: 1.* & ** denote 2-tailed significance at 1 & 5 percent levels respectively.

Withstanding the theory all the financial institutional development indicators positively correlate with the stock market activity, indicating an overall growth in the capital market in the period. The influx foreign capital has risen significantly by almost 22 times within the time span of decade since 1993 also the number of companies that have raised funds through euro issues (represented by the variable GL) have shown an remarkable increase. The degree of market openness measured as the ratio of FII inflows to GDP, the investor protection & grievance handling infrastructure initiated by SEBI followed by financial fundamentals bears a high load on the SMA, though none are significant except for the former. Interestingly the movements in the SMA are not strongly (and significantly) reflective of their financial fundamentals (FN) measured in terms of the PE ratio. Similar is the case with the injection of liquidity created by the effective infrastructure in the financial system. Truly, the correlation coefficient between financial fundamentals and the extent of globalisation are strong and significant.

We proceed with our further estimations in three steps. Firstly, we subject the time series variables to stationarity test for the existence of unit root in the time-series of above variables following ADF and PP specification, for the regression of a non-stationary time series on another non-stationary time series may produce spurious regression estimates.

Table 3. Results of the Unit Root Tests

Model 1 At Levels	**ADF t-Statistic**	**Prob.***	**PP t-Statistic**	**Prob.***
Exogenous: Constant & No Trend				
Δ Stock Market Activity	-4.10	0.00*	-4.33	0.00*
Δ Market Openness	-3.60	0.00*	-3.56	0.00*
Δ Investor Protection	-3.90	0.00*	-4.00	0.00*
Δ Market Liquidity	-2.99	0.03**	-3.01	0.03**
Δ Globalization	-4.62	0.00*	6.73	0.00*
Δ Fundamentals	-3.00	0.03**	-2.99	0.03**
Exogenous: Constant & Linear Trend				
Δ Stock Market Activity	-3.52	0.03**	-3.56	0.03*
Δ Market Openness	-3.00	0.13****	-2.95	0.12****
Δ Investor Protection	-4.40	0.00*	-5.24	0.00
Δ Market Liquidity	-2.21	0.08***	2.99	0.09***
Δ Globalization	-4.17	0.00*	-6.06	0.00
Δ Fundamentals	-3.04	0.11****	-3.12	0.09***

Notes: 1.ADF and PP are Augmented Dickey Fuller & Philip-Perron test results respectively. 2. Δ denote first-differences 3. *, ** & *** denote probabilities of 2-tailed significance asymptotic at 1, 5 & 10 percent levels respectively.

The unit root test presented in table 3 confirms that no variables in both our models demonstrate the presence of any stochastic trends; that is they do not contain a unit root in its first differenced form. Secondly, we attempt to estimate the nexus between economic performance and financial infrastructure development with a VAR framework. After confirming the data is stationary, it is possible to carry out the cointegration tests between the different proxies of new information age indicators and the stock market activity growth to test for the existence of a stable relationship between them. Econometrically, cointegration means that we have co-evolution of financial infrastructure development underlying the new information age and stock market activity in India, which gives in the long run a cointegrating vector or a log run equilibrium state. In order to check for the long term relationship amongst the dependent and independent variables, we subject the variables to estimation using the specifications stated in equation 12.

Table 4. Regression Estimates

Coefficients with P- values for Long-Run Cointegration					
Dependent Variable	**Independent Variables**	**Coefficients**	**Robust Std. Er**	***t*-Stat**	**Prob.**
Stock Market Activity	**Constant**	-2.91	8.89	-0.33	0.76
	Openness	11.44	3.28	3.49	0.02**
	I-Protection	0.52	0.39	1.32	0.25
	Liquidity	0.00	0.24	0.00	0.94
	Globalization	-14.85	14.53	-1.02	0.35
	Fundamentals	0.15	0.61	0.25	0.82
R-squared= 0.47 Durbin-Watson= 2.43 *F*-statistic= 18.75 (0.00)* Mean VIF, TOL= 1.48, 0.72 ADF test for Residual= -3.54 (0.00)*					
Coefficients with P- values for Short-Run Cointegration					
Δ Stock Market Activity	**Constant**	-4.20	3.74	-1.12	0.37
	Δ Openness	17.51	3.31	5.30	0.34
	Δ I-Protection	0.05	0.16	0.32	0.01*
	Δ Liquidity	0.49	0.14	3.56	0.77
	Δ Globalization	-24.64	10.99	-2.24	0.04**
	Δ Fundamentals	0.06	0.29	0.23	0.11
	u_{t-1}	-2.16	0.28	-7.80	0.84
R-squared= 0.95 Durbin Watson= 1.73 F-statistic= 29.42 (0.00)* Mean VIF, TOL=1.95, 0 ADF test for Residual= -2.36 (0.15)****					

Note: Same as in Table 3

The reported values of post–regression statistics are displayed separately along with the regression coefficients in table 4 illustrating the long run relationship between the regressand with the regressors. Consequently, the short run dynamics of the variables are seen as fluctuations around this equilibrium and the ECM indicates how the system adjusts to converge to its long-run equilibrium state. The speed of adjustment, to the long run path, is indicated by the magnitudes of the coefficients of α vectors (i.e. α *1* and α *2*). The effect of the error correction term β*Xt-1* on economic growth depends, first, on the sign of the adjustment coefficient α *1* and second, on the sign of $\beta Xt\text{-}1$ itself since $\beta Xt\text{-}1$ is a stationary process and may be positive, negative or equal to zero.

The above table quantifies the magnitude of cointegration of the stock market activity with the developments in related financial infrastructure. Both the short term and the long term models illustrate the short run relationship between the regressand with the regressors. The error correction term is not significant but has the expected negative sign signifying the underlying variables are weakly exogenous. The short run changes in the regressors have a positive impact on the short run changes in the independent variable which means that when the error correction term is negative, the effect on growth is positive. The signs and the coefficients of the independent variables can be interpreted as the short run relation between the regressors and the regressand. The capital inflow has the significantly largest positive impact on the capital market activity in their post-1993 periods in the short-run as well in the long run. The changes in SMA are strongly driven by the FII activity in the short-run which means a significant part of interday and intraday volatility in the stock market is influenced by the foreign institutional players. The investor-protection infrastructure initiated by the SEBI plays a very positive role in the long-run then in the immediate periods. The results further stress the fundamental fact that only in the short-run changes in the SMA are driven by liquidity conveying the scope speculative transactions. A boom in the secondary market has generally not accompanied by a corresponding boom in the euro issue market. Surprisingly, the fund pulling ability of Indian companies through ADR/GDR abroad has failed to move the stock market activity in the desired direction. In fact it is mandatory for the corporates opting for Euro issues to comply with the better disclosure practices, to initiate corporate governance protocols and adhere to international accounting and auditing standards. Similarly it is evident that the fundamental financial factors have a limited bearing on the stock market.

The above results are to be dealt with some caution and based on the above results it is still unjust to state that the market activity is not driven by the fundamentals or corporate fundamentals have no role to play in the up surging market activity today. To check the robustness of these results, we have to see the dynamic interaction between the cointegrated variables in the long run and how each one is causing the other. To carry on this, we should test the direction of granger causality between the cointegrated indicators of financial and economic development for each country. According to Granger (1988), if two variables are cointegrated, then we wait for Granger causation in at least one direction. The dynamic interaction between the cointegrated variables through Unrestricted VAR is appended in table 6 and the resulting summary of the causality hypothesis test for stock market infrastructure development variables due to the advent of new information age are distinct, as presented in Table 5 below.

Table 5. Granger Causality Wald Test with 2 Lags

Null Hypothesis	**Coefficients with P-values for Short-Run Non-Causality**	**Coefficients with P-values for Long-Run Non-Causality**
Effect = Stock Market Activity		
Openness does not Granger Cause Market Activity	23.65 (0.00)* **Reject**	0.54 (0.46) **Fail to Reject**
I-Protection does not Granger Cause Market Activity	0.62 (0.43) **Fail to Reject**	
Liquidity does not Granger Cause Market Activity	0.60 (0.44) **Fail to Reject**	
Globalization does not Granger Cause Market Activity	7.61 (0.01)** **Reject**	
Fundamentals does not Granger Cause Market Activity	16.27 (0.00)* **Reject**	
Growth in Market Activity does not Granger growth in infrastructure		22.08 (0.00)* **Reject**
Effect = Openness		
Market Activity does not Granger Cause Openness	0.98 (0.32) **Fail to Reject**	0.93 (0.33) **Fail to Reject**
I-protection does not Granger Cause Openness	0.99 (0.32) **Fail to Reject**	
Liquidity does not Granger Cause Openness	1.23 (0.27) **Fail to Reject**	
Globalisation does not Granger Cause Openness	0.07 (0.80) **Fail to Reject**	
Fundamentals does not Granger Cause Openness	16.65 (0.00)* **Reject**	
ALL does not Granger Cause Openness	77.69 (0.00)* **Reject**	
Effect =Investor Protection		
Market Activity does not Granger Cause I-protection	0.07 (0.80) **Fail to Reject**	0.08 (0.7)*** **Fail to Reject**
Openness does not Granger Cause I-protection	0.09 (0.76) **Fail to Reject**	
Liquidity does not Granger Cause I-protection	0.06 (0.80) **Fail to Reject**	
Globalisation does not Granger Cause I-protection	0.29 (0.59) **Fail to Reject**	
Fundamentals does not Granger Cause I-protection	2.89 (0.09)*** **Reject**	
ALL does not Granger Cause I-protection	31.89 (0.00)* **Reject**	
Effect = Liquidity		
Market Activity does not Granger Cause Liquidity	7.70 (0.01)** **Reject**	8.92 (0.00)* **Reject**
Openness does not Granger Cause Liquidity	0.86 (0.35) **Fail to Reject**	
I-protection does not Granger Cause Liquidity	8.34 (0.00)* **Reject**	
Globalisation does not Granger Cause Liquidity	17.71 (0.00)* **Reject**	
Fundamentals does not Granger Cause Liquidity	8.79 (0.00)* **Reject**	
ALL does not Granger Cause Liquidity	381.29 (0.00)* **Reject**	
Effect = Globalisation		
Market Activity does not Granger Cause Globalisation	17.62 (0.00)* **Reject**	17.83 (0.00)* **Reject**
Openness does not Granger Cause Globalisation	12.64 (0.00)* **Reject**	
I-protection does not Granger Cause Globalisation	18.15 (0.00)* **Reject**	
Liquidity does not Granger Cause Globalisation	17.42 (0.00)* **Reject**	
Fundamentals does not Granger Cause Globalisation	51.41 (0.00)* **Reject**	
ALL does not Granger Cause Globalisation	100.79 (0.00)* **Reject**	

Notes: *, ** & *** denote probabilities of 2-tailed significance asymptotic at 1, 5 & 10 percent levels respectively.

In the short-run financial infrastructure causes stock market activity while in the long-run the direction is from stock market activity towards infrastructural growth in the new information age. Stock market can be viewed as an effective leading sector in channeling and transferring the financial resources between surplus and deficit units in the economy. In this regard, the success of creating, developing financial market infrastructure to enhance economic growth may be attributed to the sustained efforts of the reforms through Indian monetary authority's policy and strategy. In the long-run, development of the stock market activity has led to development financial infrastructure. Evolution of stock markets has impact on the operation of financial intermediaries and hence, on economic promotion. Particularly, the speed of economic growth is highly dependent on the size of banking system and the activeness of stock market. Levine and Zervos (1998) provide empirical evidence that the stock market liquidity and banking development are both positively and robustly correlated with contemporaneous and future rate of economic growth.

The results dispel the myth that in India the stock market is not driven by fundamentals. In fact we find evidence that financial Fundamentals causes stock market activity, openness, globalization, and has led to growth of liquidity in the sector. Heightened market activity causes growth in market turnover and in turn higher liquidity. The investor protection efforts have led to increased liquidity due to enhanced confidence of the investors but independence of causality is suggested between market activity and investor protection.

6. Summary and Policy Implications

The coherent picture which emerges from Granger-causality test based on vector error correction model (VECM) further reveals that in the long run, stock market development Granger-causes infrastructural growth. Hence, this study provides robust empirical evidence in favor of finance-led growth hypothesis for the Indian economy.

The capital market infrastructure development indicators have a highly positive causation coefficient with the capital market economic activity implying that they have developed together. Our findings suggest that the evolution of financial sector and in particular the stock market tends to, or is more likely to stimulate and promote economic growth when monetary authorities adopt liberalized investment and openness policies, improve the size of the market and the de-regulatate the stock market intone with the macroeconomic stability. Thus, substantial development of a stock market is a necessary condition for complete financial liberalisation. Levine (1991), and Bencivenga, Smith and Starr (1996) confirm that stock markets can boost economic activity through the creation of liquidity. Risk diversification, through internationally integrated stock markets, is another vehicle through which stock markets can raise resources and affect growth, Obstfeld (1995). By facilitating longer-term, more profitable investments, liquid markets generally improve the allocation of capital and enhance prospects for long-term stock market & the economic growth. The view offered by Shah and Thomas (1997) can be considered as representative supporting the role of stock market development for economic growth. According to them the stock market in India is more efficient than the banking system on account of the enabling government policies and that stock market development has a key role to play in the reforms of the banking system by generating competition for funds mobilisation and allocation. High information and transaction costs prevent resources promotion and financial deepening. Hence, an efficient capital market would contribute to long-term economic growth.

Development of capital market related infrastructure can do a good job of delivering essential services and can make a huge difference to informed investor decisions. Ensuring robust financial sector development with the minimum of crises is essential for growth and reducing transaction cost and inefficiencies as has been repeatedly shown by recent research findings. Regulatory and institutional factors may also influence the development of stock markets. Regulations that instill investor confidence in brokers and other capital market intermediaries should encourage investment in the stock market by enhancing investor participation. This variable helps measure the performance monitoring activity of the institutions in order to discipline those not asking proper and effective use of their resources and could yield substantial effects in the long-run.

Appendix

Table 6. Estimates using Unrestricted VAR with 1 Lag

Variables	Lags	Coef.	Std. Err.	z	P>z	95% Conf. Interval	
Stock Market Activity (SMA)							
SMA	L1	-4.18	5.09	-0.82	0.41	-14.15	5.80
MO	L1	-25.66	5.28	-4.86	0.00*	-36.01	-15.32
IP	L1	4.02	5.11	0.79	0.43	-5.99	14.03
ML	L1	-1.72	2.22	-0.77	0.44	-6.07	2.64
GL	L1	85.03	30.83	2.76	0.01*	24.61	#####
FN	L1	-0.77	0.19	-4.03	0.00*	-1.15	-0.40
ECT	L1	6.47	8.84	0.73	0.46	-10.85	23.79
Constant		7.41	11.51	0.64	0.52	-15.15	29.98
Market Openness (MO)							
SMA	L1	0.56	0.57	0.99	0.32	-0.55	1.68
MO	L1	-1.67	0.59	-2.83	0.01*	-2.83	-0.51
IP	L1	-0.57	0.57	-0.99	0.32	-1.69	0.55
ML	L1	0.28	0.25	1.11	0.27	-0.21	0.76
GL	L1	-0.88	3.46	-0.25	0.80	-7.66	5.90
FN	L1	-0.09	0.02	-4.08	0.00*	-0.13	-0.05
ECT	L1	-0.96	0.99	-0.96	0.34	-2.90	0.99
Constant		-1.10	1.29	-0.85	0.39	-3.63	1.43
Investor Protection (IP)							
SMA	L1	1.60	6.26	0.25	0.80	-10.67	13.86
MO	L1	-1.97	6.49	-0.30	0.76	-14.69	10.74
IP	L1	-1.91	6.28	-0.30	0.76	-14.21	10.39
ML	L1	0.68	2.73	0.25	0.80	-4.67	6.03
GL	L1	20.24	37.90	0.53	0.59	-54.05	94.52
FN	L1	-0.40	0.24	-1.70	0.09***	-0.86	0.06
ECT	L1	-2.99	10.86	-0.28	0.78	-24.28	18.30
Constant		-4.16	14.15	-0.29	0.77	-31.90	23.58
Market Liquidity (ML)							
SMA	L1	-17.28	6.23	-2.78	0.01*	-29.49	-5.08
MO	L1	-5.99	6.46	-0.93	0.35	-18.64	6.67
IP	L1	18.04	6.25	2.89	0.00*	5.79	30.28
ML	L1	-8.31	2.72	-3.06	0.00*	-13.64	-2.99
GL	L1	158.76	37.73	4.21	0.00*	84.82	#####
FN	L1	-0.69	0.23	-2.97	0.00*	-1.15	-0.24
ECT	L1	32.30	10.81	2.99	0.00*	11.11	53.49
Constant		41.04	14.09	2.91	0.00*	13.44	68.65
Globalisation (GL)							
SMA	L1	-0.54	0.13	-4.20	0.00*	-0.79	-0.29
MO	L1	0.47	0.13	3.55	0.00*	0.21	0.74
IP	L1	0.55	0.13	4.26	0.00*	0.30	0.80
ML	L1	-0.23	0.06	-4.17	0.00*	-0.34	-0.12
GL	L1	3.62	0.78	4.64	0.00*	2.09	5.15
FN	L1	-0.03	0.00	-7.17	0.00*	-0.04	-0.03
ECT	L1	0.94	0.22	4.22	0.00*	0.51	1.38
Constant		1.22	0.29	4.20	0.00*	0.65	1.79

Fundamentals (FN)							
SMA	L1	-16.80	0.60	-28.01	0.00*	-17.97	-15.62
MO	L1	11.86	0.62	19.08	0.00*	10.64	13.08
IP	L1	17.28	0.60	28.73	0.00*	16.10	18.46
ML	L1	-7.30	0.26	-27.91	0.00*	-7.82	-6.79
GL	L1	134.95	3.63	37.15	0.00*	127.83	#####
FN	L1	-1.16	0.02	-51.59	0.00*	-1.21	-1.12
ECT	L1	29.41	1.04	28.25	0.00*	27.37	31.45
Constant		39.74	1.36	29.30	0.00*	37.08	42.40
Error Correction Term (ECT)							
SMA	L1	-16.75	3.56	-4.70	0.00*	-23.74	-9.77
MO	L1	-0.41	3.70	-0.11	0.91	-7.66	6.83
IP	L1	16.87	3.58	4.72	0.00*	9.87	23.88
ML	L1	-7.52	1.56	-4.83	0.00*	-10.57	-4.47
GL	L1	116.69	21.59	5.40	0.00*	74.37	#####
FN	L1	0.11	0.13	0.81	0.42	-0.15	0.37
ECT	L1	29.19	6.19	4.72	0.00*	17.06	41.32
Constant		33.91	8.06	4.21	0.00*	18.11	49.71

Note: Same as in Table 5

References

Arestis, P. and Demetriades, P. 1997. "Financial Development and Economic Growth: Assessing the Evidence". *The Economic Journal*, 107(May): 783-799.

Bencivenga, Valerie et Smith, Bruce, 1991. "Financial Intermediation and Endogenous Growth". *Review of Economic Studies,* 58:195-209.

Bhole, L. M. 1999. *Financial Institutions and Markets: Structure, Growth and Innovations.* 3rd Edition. New Delhi: Tata McGraw-Hill Publishing Company Limited.

Boyd, J. H. and Smith, B. D. 1995. "The Evolution of Debt and Equity Markets in Economic Development". *Draft, Federal Reserve Bank of Minneapolis.*

Demetriades, P. and Hussein, K. A. 1996. "Does Financial Development Cause Economic Growth? Time-series Evidence from 16 Countries". *Journal of Development Economics,* 51: 387-411.

Demetriades, P. and Luintel, K. 1996. "Financial Development, Economic Growth and Banking Sector Controls: Evidence from India". *The Economic Journal,* 106: 359-374.

Demirguc-Kunt A. and Levine, R. 1996. "Stock Markets, Corporate Finance and Economic Growth: An Overview". *World Bank Economic Review*, 10.

Demirguc-Kunt, A. and Maksimovic, V. 1996. "Stock Market Development and Financing Choices of Firms". *World Bank Economic Review,* 10.

Engle, R. and Granger, C. W. J. 1987. "Cointegration and Error-correction: Representation, Estimation and Testing". *Econometrica* (55): 251-276.

Granger, C. W. J. 1969. "Investigating Causal Relations by Econometric Methods and Cross-Spectral Methods". *Econometrica,* 37, 424-438.

Granger, C. W. J. 1980. "Testing for Causality: A Personal Viewpoint". *Journal of Economic Dynamics and Control,* 2,329-352.

Granger, C. W. J. 1981. "Some Properties of Time Series Data and their Use in Econometric Model Specification". *Journal of Econometrics,* 16, 121-130.

Granger, C. W. J. 1988. "Granger Causality, Cointegration, and Control". *Journal of Economic Dynamics and Control,* 12: 551-59.

Greenwood, J. and Smith, B. 1997. "Financial Markets in Development, and the Development of Financial Markets". *Journal of Economic Dynamic and Control,* 21: 145-181.

Johansen, S. 1988. "Statistical Analysis of Co-integrating Vectors". *Journal of Economic Dynamic and Control,* 12: 231-254.
Johansen, S. and Juselius, K. 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money". *Oxford Bulletin of Economics and Statistics*, 52: 169-210.
Johansen, S. and Juselius, K. 1992. *Some Structural Hypotheses in a Multivariate Cointegration Analysis of Purchasing Power Parity and the Uncovered Interest Parity for UK*. Denmark: University of Copenhagen.
Jung, W. S. 1986. "Financial Development and Economic Growth". *Economic Development and Cultural Change*, 34: 336-346.
King, R. and Levine, R. 1993. "Financial Intermediation and Economic Development" in *Financial Intermediation in the Construction of Europe*, ed. by Colin Mayer and Xavier Vives, PP. 156-89.
King, R. and Levine, R. 1993b. "Finance, Entrepreneurship and Growth: Theory and Growth". *Journal of Monetary Economics*, 32(Dec): 513-542.
Kul B. L. and Khan, M. 1999. "A Quantitative Reassessment of the Finance growth Nexus: Evidence from a Multivariate VAR". *Journal of Development Economics*
Levine, R. 1997. "Financial Development and Economic Growth: Views and Agenda". *Journal of Economic Literature*, 25(June): 688-726.
Levine, R. and Zervos, S. 1996. "Stock Market Development and Long-run Growth". *World Bank Economic Review,* 10, PP.323-339.
Levine, R. and Zervos, S. 1998. "Stock Markets, Banks and Economic Growth". *American Economic Review*, Volume 8: 537-558.
Luintel, K.B. and Khan, M. 1999. "A Quantitative Reassessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR". *Journal of Development Economics*, 60, 381-405.
MacKinnon, J. G. 1991. "Critical Values for Cointegration Tests." *In Long Run Equilibrium Relationships: Readings in Cointegration,* edited by R. F. Engel and C. W. Granger. Oxford: Oxford University Press.
Murinde, V. et F. Eng 1994, "Financial Development and Economic Growth in Singapore: Demand-following of Supply-leading ?" , *Applied Financial Economics*, 4, 391-404
Nagraj, R. 1996. "Indian Capital Market Growth: Trends, Explanations and Evidences". *Economic and Political Weekly*, 33 (14-20 March)
Nagaishi, M. 1999. "Stock Market Development and Economic Growth". *Economic and Political Weekly,* July 17, 1999, PP.2004-2012.
Pagano, M. 1993. "Financial Markets and Growth: An Overview". *European Economic Review*, 37(Apr): 613-622.
Phillips, P.C.B. & Perron, P. 1988. "Testing for a Unit Root in Time Series Regression," *Biometrika,* 75, 335-346.
Pindyck. R. S., and Rubinfeld, D. L. 1998. *"Econometric Models and Economic Forecasts,"* 4th Ed. New York: McGraw-Hill.
Schumpeter, J. A. 1912. "*Theorie der Wirtschaftlichen Entwicklung"* (The *Theory of Economic Development*). Leipzig: Dunker& Humblot, Translated by Redvers Opie, Cambridge, MA: Harvard University Press, 1934.
Shah, A. 1998. "*The institutional development of India's financial markets", in* T.Waghmare, ed., 'The future of India's stock markets', Tata McGraw Hill, chapter 3, pp. 21–39.
Shah, A. & Thomas, S. 1996. How automation and competition have changed the BSE, Technical report, Centre for Monitoring Indian Economy.
Sims, C. A. 1972. "Money Income and Causality" *American Economic Review*, (62): 540-552.

Singh. A. 1997. “The Stock Market, Industrial Development and the Financing of Corporate Growth in India” in D.Nayyar (ed) *Trade and Industrialisation*, Delhi: Oxford University Press.
Singh. A. 1998. “Liberalisation, the Stock Market and the Market for Corporate Control: A Bridge Too Far for the Indian Economy”, in I. J. Ahluwalia and I.M.D. Little (eds), *India’s Economic Reforms and Development: Essays for Manmohan Singh*, New Delhi: Oxford University Press.
Toda, H. and P.C.B. Phillips 1993. “Vector Auto-regressions and Causality” *Econometrica*, 61:1367-1393.