

FINANCIAL INTERMEDIATION AND STOCK MARKET ACTIVITY GROWTH: A CAUSALITY- CO-INTEGRATION APPROACH

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ABSTRACT

The nexus between stock market growth and its intermediary developments with the economic activity for India is investigated over the post-liberalization period ranging 1993-2011. Using Unrestricted Vector Auto Regression (VAR) based on Error Correction Models (ECM). Both in the short term and the long term models we illustrate the short run relationship of the time-series properties relating stock market development and the intermediation growth relations. The coherent picture which emerges from Granger-causality test based on Vector Error Correction Model (VECM) reveals that in the long run, stock market development Granger-causes financial infrastructural growth. Our findings suggest that the evolution of 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. The capital market intermediation development indicators have a highly positive causation coefficient with the capital market economic activity implying that they have developed together in the Indian economy.

Keywords: *Stock Market, Growth, Investor, Financial Innovations, Infrastructure Development, Causality, Cointegration, VAR, VECM, India.*

Introduction:

Conceptually, well-developed financial intermediation 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 intermediation strongly correlate with better stock market performance. It thus follows from the above proposition that the evolution of financial intermediation 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 intermediation development is also expected to have significant liaisons with the economic growth. Such myths and realities are demystified in this paper. Using set of econometric models we firstly explore the time-series properties of capital market developments,

and probe the nexus between developments of financial intermediation with the growth in capital market activity for India over the post-reform period, 1994 through 2011. Both over short-run and the long-run perspective the paper seeks answer; whether the financial intermediation 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 intermediation specifically in the post-liberalisation period, affects the growth in the stock market activity. The principle question underhand is thus to re-examine the “financial intermediation development & the stock market growth puzzle” from a developing economy perspective.

The objective of the present study is to contribute to the existing debate on stock market development and the financial intermediation nexus, by analyzing the

time-series for India over a longer time-frame of 17 years. The present study aims at three-pronged objectives. This work is foremost attempt to quantify the extent and magnitude of select financial intermediary development indicators on the stock market performance. Secondly, we test the time-series properties of those variables to analyse 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 intermediation development indicators with that of the development of stock market activity.

Understanding the causal relationship between stock market development and financial intermediation 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 intermediation 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. This 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 intermediation growth, without taking into account of the stock market development. Thus, the investigated issue will be useful either for researchers and policy makers looking for optimal policies to institute competitive economic growth.

Underlying Empirical Evidence:

Schumpeter (1912) 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), Demircug-Kunt and Levine (1996), Demircug-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. Demircug – 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.

Data Sources and Variables:

The necessary secondary data for India (in Indian Rupees) for the period 1994-2011 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 (NSE), the Over The Counter Stock Exchange of India (OTCEI), Depositories, Clearing and Custodial Services (CCS), evolution of an array of hybrid derivative instruments for trading, inculcation of efficient market practices towards settlement of trades, electronic exchanges, ring less 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, Stock 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-earnings ratio of the BSE Sensex companies.

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 stationary properties (absence of trend and long-run mean reversion) of the time series data so as to avoid spurious regressions.

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

$$Z(t_{\mu}) = \langle S_{\mu} | S_{t_k} \rangle t_{\mu} - \frac{1}{2} (S_{t_k}^2 - S_{\mu}^2) \left[S_{t_k} \left\{ T^2 \sum_{t=2}^T (Y_t - Y_{t-1})^2 \right\}^{1/2} \right]$$

Multivariate Co-integration:

The Co-integration 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 co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables. If both series are

integrated of different orders, it is safely possible to conclude non-co-integration. Lack of co-integration 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 co-integrating relationships. The Residual-based approach proposed by Engle and Granger (1987) and the maximum likelihood method developed by Johansen and Juselius (1990) is used.

This test helps ascertain the existence of a long-run equilibrium relationship between stock market activity and select financial – Intermediary development indicators in multivariate setting.

We regress SMA on other financial indicators as follows

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

This can respectively, be written as

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

If the residuals, *u_t* from the above regressions are subject to unit root analysis are found I(0) i.e. stationary, then the variables are said to be co-integrated 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.

Error Correction Mechanism:

The Error Correction Mechanism (ECM) corrects for disequilibrium and the relationship between the two co-integrating variables can be expressed as ECM as under.

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

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

$$u_{t-1} = (SMA_t - \beta_1 - \beta_2 MO_t - \beta_3 IP_t - \beta_4 ML_t - \beta_5 GL_t - \beta_6 FN_t)$$

The error correcting equation 4 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 than the normal standard errors and therefore the robust t ratios are much smaller than normal t ratios.

In a multivariate system, the alternate co-integration 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 co-integrating 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

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Bx_t + \varepsilon_t$$

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

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

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

7

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 $\beta' y_t = I(0)$. r is the number of co-integrating relations (the co-integrating rank) and each column of β is the co-integrating 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 co-integrating equations have intercepts such as

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

8

In order to determine the number of r co-integrating 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 co-integrating relations against the alternative of k co-integrating relations, where k is the number of endogenous variables, for $r = 0, 1, \dots, k-1$. The alternative of k co-integrating 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 co-integrating relations whereas the max statistic tests the null hypothesis of r co-integrating relations against the alternative of $r+1$ co-integrating relations. The trace statistic (tr) and the max statistics (max) are computed as

$$LR_{tr}(r | k) = -T \sum_{i=r+1}^k \log(1 - \lambda_i) \quad \text{and}$$

$$LR_{max}(r | r+1) = -T \log(1 - \lambda_{r+1})$$

, which can be transformed as $LR_{tr}(r | k) - LR_{tr}(r+1 | k)$ for $r = 0, 1, \dots, k-1$.

Where λ_i is the i -th largest eigenvalue of the Π matrix in equation 7.

Causality using Unrestricted VAR:

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

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

Where the error terms is taken from the following cointegrating equation

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

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.

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

Statistics	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 1993–11. 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 2001-11. The SMA has not become more stable and sustainable under the stabilization program.

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

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 stationary 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.*
<i>Exogenous: Constant & No Trend</i>				
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**
<i>Exogenous: Constant & Linear Trend</i>				
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 co-integration 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, co-integration 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 co-integrating vector or a long 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 Co-integration						
Dependent Variable	Independent Variables	Coefficients	Robust Std. Err	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 Co-integration						
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. $\alpha 1$ and $\alpha 2$). The effect of the error correction term βX_{t-1} on economic growth depends, first, on the sign of the adjustment coefficient $\alpha 1$ and second, on the sign of βX_{t-1} itself since βX_{t-1} is a stationary process and may be positive, negative or equal to zero.

The above table quantifies the magnitude of co-integration 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 Table No. 05 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 co-integrated 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 co-integrated indicators of financial and economic development. According to Granger (1988), if two variables are co-integrated, then we wait for Granger causation in at least one direction. The dynamic interaction between the co-integrated variables through Unrestricted VAR 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.

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 intermediation 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 intermediation. 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 further 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.

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 financial intermediation growth. Hence, this study provides robust empirical evidence in favor of finance-led growth hypothesis for the Indian economy.

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.

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-regulate 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.

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