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The role of Stock market in Economic Growth: Empirical Evidence from India

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ABSTRACT: The study examines the relationship between the stock market and economic development in the Indian economy using monthly data from April 1993 to May 2017. The study used a vector error correction model to find a short- and long-run relationship between output and a number of stock market indices. We observed that the stock market has a positive impact on economic growth. As a result, the stock market must be enhanced more in order for the Indian economy to achieve higher economic growth.

KEYWORDS: Stock Market, Economic Growth, Causality, Short Run Dynamics, Long Run Relationship

1. INTRODUCTION

The Indian economy witnessed lots of financial sector reforms in the 1990s which have resulted in the development of stock market and higher economic growth. Stock market is often seen as barometer of the health of the economy. The stock market played an important role in the growth of the industry and commerce of the country which in turn affects the growth rate of the economy. There are more than 20 stock exchanges in India. The Bombay Stock Exchange is the most prominent stock exchange in India and it is the oldest stock exchange in Asia founded in the year 1857. The National Stock Exchange follows the Bombay Stock Exchange in terms of popularity.

There are three broad channels through which stock market can stimulate economic growth. First, there is an incentive for financial markets to monitor firms as trading in liquid and large markets benefits from this information. Second, financial markets facilitate takeovers and linked managerial compensation to the performance of firm thereby improving corporate governance. Third, financial markets ease risk-management (Levine, 2002)

The financial markets address some of the limitations of the banking system. The banking system is less willing to finance new technologies as diversification is limited in the banking system. The stock market on the other hand is more willing to finance innovative projects. It is possible for powerful banks to collaborate with managers of the firms to impede effective corporate governance. However, competitive financial markets collect information and transmit it effectively to investors (Beck and Levine, 2002).

2. OBJECTIVE OF THE PAPER

Using linear cointegration analysis, this research investigates the link between India's stock market and economic development. The three research questions for this paper are:

1. To examine whether any cointegrating relationship exists between various indicators of stock market and economic growth.
2. To investigate the short-term dynamics as well as the long-term link between the stock market and economic growth.
3. To determine the nature and direction of causality between various indicators of stock market and economic growth.

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3. LITERATURE REVIEW

Greenwood and Jovanovic (1990) propose a model in which financial intermediation and economic growth rates are governed endogenously. The model use dynamic programming to demonstrate how the flow of resources may be improved by study, collecting, and analysis of data, resulting in economic progress. Financial intermediation is favourably associated with economic growth as a result of this process. Through overlapping generation models, Bencivenga, Smith, and Starr (1996) show that stock market development supports lower transaction costs, which aids economic growth by allowing investors and savers to sell and purchase assets more often. Greenwood and Smith (1997) also contend that the stock market plays an important role in the effective allocation of resources, fostering specialisation, lowering the cost of mobilising savings, and, as a result, supporting higher economic development. Jensen and Murphy (1990) conduct a study of over 2000 CEOs at the business level, concluding that stock markets improve corporate governance by minimising the principal-agent dilemma. Banks' intrinsic inclination toward caution, according to Morck and Nakamura (1999), tends to stifle company innovation and growth. According to Allen and Gale (2000), while banks are excellent at reducing duplication of information collection and processing, they are ineffective at obtaining and processing information in uncertain situations involving novel goods and processes.

There are various studies relating to financial development and economic growth in India. In the Indian context, Kumar and Lenka (2015) use ARDL and ECM methodology and found that financial development is one of the long run determinants of economic growth and not vice-versa. Palamalai and Prakasam (2014) use stock market indicators of financial development and found long run relationship between economic growth and stock market development indicators. Sahoo (2013) uses both banking sector and stock market data and both the sector have positive effect on economic growth. Ray (2013) use annual data from 1990-91 to 2010-11 and found that financial development granger causes economic growth. Kar and Mandal (2012) use both banking and stock market data capturing the size and activity of both these sectors and found finance has long run impact on economic growth in post reform period. Mohapatra (2012) use annual data from 1970-71 to 2008-09 and highlight the importance of financial development in India's recent growth. Pradhan (2009) analyse the nexus between financial development and economic growth from 1993-2008 using multivariate VAR Model and found long run equilibrium relationship between them. Chakraborty (2008) use quarterly data from 1993 to 2005 and found weak support for stock market development in economic growth in India.

We find that there are numerous studies about Indian financial development and economic growth. Different authors use different measures of stock market development indicators. However, there is no studies which considered the efficiency and stability measures of stock market development. We try to address these issues in this paper.

3.2. Contributions to the literature

The paper contributed to the development of the literature in the following ways:

(1) There are various dimensions of stock market development such as size, activity, efficiency and stability (Cihak et al. 2012). None of the studies on Indian stock market and economic growth look at the efficiency and stability aspects of stock market. This study will include all the four dimensions of stock market development.

(2) Most of the studies on finance and growth use both real variables for real sector and nominal variables for financial sector. In this paper we converted all the nominal financial variables into real variables using wholesale price as a deflator. So, we study the relationship between real variables.

4. DATA AND METHODOLOGY

4.1. *Data Description*

We use monthly data from April 1993 to May 2017 provided by the Reserve Bank of India, Central Statistics Office and Office of the Economic Adviser. We de-seasonalize these data using the" X-12 techniques pioneered by the US Federal Bureau of Census" to seasonally adjust all the variables. The de-seasonalized data are converted into their natural logarithmic values. We used the constant price index of industrial production (IIP)1 as a proxy for economic growth. This is because IIP is available at monthly frequency and this gives larger sample size for the period of our study. Secondly, We may investigate the influence of the financial sector on the non-financial sector separately since the IIP measure excludes production from the financial sector. We use wholesale Price Index to convert these variables into their real values.

The following variables are used to capture the development of stock market in India:

Size: The capitalization of the Bombay stock exchange is used to determine the size of the stock market. The entire worth of a publicly traded company's tradable shares is called market capitalization (also known as

[1] Gupta(1984) had earlier used IIP as a proxy for output to study the same issue.

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market value). It's the stock price multiplied by the number of outstanding shares.

Activity: Stock market turnover is the activity variable for this market. It refers to the total value of shares exchanged during the course of that time period. This indicator enhances the market capitalization ratio by indicating if trading matches market size. The stock market turnover has become a popular new metric for measuring financial strength.

Efficiency: Stock market efficiency measures place a greater emphasis on measuring transactions rather than simply assessing transaction costs. In the stock market, the turnover ratio is a basic metric of efficiency. In the stock market, the turnover ratio is defined as the proportion of turnover to capitalization.

Stability: The most commonly used measure for stability of stock markets is market volatility. Other measures include skewness of stock returns. If a market has more negative skewed distribution of stock return, it will deliver large negative returns and will be more unstable. We use the price/earnings ratio (P/E ratio) to approximate stock market volatility. When there is large difference between the current price of the stock and it's earning, the stock market is said to be more volatile. The stock prices contain expectations of the future cash flows and growth and not just the current fundamentals. So, they may be more volatile and negatively skewed in the future.

4.2. *Unit root testing and linear cointegration*

This paper attempt to study the relationship between economic growth and various indicators of stock market development for the Indian economy. We use vector error correction model (VECM). All the variables are converted to their natural logarithm for our study.

(a) **Unit root testing**

The first step for any co-integration analysis is to check for the stationarity of the variables under consideration. The stationarity of the variables are tested using Augmented Dickey Fuller (ADF) test, Phillips Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test. The ADF test can be understood by looking at the following regression equation:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{j=1}^{p} \delta_j \Delta y_{t-j} + \varepsilon_t$$

The variables α and β captures the intercept and trend in the time series. We considered three models in our tests namely (i) intercept and trend (ii) intercept and (iii) Random Walk model which has no intercept and no trend. Any existence of higher order autoregressive processes is captured by the additional lags in the regression. The presence for Unit root is tested on the coefficient of γ where the null hypothesis $H_0: \gamma = 0$ and the alternate hypothesis is $H_1: \gamma < 0$.

Unlike the ADF test, the Phillips-Pherron (PP) Unit root test uses a non-parametric correction for any serial correlation and heteroskedasticity in the error terms. The PP test however works well only for large sample data sets. The KPSS tests complements the two tests further. The null hypothesis of the KPSS test is trend stationary against the alternative hypothesis of a unit root process. The rejection of null hypothesis in the KPSS test is a strong indicator of the presence of unit root in the time series variable.

(b) **The linear co-integration analysis**

Different analytical approaches are proposed in the econometric literature to empirically analyse long-run connections and dynamical interactions between two or more time-series variables. Two or more variables are said to be co-integrated if they follow a first order integrated or I (1) process and the linear combination of these variables exist such that the residual is I (0) or stationary. The most widely used methods include the full information maximum likelihood-based approach due to Johansen (1988) and Johansen and Juselius (1990). The Vector Error Model of Johansen and Juselius (1990) can be represented as below:

$$\Delta X_t = \mu + \sum_{i=1}^{p} \Gamma \Delta X_{t-1} + \alpha\beta' X_{t-1} + \varepsilon_t$$

Where

Γ are $m\ X\ m$ coefficient matrices ($i = 1, 2, 3, \ldots\ldots, k$)

$\alpha\beta' X_{t-1}$ is the error correction terms where the matrix α is the matrix of error correction coefficients that measure the speed at which the variables adjust to their equilibrium values.

The β vectors represent estimates of the long-run cointegrating relationship between the variables in the system. variables adjust to their equilibrium values.

5. **RESULTS AND DISCUSSIONS**

(a) Stock market capitalization and output

We conduct three different unit root tests namely the Augmented Dickey-Fuller test, the Phillips-Perron (PP) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The test results (see table 1.1, 1.2, 1.3, 1.4) from the three tests indicates that both the output and stock market capitalization are non-stationary at levels and stationary at first-differences. So, both the variables are integrated of order 1 and the VECM methodology could be applied.

Table 1.1: Unit root testing for stock market capitalization (Levels only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-1.991358 (0.6032)	-1.037106 (0.7406)	2.251650 (0.9944)
PP Test	-2.393843	-1.109399	1.874245

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	(0.3820)	(0.7129)	(0.9856)
KPSS Test	0.166188 (0.146000)	1.899026 (0.46300)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 1.2: Unit root testing for stock market capitalization (First difference only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-15.25292 (0.0000)	-15.27455 (0.0000)	-15.02491 (0.0000)
PP Test	-15.40395 (0.0000)	-15.42527 (0.0000)	-15.29172 (0.0000)
KPSS Test	0.052044 (0.146000)	0.056562 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 1.3: Unit root testing for output (Levels only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-1.598367 (0.7916)	-2.279839 (0.1793)	6.475506 (1.000)
PP Test	-2.014214 (0.5907)	-2.201199 (0.2064)	6.003568 (1.000)
KPSS Test	0.259603 (0.146000)	2.026197 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 1.4: Unit root testing for output (First difference only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-26.98430 (0.000)	-26.75565 (0.000)	-8.22053 (0.000)
PP Test	-27.41261 (0.000)	-26.75565 (0.000)	-22.7215 (0.000)
KPSS Test	0.069450 (0.146000)	0.32915 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

The next step is to test whether the stock market capitalisation has a long run cointegrating relationship with output. To estimate the VECM model, we need to first find out the optimum number of lags to include in the model. The Akaike Information Criterion (AIC) chose a lag length of 3 while the Bayesian Information Criterion (BIC) chose 2. So, we the BIC and chose the optimum lag length of VAR for output and stock market capitalisation as 2. We also found that the VAR model with lag length of 2 is stable2.

The study has carriour test test for the existence of cointegration between these two variables using Johansen's Maximun Likelihood Approach. Because the assumptions made regarding the model's deterministic components are so important, these tests are quite sensitive. The study has used 'Modified Pantula Principle' proposed by Hjelm and Johansson (2005) to determine the rank and deterministic components of the system. There are five sets of assumption made about the deterministic components (i.e., the intercept and the trend) of the model namely (i) no intercepts and no trends (ii) "restricted intercepts and no trends" (also known as restricted constant) (iii) "unrestricted intercepts and no trends" (also known as unrestricted constant) (iv) "unrestricted intercepts and restricted trends" (also known as restricted trends) and (v) unrestricted intercepts and unrestricted trends (also known as unrestricted trends). The limited constant is the most acceptable assumption regarding the deterministic components for output and stock market capitalization, according to the modified Pantula Principle.

Table 1.5: Finding the number of cointegrating vectors between output and stock market capitalization

Variables	Test	Hypothesized No. of CE(s)	Test Statistics	P Value
LIIP and LCAP	Trace Test	None	62.0650	0.000
		At most 1	6.37671	0.163
	Maximal Eigen Value test	None	55.6883	0.000
		At most 1	6.376711	0.163

The trace test and the maximal eigen value test indicates the presence of one cointegrating vector between output and stock market capitalization (see table 1.5). So there exists a unique long run relationship between output and stock market capitalization. The long run relationship between output and stock market capitalization is identified by normalizing cointegrating vector with output variable (see table 1.6). The stock market capitalization coefficient is in the correct direction, showing that stock market capitalization and production have a positive long-run connection. The error correction framework may be used to depict the cointegrating long run connection between the two variables. In the long run cointegrating relationship, the error correction coefficient represents each variable's (one period delayed) adjustment to any disequilibrium.

Table 1.6: VECM for output and stock market capitalisation estimates

Regressor	$\Delta LIIP$	$\Delta LCAP$
$\Delta LIIP(-1)$	-0.451645 (0.000)	-0.1239715 (0.578)
$\Delta LCAP(-1)$	0.0450732 (0.001)	0.1031849 (0.084)
ECT(-1)	-0.208902	0.0213654

[2] A VAR model is stable if all its root lies below 1

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	(0.000)		(0.083)
"The Cointegrating Vector for Output and Stock Market Capitalization"			
	LIIP	LCAP	Constant
Cointegrating Vector	1	-0.3773457	-2.412018
P-Value	None	0.000	0.000

*The values inside the bracket are P-values

The error correction coefficient of both output and stock market capitalization are statistically significant and has correct sign. This implies that there is bi-directional causality between stock market capitalizations and output in the long run. Stock market capitalisation has a statistically significant short term effect multiplier on production. The effect multiplier of output on stock market capitalization in the near run, on the other hand, is not statistically significant. In the short term, a rise in stock market capitalisation will boost output.

(b) **Stock market turnover and output**

We conduct three different unit root tests namely the "Augmented Dickey-Fuller test, the Phillips-Perron (PP) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test". The test results (see table 2.1, 2.2, 1.3 and 1.4) from the three tests indicates that both output and stock market turnover are non-stationary at levels and stationary at first-differences. So, both the variables are integrated of order 1 and the VECM methodology could be applied.

Table 2.1: Unit root testing for stock market turnover (Levels only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-2.445998 (0.3550)	-2.364002 (0.1530)	-0.50635 (0.4964)
PP Test	-2.755686 (0.2152)	-2.636466 (0.0868)	-0.35614 (0.5559)
KPSS Test	0.323393 (0.146000)	0.700531 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 2.2: Unit root testing for stock market turnover (First difference only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-23.02675 (0.0000)	-23.05736 (0.0000)	-23.08476 (0.0000)
PP Test	-24.99513 (0.0000)	-24.78818 (0.0000)	-24.74372 (0.0000)
KPSS Test	0.051937 (0.146000)	0.103544 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

The next step is to test whether the stock market turnover has a long run cointegrating relationship with output. To calculate the VECM model, we must first determine the optimal amount of delays to incorporate. The Akaike Information Criterion (AIC) chooses a lag length of 2 and similarly the Bayesian Information Criterion (BIC) chooses a lag length of 2. We choose the lag length given by AIC and BIC and choose a VAR model with lag length of 2. We also found that the VAR model with lag length of 2 is stable.

We test for the existence of cointegration between these two variables using Johansen's Maximum Likelihood Approach. Because the assumptions made regarding the model's deterministic components are so important, these tests are quite sensitive, the study has used 'Modified Pantula Principle' to choose the correct model. According to the modified Pantula Principle, the limiting constant is the best acceptable assumption for the deterministic components of production and stock market turnover.

Table 2.3: Finding the number of cointegrating vectors between output and stock market turnover

Variables	Test	Hypothesized No. of CE(s)	Test Statistics	P Value
LIIP and LTURN	Trace Test	None	59.5464	0.000
		At most 1	5.71426	0.214
	Maximal Eigen Value test	None	53.8321	0.000
		At most 1	5.71426	0.2140

The trace test and the maximal eigen value test (See table 2.3) indicates the presence of one cointegrating vector between output and stock market turnover. So there exists a unique long run relationship between output and stock market turnover. The cointegrating equation shows that the coefficient of stock market turnover has the right sign which indicates that there is positive relationship between the two output and stock market turnover. The cointegrating long run relationship between the two variables can also be represented in terms of error correction framework (See table 2.4).

The error correction coefficient for output is statistically significant and has correct sign. However, the error correction coefficient for stock market turnover is not statistically significant. This means the stock market turnover is weakly exogenous in the long run and the direction of causality run from stock market turnover to output. The effect multiplier of production on stock market turnover and the impact multiplier of stock market turnover on output is not statistically significant in the near run.

Table 2.4: Estimated VECM for output and stock market turnover

Regressor	$\Delta \boldsymbol{LIIP}$	$\Delta \boldsymbol{LTURN}$
$\Delta LIIP(-1)$	-0.4334204 (0.000)	-0.401664 (0.600)

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$\Delta LTURN(-1)$	-0. 0011932 (0.773)	-0.2929423 (0.000)
ECT(-1)	-0. 0064369 (0.000)	-0.0059371 (0.636)

"The Cointegrating Vector for Output and Stock Market Turnover"

	LIIP	LTURN	Constant
Cointegrating Vector	1	-0.1896371	-4.999929
P-Value	None	0.369	0.000

*The values inside the bracket are P-values

(c) Stock market turnover ratio and output

We conduct three different unit root tests namely the "Augmented Dickey-Fuller test, the Phillips-Perron (PP) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test". The test results (See table 3.1,3.2,1.3, 1.4) from the three tests indicate that both output and stock market turnover ratio are non-stationary at levels and stationary at first-differences. So, the variable Stock market turnover ratio and the output are integrated of order 1 and the VECM methodology could be applied.

Table 3.1: Unit root testing for Stock market turnover ratio (Levels only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-1.695589 (0.7510)	-1.056244 (0.7334)	0.311322 (0.7750)
PP Test	-2.354019 (0.4030)	-1.687190 (0.4367)	0.302960 (0.7728)
KPSS Test	0.351950 (0.146000)	1.017432 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 3.2: Unit root testing for Stock market turnover (First Difference only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-17.17660 (0.0000)	-17.19573 (0.0000)	-17.2085 (0.0000)
PP Test	-28.41145 (0.0000)	-28.32361 (0.0000)	-28.1826 (0.0000)
KPSS Test	0.073980 (0.146000)	0.110960 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

The next step is to test whether the stock market turnover has a long run cointegrating relationship with output. To calculate the VECM model, It is important to determine the optimal amount of delays to incorporate. The Akaike Information Criterion (AIC) chooses a VAR model with 3 lags while the Bayesian Information Criterion (BIC) chooses a VAR model with 2 lags. We choose a VAR model with two lags as given by the BIC. We also found that the VAR model with lag length of 2 is stable

The study has carried out test for the existence of cointegration between these two variables using Johansen's Maximum Likelihood Approach. Because the assumptions made regarding the deterministic components of the model are so important in these tests, we used 'Modified Pantula Principle' to choose the correct model. The limited constant is the most acceptable assumption for the deterministic components of output and stock market turnover ratio, according to the modified Pantula Principle.

Table 3.3: Finding the number of cointegrating Vector between output and stock market turnover ratio

Variables	Test	Hypothesized No. of CE(s)	Test Statistics	P Value
LIIP and LTR	Trace Test	None	55.4625	0.000
		At most 1	3.39773	0.509
	Maximal Eigen Value Test	None	52.0648	0.000
		At most 1	3.39773	0.5091

The trace test and the maximal eigen value test indicates the presence of one cointegrating vector between output and stock market turnover ratio (See table 3.3). So there exists a unique long run relationship between output and stock market turnover ratio. The cointegrating equation between output and stock market turnover ratio show negative relationship between the two variables. This means the increase in stock market efficiency and output and is inversely related in the long run. In terms of error correction framework, the cointegrating long run connection between the two variables may be expressed. (See table 3.4)

Table 3.4: Estimated VECM for output and stock market turnover ratio

Regressor	$\Delta \boldsymbol{LIIP}$	$\Delta \boldsymbol{LTR}$
$\Delta LIIP(-1)$	-0.4201596 (0.000)	-0.1065662 (0.877)
$\Delta LTR(-1)$	-0.0054212 (0.216)	-0.4012415 (0.000)
ECT(-1)	-0.0054275 (0.000)	0.0034411 (0.722)

The Cointegrating Vector for Output and Stock Market Turnover Ratio

	LIIP	LTR	Constant
Cointegrating Vector	1	0.0352882	-5.39697
P-Value	None	0.874	0.000

*The values inside the bracket are P-values

The error correction equation for the output indicates that the error correction coefficient is statistically significant and has correct sign. The stock market turnover ratio, however, does not have a large error correction period. This suggests that, in the long term, the stock market turnover ratio is weakly exogenous, and that the causal chain goes from stock market turnover to production. The short run impact multiplier of output on turnover ratio is not statistically significant. Similarly, the short run impact multiplier of turnover ratio on output is not statistically significant.

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(d) Stock market price earnings ratio and output

The study has carried out three different unit root tests namely the "Augmented Dickey-Fuller test, the Phillips-Perron (PP) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test". The test results from the three tests indicate that both output and stock market price earnings ratio are non-stationary at levels and stationary at first-differences (See table 4.1, 4.2, 1.3, 1.4). So, the variables price earnings ratio and output are integrated of order 1 and the VECM methodology could be applied.

Table 4.1: Unit root testing for price earnings ratio (Levels only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-2.321918 (0.4203)	-2.416781 (0.0172)	-0.329492 (0.5660)
PP Test	-2.585608 (0.2873)	2.024859 (0.0438)	-0.309105 (0.5737)
KPSS Test	0.155270 (0.146000)	0.182718 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

Table 4.2: Unit root testing for Price Earnings Ratio (First Difference only)

Test/Model	Intercept and Trend	Intercept	Random Walk
ADF Test	-14.51151 (0.0000)	-14.50531 (0.0000)	-14.5300 (0.0000)
PP Test	-14.74832 (0.0000)	-14.75601 (0.0000)	-14.7794 (0.0000)
KPSS Test	0.030522 (0.146000)	0.066714 (0.463000)	

*The value inside bracket in ADF test and PP test are P values while in KPSS test it is the critical value at 5%.

The next step is to test whether the price earnings ratio has a long run cointegrating relationship with output. To estimate the VECM model, we need to first find out the optimum number of lags to include in the model. Using the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC), we find that the optimum lag length of VAR for output and price earnings ratio is 4 and 2 respectively. So, we choose the lag length of 2 as given by the BIC. We also found that the VAR model with lag length of 2 is stable.

We test for the existence of cointegration between these two variables using Johansen's Maximun Likelihood Approach. Because the assumptions made regarding the deterministic components of the model are so important in these tests, we used 'Modified Pantula Principle' to choose the correct model. The limited constant is the most acceptable assumption regarding the deterministic components for production and price earnings ratio, according to the modified Pantula Principle.

The trace test and the maximal eigen value test indicates the presence of one cointegrating vector between output and price earnings ratio (See table 4.3). So there exists a unique long run relationship between output and price earnings ratio. The price earnings ratio coefficient has the right sign, suggesting that the price earnings ratio and production have a positive long-run connection.

Table 4.3: Finding the number of cointegrating vector between output and price earnings ratio

Variables	Test	Hypothesized No. of CE(s)	Test Statistics	P Value
LIIP and LPE	Trace Test	None	66.6378	0.000
		At most 1	6.22862	0.173
	Maximal Eigen Value Test	None	60.4092	0.000
		At most 1	6.22862	0.17

The cointegrating long run relationship between the two variables can also be represented in terms of error correction framework (See table 4.4). The output error correction coefficients are statistically significant and have the proper sign. However, the price earnings ratio error correction coefficient is not statistically significant. As a result, price earnings ratio is weakly exogenous in the long term, and there is unidirectional causation between price earnings ratio and production. The price earnings ratio's short-run effect multiplier on output is determined to be statistically negligible. Similarly, the output's short-run impact multiplier on the price-earnings ratio is statistically insignificant.

Table 4.4: Estimated VECM for output and stock market price-earnings ratio

Regressor	$\Delta \boldsymbol{LIIP}$	$\Delta \boldsymbol{LPE}$
$\Delta LIIP(-1)$	-0.4528229 (0.000)	-0.0991364 (0.618)
$\Delta LPE(-1)$	0.0221592 (0. 162)	0.1576418 (0.008)
ECT(-1)	-0.04967 (0.000)	0.0016438 (0.508)

"The Cointegrating Vector for Output and Stock Market Price-Earnings Ratio"

	LIIP	LPE	Constant
Cointegrating Vector	1	-1.447984	-1.392352
P-Value	None	0.044	0.511

*The values inside the bracket are P-values

6. CONCLUSION

From April 1993 to May 2017, the article explores the short-run dynamics and long-run links between economic growth and several measures of stock market development in India. The study presents a short-term as well as a long-term association between output and a variety of stock market variables. The VECM results reveal that production and stock market capitalisation are bidirectionally related. The activity and efficiency variables reveal unidirectional causation between turnover and output, as well as between turnover ratio and production. The stability variable demonstrates that in the long term, the price-earnings ratio granger drives output. In the long term, all indices of stock market

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development reveal unidirectional causation from stock market to economic growth. However, production and stock market capitalisation have a bi-directional causal relationship. According to the report, the stock market had a significant impact in India's economic development. More financial sector reforms are needed to help the financial sector move the economy towards a higher growth path.

REFERENCES

Acharya,D., Amanulla,S. and Joy,S. (2009), "Financial development and economic growth in Indian states: An Examination", Journal of Finance And Economics, 24,117-126.

Ahmed, S. (2010), "Aggregate economic variables and stock markets in India", International Research Journal of Finance and Economics, 14, 141-164

Ang, J. B. and W. J. McKibbin (2007), "Financial liberalization, financial sector development and growth", Evidence from Malaysia, Journal of Development Economics, 84, 215-233.

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

Arestis, P., Demetriades, P.O. and Luintel, K.B. (2001), "Financial Development and Economic Growth: The Role of Stock Markets", Journal of Money, Credit and Banking, 33(1), 16-41..

Atje R. and Jovanovic B. (1993), "Stock markets and development", European Economic Review, 37, 632-640.

Beck, T., R. Levine, and N. Loayza, (2000), "Finance and sources of growth", Journal of Financial Economics, 58, 261-300.

Bhattacharya, P.C. and Sivasubramanian, M.N. (2003), "Financial development and Economic growth in India: 1970-71 to 1998-99", Applied Financial Economics, 13,925-929.

Chakraborty, I. (2008), "Does financial development cause economic growth? The case of India", South Asia Economic Journal, 9,109-139.

Chaudhari, K. and Raje, M. (2014), "Corporate Bond Market in India: A study and Policy Recommendations", Paper presented at India Institute of Management Bangalore in August, 2014

Cihak, M., Demirguc-Kunt, A., Feyen, E and Levine, R. (2012), "Benchmarking financial systems around the world", The World Bank Policy Research Working Paper, WPS6175.

Deb, S.G. and Mukherjee, J. (2008), "Does stock market development Economic growth: A time series analysis for Indian Economy", International Research Journal of Finance and Economics, 21,142-149.

Demirgic-Kunt, A. and Levine, R. (1996), "Stock market development and Financial intermediaries: Stylized facts", The World Bank Economic Review, 10, 291-321.

Enders, W. (2004), Applied Econometric Time Series, Second Edition, New Jersey: John Wiley and Sons.

Goldsmith, R. (1969), "Financial Structure and Development", Yale University Press, New Haven, CT.

Greenwood, J. and Jovanovic, B. (1990), "Financial development, Growth and the distribution of income", Journal of Political Economy, 98 (5), 1076-1107.

Ireland, P. N. (1994), "Money and Growth: An Alternative Approach", American Economic, 47-65

Kar, S. and Mandal, K. (2012), "Re-examining the Finance–Growth Relationship for a Developing Economy: A time series analysis of post-reform India", Institute of Economic Growth, Working Paper, No. 313.

King, R. and Levine, R. (1993), "Finance and growth: Was Schumpeter might be right", Quarterly Journal of Economics, 109, 83-109.

Kumar, Vinod and Mittal, P. (2010). Empirical Investigation of Price Variability Mechanism of Colombo All Share Price Index. Business Analyst, 31(2), 21–29.

Kumar, Vinod and Mittal, P. (2011). Johansen Co-integration analysis of Indian and Major Global Stock Market Indices: An Empirical Study. Nice Journal of Business, 6(1), 9–22.

Levine, R. (1997), "Financial development and economic growth: views and agendas", Journal of Economic Literature, 35 (688-726).

Levine, R., and Zervos, S. (1998), "Stock Markets, Banks, and Economic Growth," American Economic Review, 88, 537-558.

McKinnon, R. I. (1989), "Financial Liberalization and Economic Development: A Reassessment of Interest Rate Policies in Asia and Latin America", Oxford Review of Economic Policy, 5(4), 29-54

Mittal, P. (2010). E-Supply Chain & Digital Technologies: A Vision. IME Journal, 5(2), 9–11.

Mittal, P. (2011). Comparative Study of Realized Index Volatility Mechanism of S&P Cash index and S&P CNX NIFTY. Journal of Management and Information Technology, 3(1), 1–7.

Mittal, P. (2017). Time Series Analysis Using ARCH Models: A Case Analysis of Australian Stock Index. VEETHIKA-An International Interdisciplinary Research Journal, 3(1), 74–80. https://doi.org/10.48001/veethika.2017.03.01.007

Pethe, A. and Karnik, A. (2000), "Do Indian Stock Markets matter? Stock Market Indices and Macro-Economic Variables", Economic and Political Weekly, 35, 349-356.

Pradhan, R.P (2009), "The Nexus between Financial Development and Economic Growth in India: Evidence from Multivariate VAR Model," International Journal of Research and Reviews in Applied Science, 1(2).

Sharma, S., & Mittal, P. (2016). Quantifying the Bullwhip in Multi-location Supply Chain Network: The Impact of Demand Forecasting. BULMIM Journal of Management and Research, 1(1), 55. https://doi.org/10.5958/2455-3298.2016.00006.4

Singh, T. (2008), "Financial development and economic nexus: A time series evidence From India", Applied Economics, 40, 1615-1627.

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