Money Supply and Stock Prices: An Econometric Analysis for India

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ABSTRACT

The linkages between money supply and stock prices are significant in today's scenario. The idea of this study is to check connections between money supply and stock returns in the Indian context with the help of Unit root tests, Johansen's co-integration test and Correction Model of Vector Error. The study is based on secondary database. The monthly prices of BSE Sensex for the period from January 2008 to December 2017 was obtained from the Centre for Monitoring of Indian Economy (CMIE) prowess database and money supply data were collected from the website of Reserve Bank of India. The results of the study indicate long-term relationship between money supply and stock prices. The present study may be of use to investors, analysts in their investment decision making. The results of this study may also be of use to policy makers, researchers and regulators.

Keywords: Stock Market Prices, Money Supply, Co-integration Test, Indian Economy.

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1. INTRODUCTION

Economic principles suggest that the behavior of stock returns can be predicted with the help of inflation, money supply and the other elements. Their impact can be positive or negative. Money supply in an economy determines the liquidity position in the market. Various theories showed positive connection between money supply and stock prices. Some studies found no connection between both the variables and some studies established long-run relationship between them. However, there are no concrete results on this subject in India. According to the transitional financial system, there is a need to investigate the concept of money supply in the context of Indian stock market. This study investigated the connection between money supply and stock returns in India.

2. REVIEW OF LITERATURE

Rao (1997) inspected the functioning of stock prices to Macroeconomic proceedings e.g., changes in direct or indirect tax rates or decontrol of lending rates, changes in individual policy, changes in trade policies, changes in exchange rate policies etc. The study covered a phase from January 1991 to December 1994 and daily stock prices of selected firms and daily BSE Sensex prices have been used. Events were selected on the basis of their expected impact on the industry or a group of firms. The study resulted that the changes in prices had the greatest contact on the market.

Seshaiah and Tomer (1997) measured the interconnection between industry security return and inflation rate and also studied the outcome of exchange rates on stock returns. The study used linear regression technique to find out the various relationships. The study covered a period from 1980-81 to 1993-94. The study found that negative relationship between the speed of inflation and therefore, the rate of exchange with stock returns.

Alatiqi and Fazel (2008) considered the connection along with the supply of money and stock prices. The study used M1 data to calculate the supply of money and S&P 500 data were used to calculate the stock prices. Econometric techniques have been used in the study and the study argued the hypothesis of the correlation between the variables.

Aydemir and Demirhan (2009) studied the result of macroeconomic variables in Turkey Stocks. The study is based on a daily data for the period

from February, 2001 to January, 2008. In the study, hundred national, different sectors indices are used as stock rate indices. The bi-directional integral relationship between rate of exchange and all inventory market indices was found.

On the other hand **Mohammad et al. (2009)** studied the association between the macro economic variables and share prices of the stock market of Karachi. The study used data of special macroeconomic variables (Foreign Exchange Reserves, the speed of interchange, the index of commercial production, the index of wholesale price, Gross Fixed Capital Formation (GFCF) and M2 for the period 1986-2008. They found out that the observed data have an impact on the foreign trade and different overseas exchanges reserve extensively impact the inventory prices, whilst other variables like IPI and GFCF have an impact on stock prices.

Ahamed et al. (2010) in their study examined the forceful linkages among the speed of exchange and stock costs. The study used a daily data for the period of five years i.e., from calendar month 2005 to December 2009. The study used Granger causality test to search out the linkages among both variables and they reported unidirectional association between two variables and for the year 2009, there was bidirectional connection between two variables.

The study by **Kutty (2010)** tested the link flanked by stock costs and speed of exchange in Mexico. The reading used weekly closing prices from the beginning of January 1989 to ending of December 2006. The study revealed that the stock prices showed the way of speed of exchange in short period and also showed no long period relationship exists between both the variables. The study supported the finding of Murinde and Abdalla (1997), who propounded that stock costs granger cause the speed of exchange.

Sharma and Mahendru (2010) considered the long period relationship among BSE and more variables of macroeconomic for the phase from the beginning of January 2008 to the ending of January 2009. The variables of macroeconomics used in this study are the speed of exchange, interchange reserves, the speed of inflation and gold prices. The reading concluded that exchange rate and the prices of gold highly influence the stock price. The study showed no relationship between speed of exchange and the costs of stock.

Almutair (2015) examined the co-integration analysis of the supply of money and Stock price Index in the context of Saudi market. It used the econometric techniques such as ADF test, Johansen's co-integration test and also the Vector error correction model (VECM) in their study. The study used annual and monthly both type of data. The consequences of the study proved that positive long period relationship exists between SSPI and money supply (M1, M2).

Wang (2016) considered the association between supply of money and stock costs in China. The study used econometric techniques i.e., the unit room test and Error Correction Mechanism (ECM) meant for the purpose of investigation of the association stuck between money supply and stock costs in China. It revealed co-integration relationship existed.

After reviewing the above articles it was found that there was no clear pattern. Some have positive view and some have negative view. Therefore, the present study tries to establish a relationship between the Indian stock market and the money supply.

3. OBJECTIVE OF THE STUDY

The objective of this study is as follows:

- To observe the relationship between money supply and stock prices in India.

4. HYPOTHESIS OF THE STUDY

Given the above explanation, the hypothesis can be stated as follows:

- There is no significant relationship between money supply and stock prices in India.

5. DATA BASE AND RESEARCH METHODOLOGY

The present study is based on the secondary data. The month-to-month closing prices of BSE Sensex and money supply data have been used. The monthly closing prices of BSE Sensex have been accumulated from CMIE prowess database and money supply data have been retrieved from the website of Reserve Bank of India. The study uses time series data from January 2008 to December 2017. The reading was carried out by 120

monthly observations. To analyze data, E-views software has been used. The relationship between them was estimated by employing Unit root tests (Dickey-Fuller and Phillips-Perron), Johansen's co-integration test and Vector Error Correction Model. A brief explanation of econometric techniques is as follows:

Econometric Techniques

To check the stationary of series, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root have been applied.

Gujarati, porter & Gunasekar (2007) explained that the ADF test at this time consists of predicting the subsequent regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-1} + \varepsilon_t$$

Where, Y is the variable their time collection residences are measured β, δ and α are the coefficients to be projected, and ε is the error white-noise term.

The null hypothesis is $\delta = 0$, that is there is a unit root and the choice hypothesis is that $\delta < 0$ that means the time series is stationary.

Ahmed (2008) explained that PP test is that it is free from parametric errors. Philips-Perron (PP) test allows the disturbances to be weakly dependent and heterogeneously distributed.

When we comprise the first difference of variable it is required to check the co-integration between dependent and independent variable to ascertain the true relationship. If both of the variables are stationary at same order, then co-integration test can be applied.

Nachane (2006) explained the Johansen's co-integration model in this manner: Johansen (1988) suggested two statistics for testing expression viz. the trace statistic J_t and maximum Eigen value statistic λ_{max}

$$J_T = -T \sum_{i=r+1}^{N} In\left(1 - \hat{\lambda}\right)$$

$$\lambda_{max} = -TIn\left(1 - \hat{\lambda}_{r+1}\right)$$

Where, T is the effective number of observations

The two statistics are designed to cover two distinct hypothesis testing scenarios. For the trace statistics J_t the null hypothesis is:

H_0: At most r co-integrating vectors against the alternative hypothesis

H_1: More than r co-integrating vectors.

For the maximal Eigen value statistics λ_{max} the null hypothesis is

H_0: Exactly r co-integrating vectors

And the alternative hypothesis is

H_1: Exactly (r+1) co-integrating vectors.

To observe the short run dynamics, Vector Error Correction Model (VECM) has been estimated in the study. The VECM can be represented through the following equation:

$$\Delta Y_t = \delta + \prod Y_{t-1} + \sum_{i=1}^{p-1} \phi_i^* \Delta Y_{t-1} + \varepsilon_t$$

ΠY_{t-1} is called the error correction term.

6. SUMMARY AND RESULTS

First of all, ADF test was run to test whether each variable series have unit root or not. The results in the Table 1 revealed that the hypothesis relevant with the unit root test can't be rejected in both variables at level but the assumption of unit root test can be rejected in both variables at first difference. Both the variables are stationary at first difference. In case of BSE Sensex's series at first difference, the ADF Calculated Value is less than the critical values at 1%, 5% and 10% significance level. It means BSE Sensex series has no unit root problem. It means the BSE Sensex's prices series is stationary. In case of money supply (at first difference), the ADF Calculated Value is also less than the critical values at 1%, 5% and 10% significance level. It showed money supply series has no unit root problem. It resulted that the money supply series is stationary. With the outcome of ADF and PP test it can be concluded that both the variables are stationary at first difference level.

Table 1: Results of Unit root assessments at level and first difference (2008-2017)

Variables	ADF		PP test	
	Level	First Difference	Level	First Difference
BSE Sensex	1.496060	-16.44111	2.426023	-11.20113
Money Supply	-1.952247	-8.476046	-1.956408	-13.17435
Critical Values 1%	-4.0307	-4.0354	-4.0309	-4.0329
Critical Values 5%	-3.4446	-3.4449	-3.4442	-3.4444
Critical Values 10%	-3.1468	-3.1441	-3.1465	-3.1443

Note: ADF & PP tests results of both of the variables from 2008 to 2017

Results of Johansen's Co-integration Test

The next step in this study is to test the co-integration between money supply and stock prices in India. It is known that, if both the variables are stationary at same order, then co-integration test can be used. The value of l_{trace} (trace statistics) corresponding to r = 0 is 43.53678 which is higher than the consequent critical value of 19.97 at 5% level of significance. Therefore, the alternative hypothesis is accepted, which shows there is a long run relationship between both the variables and the null of 1*r*£ is also rejected by l_{trace} because at this the trace statistics values 19.81774 is higher than the critical value 9.25.

The same conclusion is also obtained from the l_{max} statistics because in this case computed values for r = 0 and 1*r*£ $_{are}$ 22.5347 and 15.6480 which are also higher than the corresponding critical values 15.57 and 9.25, so, the null hypothesis is not accepted. Though l_{trace} and l_{max} results, it is clearly found that long run association exists between money supply and stock prices in India.

Table 2: RESULTS OF JOHANSEN'S CO-INTEGRATION TEST (MONEY SUPPLY AND STOCK PRICES)

$(SMI)_{it} = a + b_1 (MYSY) + m_{it}$

Co-integration Unrestricted Rank Test (Trace)				
Hypothesis-Null	**Values-Eigen**	**Statistic-Trace**	**Values - Critical (five %)**	**Prob.****
None* r = 0	0.178210	43.53678	19.97	0.00
At most 1* r £ 1	0.145464	19.81774	9.25	0.00
Co-integration Unrestricted Rank Test (Max Eigen values)				
Hypothesis-Null	**Values-Eigen**	**Values-Max Eigen**	**Values – critical (five %)**	**Prob.****
None* r = 0	0.178210	22.5357	15.57	0.00
At most 1* r £ 1	0.145464	15.6480	9.25	0.00

Note: co-integration test of both of the variables from 2008 to 2017

*for the hypothesis rejection at 5% significance level

** p-values, Mackinnon-Haug-Michelis (1999)

Outcome of Vector Error Correction Model

Table 3 exhibits the results of Vector Error Correction Model. The error correction term 3 shows that the predictable t-value (–5.16942) is less than the significance level and the entire variables in lag 1 and lag 2 for t-values of BSE Sensex (-1.29841and -1.57246 respectively) and money supply (-1.249535 and -0.348516 respectively), are insignificant. So as per VECM, it can be concluded that no short run relationship exists.

Table 3: Results of Vector Error Correction Model (2008-2017)

Variables	Co-efficient	Standard Error	t-statistics
EC term 1	-0.594619	(0.09564)	(-5.16942)
D(BSE(-1))	-0.359439	(0.12546)	(-1.29841)
D(BSE(-2))	-0.234952	(0.95842)	(-1.57246)
D(MYSY(-1))	0.615933	(0.24561)	(-1.249535)
D(MYSY(-2))	0.259439	(0.34954)	(-0.348516)
R squared	0.492942	0.35649	

Note: Vector Error Correction Model between both of the variables (2008 to 2017)

7. CONCLUSION AND IMPLICATIONS

The main idea of this article is to observe the relationship involving money supply and stock prices in Indian economy by applying unit root tests, Johansen's co-integration test and Vector Error Correction Model (VECM). The study used the secondary data. The monthly prices of BSE Sensitive Index (Sensex) and the money supply data have been used. The paper analyzes the time series data from January 2008 to December 2017. In the study, BSE Sensitive Index (Sensex) prices have been collected from the Centre for Monitoring of Indian Economy (CMIE) prowess database and money supply data was collected from the website of Reserve Bank of India. Through the results of ADF and PP test it can be concluded that both the variables are stationary at first difference. The results of the study indicated that long run association exists between money supply and the prices of stock. It can be concluded from Vector Error Correction Model that there is no short run relationship exists between both the variables.

The present study may be of use to investors in their investment decisions and in the management of portfolios. The results of this study may be applicable for policy makers, researchers and regulators to predict Stock market returns in India.

8. LIMITATIONS AND SCOPE FOR FURTHER RESEARCH

The study has certain limitations which also provide avenues for further research. In the present work, only Money Supply has been taken as a Macroeconomic variable but other prominent macroeconomic variables such as GDP, Industrial Production, Inflation, Interest rate, Exchange rate can be used. There are several measures of money supply which are available now including liquidity aggregates, so they can be considered. The study period though long, can be further extended.

So, a more comprehensive assessment of impact of macroeconomic variables and systematic risk can be done by simultaneously incorporating several macroeconomic variables in the study and considering longer range data. Also, sectoral level indices can be used as proxy for different industry segments of the broad market.

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