ANALYSIS ON THE VECTOR AUTOREGRESSIVE MODEL (VAR) AND VECTOR ERROR CORRECTION MODEL (VECM) FOR THE BSE INDEX, EXCHANGE RATE, CONSUMER PRICE INDEX, AND INTEREST RATE

Vishlesh K H
Research Scholar, School Of Business and Commerce
The Glocal University, Mirzapur Pole , Saharanpur ,Uttar Pradesh, India.

Dr.SapnaRathore,
Research Supervisor, School Of Business and Commerce
The Glocal University, MirzapurPloe, Saharanpur, Uttar Pradesh, India.

ABSTRACTS

All of the time series data were transformed into stationary series at the first difference, and the Vector Autoregressive Model (VAR) was used to calculate the lag length selection criterion. Using the "Autoregressive Distributed Lag" (ARDL) & Bound testing technique, the short- and long-term cointegration relations between the macroeconomic variables and share prices have been studied. The "direction of causality" is investigated using the "Granger Causality test," which is based on the "Vector Error Correction Model" (VECM) and further establishes the cointegrating relation. The goal of the current study is to investigate how macroeconomic factors generally affect stock market results. The study looks at how key macroeconomic variables like "trade openness," "exchange rate," "inflation," "interest rate," and "crude oil prices" affect the long- and short-term relationships as well as the bidirectional and unidirectional causality between the share prices, as measured by the BSE SENSEX, and a few key macroeconomic indicators. Stock market values are a reliable predictor of a nation's economic health and a leading sign of actual economic activity. The country's population's household consumption, investments, and saving decisions can all be impacted by share prices. Thus, it has been demonstrated that the stock market functions similarly to a barometer to assess the real growth of the economy from a variety of angles. Connecting savers and investors to manage money leads to the expansion of the nation's financial system.

Key Words-: Autoregressive Distributed Lag" (ARDL),BSE SENSEX,cointegration

1. INTRODUCTION:

Understanding macro dynamics of Indian stock market may be useful for policy makers, traders and investors. Results may reveal whether the movement of stock prices is the outcome of something else or it is one of the causes of movement in other macro dimension in the economy. The study also expects to explore whether the movement of stock market are associated with real sector of the economy or financial sector or both We analyze the long term relationship between BSE and certain macroeconomic variables. We use the regression equation model (Galton, 1877) in order to investigate the relationship among these factors. Results reveal that there is high correlation between the empirical results reveal that exchange rate and gold prices highly effect the stock prices on the other hand the influence of foreign exchange reserves and Inflation on the stock price is up to limited extend only. The movement of stock indices is highly

sensitive to the changes in fundamentals of the economy and to the changes in expectations about future prospects. Expectations are influenced by the micro and macro fundamentals which may be formed either rationally or adaptively on economic fundamentals, as well as by many subjective factors which are unpredictable and also non quantifiable. It is assumed that domestic economic fundamentals play determining role in the performance of stock market. However, in the globally integrated economy, domestic economic variables are also subject to change due to the policies adopted and expected to be adopted by other countries or some global events. The common external factors influencing the stock return would be stock prices in global economy, the interest rate and the exchange rate. For instance, capital inflows and outflows are not determined by domestic interest rate only but also by changes in the interest rate by major economies in the world. Burning example in India is the appreciation of currency due to higher inflow of foreign exchange. Rupee appreciation has declined stock prices of major export oriented companies. Information technology and textile sector are the example of falling stock prices due to rupee appreciation. From the beginning of the 1990s in India, a number of measures have been taken for economic liberalization. At the same time, large number of steps has been taken to strengthen the stock market such as opening of the stock markets to international investors, regulatory power of SEBI, trading in derivatives, etc. These measures have resulted in significant improvements in the size and depth of stock markets in India and they are beginning to play their due role. Presently, the movement in stock market in India is viewed and analyzed carefully by large number of global players.

2. RESEARCH METHODOLOGY:

Research Design

In the present research the quantitative approach of has been used. By applying the quantitative research approach the time series data of dependent and independent variables have been collected and then a complete set of quantitative analysis performed. "Quantitative research method" accomplishes the standardized estimation for the taken indicators/ variables to estimate the expected results. The most dependable methods of organizing the study/ research, as calculation are based on the numerical data. The QRM helps in the explanation of any issue or incident with the help of collecting thenumerical data and its analysis with the help of statistical tools" (Alieaga, and Gunaderson, 2003). A descriptive and causal-comparative research design has been applied in the study.

Data Analysis Tools & Techniques

The present research has taken a set of wide-ranging econometric models/methods for analysing data such as; the VAR and VECM (Vector error correction model) based "Granger Causality Test" for testing the bidirectional causality among the variables , Residuals tests such as: -"Serial correlation test" , "Heteroscedasticity test" ,"Normality test" and CUSUM & CUSUM Square Test, "Impulse Response Function" and "Variance Decomposition Test" for analysing the exogenous shocks to the macroeconomic indicators respond to "BSE SENSEX".

Independent Variable

"BSE SENSEX" has taken as an independent variable for this study.

DependentVariables

RealExchangeRate

The "exchange rate" is estimated as averaging all the fluctuating values of domestic currency which is included an index adjusted with the changes in rate of inflation. It defines the "weighted average" of exchange rates, which is estimated for variance in prices amongthe foreign currencies and domestic currency, related to the hypothesis on (PPP) "purchasing power parity". The strength of Indian/domestic currency calculates on the basis of six major foreign currencies and against the 36 currencies. The group of currency is relevant which represents aset oftrading nations as moreexpensive.For research, a "real effectiveexchange rate" has been taken to examine the impact on share prices.

Inflation (CPI)

Inflation is defined as a increase in price of the products after a time period. It can be calculated through many security indices, and every index delivers separate statistical estimations. There are two indices for measuring rate of inflation "Wholesale Price Index" and the "Consumer Price Index", especially for definite groups like agriculture industry and/or employees in developed areas. Both share indices are formulated in a very specified method for a particular year takes as a "base year", and further considers the changes inprices over the year. However, the high and low inflation rates both affect stock prices. In the present study (CPI) "Consumer Price Index" is taken as a substitution for "rate of inflation"to examine its impact on the share prices returns in India. The "consumer price index" calculates the fluctuations in the level of product's prices of a market which is a group of "consumer goods" and "services" regularly acquired by domestic households.

RealInterest Rate

Many studies established that the interest rates and the prices of the stock market are closely related. Among the various fundamental macroeconomic variables interest rate is the most significant macroeconomic indicator. Rate of interest directly correlates with the "country's economic growth". Generally, the rate of interest can be measured as the "cost of capital", which means, using money for some durations. From the debtor's point of view, the rate of interest is regarded as the cost of deriving money that represents the rate of borrowings, whereas, from the side of lender, the rate of interest is regarded as the charged extra amount as a fee for lending money. The effect of "rate of interest" on the share pricecan offer different insinuations for "risk management practices", "monetary policy","financial securities", and the "government policies" to the stock market.

Oil Prices

Fluctuation or changes in transnational "crude oil prices" are estimated an essential variable for evaluating the fluctuations in the share market. The present study has usedGlobal "crude oil prices per 1000 barrels. Monthly Time series data for "crude oil prices" is accessible. Data has been collected from www.fred.stluis.com .

Trade Openness

Trade openness calculated with the summation of the imports and exports of the country which contribute as a part of that country's real GDP (Gross Domestic Product). The value of "trade openness" represents the contribution of the state/country in the global flows of capital and goods. A range to which any of the host country is very flexible and availableto the investors from foreign countries for trade at international level. Trade openness raisesto the positioning of the economy of a country in the context of "global trade". The

grade of "trade openness" is estimated bythe real size of registered exports and imports of a country's economy.

3. DATAANALYSIS

ModelSpecifications

LBS=α_0+α_1LCO+ α_2CPI+α_3LEXR +α_4LIR+α_5LTO +$\mathcal{E}$t….(45)

VAR(VectorAutoregressive)LagLengthSelectionCriteria

Table4.5:Resultsof VAR(Vector Autoregressive)LagLengthSelectionCriteria

Laglength	Lo		lo L.RFPO	(A.I.C)	(SIC)	H.Q
0	-2173.28	NA	98765198	35.43552	35.57270*	35.49124
1	-2131.09	79.59478*	89361134*	35.33472*	36.29498	35.72477*
2	-2112.67	32.94534	1.19e+08	35.62058	37.40392	36.34497
3	-2094.93	29.98870	1.62e+08	35.91760	38.52401	36.97631
4	-2070.25	39.32717	1.99e+08	36.10166	39.53116	37.49472
5	-2045.01	37.76491	2.45e+08	36.27654	40.52911	38.00393
6	-2024.23	29.06021	3.29e+08	36.52400	41.59965	38.58571
7	-1983.75	52.65499*	3.28e+08	36.45118	42.34990	38.84723
8	-1957.95	31.04339	4.26e+08	36.61704	43.33884	39.34742
(*)laglengthselectionbycriterias						
L.R.:"sequential modifiedL.R.test statistic"(at 5%level)						
F.P.E:"Final predictionerror"						
AC:Akaikiinfocriteria						
SIC: Schewarzinfocriteria						

H.Q.:Hanna\un-Quininfocriteria		

Source:Resultsobtained byown calculationonE-Views12

BSESENSEX

Table4.6:BSESENSEX

Lag	Akaikeinfocriteria	Schwarz info Criteria
0	18.02641	17.07594
1	17.17732*	18.27625*
2	14.22813	13.37656

Source:Resultsobtained byown calculationonE-Views12

ExchangeRate

Table4.7: ExchangeRate

Lag	Akaikeinfocriteria	SchwarzinfoCriteria
0	21.96923	22.01874
1	22.42982*	24.52875*
2	23.52471	26.67316

Source:Resultsobtained byown calculationonE-Views12

Inflation(CPI)

Table4.8: Inflation(CPI)

Lag	Akaikeinformationcriterion	SchwarzinformationCriterion
0	25.24800	26.19247
1	26.65970	25.25463*
2	27.75388	24.30727

Source:Resultsobtained byown calculationonE-Views12

CrudeOilPrices

Table4.9: CrudeOil Prices

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0	20.32471	22.15410
1	23.47892*	23.46784*
2	24.64493	24.67335

Source:Resultsobtained byown calculationonE-Views12

InterestRate

Table4.10: InterestRate

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0	27.12060	25.23014
1	28.22528*	26.45413
2	29.43194	27.56036

Source:Resultsobtained byown calculationon E-Views12

TradeOpenness

Table4.11:TradeOpenness

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0.	21.45308	19.80223
1	14.34421*	22.46356*
2	17.23533	17.62389

Source:Resultsobtainedbyown calculationonE-Views12

BSESENSEX&ExchangeRate

Table4.12:BSE SENSEX&ExchangeRate

Lag.	Akaikiinfocriteria	Schewarzinfo Criteria
0.	36.23421	31.78314
1	34.45906*	31.89585*
2	39.09853	26.60318

Source:Resultsobtained byown calculationonE-Views12

BSESENSEX&Inflation(CPI)

Table4.13:BSESENSEX&Inflation(CPI)

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0	32.23748	27.70641
1	29.45484*	23.45163*
2	30.76829	34.32294

Source:Resultsobtained byowncalculation onE-Views12

BSESENSEX&CrudeOilPrices

Table4.14:BSE SENSEX&Crude OilPrices

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0	23.14421	37.15314
1	34.96906*	30.98585*
2	39.20853	30.50318

Source:Resultsobtained byown calculationonE-Views12

BSESENSEX&InterestRate

Table4.15:BSESENSEX&InterestRate

Lag.	Akaikeinfocriterion	SchwarzinfoCriterion
0	31.29112	29.48005
1	32.63009*	25.55688*
2	33.01817	26.66282

Source:Resultsobtained byown calculationonE-Views12

BSESENSEX&TradeOpenness

Table4.16BSESENSEX &TradeOpenness

Lag.	Akaikeinfocriterion	Schwarzinfo Criterion
0	28.29857	28.39750
1	23.94419*	24.24098*
2	44.37111	24.86576

Source:Resultsobtained byown calculationonE-Views12

Interpretationoftheresult:-Accordingtothecalculations,theideallaglengthis1forallthevariables.After finding the order of the lag length of all dependent and independent indicators.For examine the long-term association among all the variables, further the next step is toapply"ARDL"procedureto co-integration.

4. Conclusion:

The empirical analysis began with testing the stationarity of the time series data by applying the "Augmented Dicky Fuller" (ADF) and "Phillip Perron" unit root test. At the first difference, all the time series data were converted into stationary series, and the lag length selection criteria were determined by applying Vector Autoregressive Model (VAR). For studying the short-term and long-term cointegration relation amongst the macroeconomic indicators and share prices, "Autoregressive Distributed Lag" (ARDL) & bound testing approach has been applied. The "error correction term" (ECM t-1) identified the rapidityof adjustments in the direction of the symmetry. After further establishing the cointegratingrelation, the "direction of causality" is examined using the "Vector Error Correction Model" (VECM) based "Granger Causality test".

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