Research Paper Mathematics

Sensex Vs Djia: A Relative Analysis

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ABSTRACT

This paper examines the past performance of Sensex and Dow Jones Industrial Average (DJIA) using the weekly data from 2001 to 2014. This study found the Correlation between the movements of Sensex and DJIA. The data series are tested with ADF (Augmented Dickey Fuller) -test for stationarity and their relative impact has been found out by making the regression analysis. The residuals of the regression series are also tested with autocorrelation effect. The result of the study shows the Sensex movement was meagerly affected by DJIA movement indicates that there are many other factors that affect the movement of Sensex.

KEYWORDS

1. Introduction

In the present Globalised economic scenario, the economic factors of one country affects the economy of other country in lucid manner. In this study the American major stock index Dow Jones Industrial Average (DJIA) was taken to compare with Indian major stock market index Sensex. The growth of American economy was coined by integrate other country economy. The American currency dollar ($) was used by many countries for their import, export payments, receipts and foreign exchange reserves. The economic activities that are happening in the USA was affects many other countries including India. This study only considers the movements of DJIA and its relative impact on Sensex.

Sensex

Bombay stock exchange is the oldest stock exchange in Asia with a rich heritage of over 133 years of existence. What is now popularly known as BSE was established as "The Native Share and Stock Brokers' Association" in 1875. BSE is the first stock exchange in the country which obtained permanent recognition (in 1956) from the government of India under the securities contracts (regulation) act (SCRA) 1956. Over the past 133 years, BSE has facilitated the growth of the Indian corporate sector by providing it with cost and time efficient access to resources.

The BSE index, SENSEX, is India's first and most popular stock market bench mark index. SENSEX is tracked worldwide. It constitutes 20 stocks representing 12 major sectors. The SENSEX is constructed on a free float methodology, and is sensitive to market movements and market realities. Apart from the SENSEX, BSE offers 23 indices, including 13 sectoral indices.

Bombay stock exchange Sensitive Index is a value weighted index composed of 30 stocks that started January 1, 1986. The Sensex is regarded as the pulse of the domestic stock markets in India. It consists of the 30 largest and most actively traded stocks, representative of various sectors, on Bombay stock exchange. These companies account for around fifty per cent of the market capitalization of the BSE. The base value of the sensex is ***100*** on April 1, 1979, and the base year of BSE-SENSEX is ***1978-79***.

At regular intervals, the Bombay Stock Exchange (BSE) authorities review and modify its composition to make sure it reflects current market conditions. The index is calculated based on a free float capitalization method; a variation of the market cap method. Instead of using a company's outstanding shares it uses its float, or shares that are readily available for trading. The free-float method, therefore, does not include restricted stocks, such as those held by promoters, government and strategic investors.

As per free float capitalization methodology, the level of index at any point of time reflects the free float market value of 30 component stocks relative to a base period. The Market Capitalization of a company is determined by multiplying the price of its stock by the number of shares issued by the company. This Market capitalization is multiplied by a free float factor to determine the free float market capitalization. Free float factor is also referred as adjustment factor. Free float factor represent the percentage of shares that are readily available for trading.

The index has increased by over ten times from June 1990 to the present. Using information from April 1979 onwards, the long-run rate of return on the BSE Sensex works out to be 18.6% per annum, which translates to roughly 9% per annum after compensating for inflation.

Dow Jones

The Dow Jones Industrial Average, the Dow Jones 30 or simply the Dow Jones stock index, was created by Wall Street Journal editor and Dow Jones & Company co-founder Charles Dow. Today it's owned by CME Group as the majority owner of the Dow Jones index. This index shows how 30 major public corporations are trading in the United States based on a standard trading session in the stock market. The Dow Jones stock market in value is not the actual average of the component stocks prices, but means the sum of the component prices are divided by a divisor, it will change anytime when one of the component stocks has split or stock is divided for generating a suitable value for the index.

The Dow Jones stock market includes the world's largest multinational corporations and corporation's brands such as Coca-Cola, Microsoft, Apple, General Electric and Exxon Mobil. The 30 Current Shares in the Dow Jones Industrial Average are important factors in its industries, and its shares are held by private individuals and institutional investors. The Dow Jones holds for 27% of the market capitalization of free float-adjusted marketing the U.S on 31 December 2008. Over two-thirds of the 30 components of the Dow Jones Industrial companies are manufacturers and consumer goods. The oth-

ers represent various sectors such as financial services, entertainment and information technology. The Dow Jones stock market is not limited to the traditional definition of industrial shares. In contrast, the index serves as a measure of the total U.S. market for such diverse areas as financial services, technology, entertainment, retail and consumer goods. Market value of the Dow Jones stock market is a weighted average price of 30 blue-chip stocks, mainly industrials but also includes American Express Co. and American Telephone and Telegraph Co. Prepared and published by Dow Jones & co., it is the oldest and most widely quoted of all the market indicators. The components, which change from time to time between 15% and 20% of the NYSE securities, market value. The average is expressed in points, not dollars. The Dow Jones stock market product line provides a range of investing instruments: leveraged equities, futures contracts and options contracts.

2. Review of Literature

Naliniprava Tripathy (2011) in his paper he investigated the market efficiency and causal relationship between selected Macroeconomic variables and the Indian stock market during the period January 2005 to February 2011 by using Ljung-Box Q test, Breusch-Godfrey LM test, Unit Root test, Granger Causality test and granger causality test evidence the bidirectional causal relationship between Granger-causality test shows evidence of bidirectional relationship between interest rate and stock market, exchange rate and stock market, international stock market and BSE volume, exchange rate and BSE volume.

Paul Alagidede (2011) studied the causal relationship between Exchange rate investigates the nature of the causal linkage between stock markets and foreign exchange markets in Australia, Canada, Japan, Switzerland, and UK from January 1992 to December 2000. They found no evidence of a long run relationship between the variables.

Lean.H.H., et al (2008) studied the the relationship between exchange rates and stock prices in eight Asian countries using cointegration and Granger causality tests over the period 1991 to 2005 and found the mixed set of results.

Beer. F. Hebein. F (2008) examined the stock market and exchange rate dynamics in two groups of countries by using Exponential General Autoregressive Conditional Heteroskedasticity. Mansor H. Ibrahim (2000), his article analysed the interactions between stock prices and exchange rates in Malaysia, using bivariate as well as multivariate cointegration, and the Granger causality test.

3. Objectives of the study

* To test the stationarity of Dow jones and Sensex for the study period

* To find the statistically significant relationship between Sensex and Dow jones indices.

4. Hypothesis of the Study

Null hypothesis

* There is no significant relationship between movements of Sensex and Dow jones indices.

* The Dow jones index does not statistically impact the Sensex

Null hypothesis ADF- test

* There is no stationarity relationship in Sensex and Dow jones series.

5. Research Methodology

Data

The weekly closing values of sensex and dowjones is taken for the study for the period 2001 to 2014 from www.yahoo.com/finance. The total 574 observations have been taken for the study.

Tools used for the analysis

Augmented dickey-filler test:

"A series is said to be stationary if displacement over time does not alter the characteristics of a series in a sense the probability distribution remains constant over time".-Engle & Granger, 1991 Formal testing for stationarity can be performed with the Augmented Dickey-Fuller. **Augmented Dickey-Fuller test (ADF)** is a test for a unit root in a time series sample. It is an augmented version of the Dickey-Fuller test for a larger and more complicated set of time series models. The augmented Dickey-Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejections of the hypothesis that there is a stationary level of confidence.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_p \Delta y_{t-p} + \varepsilon_t,$$

Where α is a constant, β the coefficient on a time trend and ***p*** the lag order of the autoregressive process. Imposing the constraints $\alpha = 0$ and $\beta = 0$ corresponds to modelling a random walk and using the constraint $\beta = 0$ corresponds to modelling a random walk with a drift.By including lags of the order ***p*** the ADF formulation allows for higher-order autoregressive processes. This means that the lag length ***p*** has to be determined when applying the test. One possible approach is to test down from high orders and examine the t-values on coefficients. An alternative approach is to examine information criteria such as the Akaike information criterion, Bayesian information criterion or the Hannon Quinn criterion. These tests are based on a linear AR (p) model with ρ number of lags, which considers all combinations of price sensitivity γ to the past mean prices and the significance of some resilient price level as drift.

ARCH Model

Engle (1982) proposed the ARCH (q) model is given by

let ϵ_t denote the error terms (return residuals, w.r.t. a mean process) and assume that $\epsilon_t = \sigma_t z_t$, where and where $z_t \overset{\text{iid}}{\sim} N(0,1)$ the series σ_t^2 are modeled by

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \cdots + \alpha_q \epsilon_{t-q}^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \epsilon_{t-i}^2$$

here $\alpha_0 > 0$ and $\alpha_i \geq 0,\ i > 0$.

$$\hat{\epsilon}_t^2 = \hat{\alpha}_0 + \sum_{i=1}^{q} \hat{\alpha}_i \hat{\epsilon}_{t-i}^2$$

Where ***q*** is the length of ARCH lags.

The null hypothesis is that, in the absence of ARCH components, we have $\alpha_i = 0$ for

all $i = 1, \cdots, q$. The alternative hypothesis is that, in the presence of ARCH components, at

least one of the estimated α_i coefficients must be significant. In a sample of T residuals under the

null hypothesis of no ARCH errors, the test statistic ***TR²*** follows χ^2 distribution with ***q*** degrees of

freedom. If ***TR²*** is greater than the Chi-square table value, we ***reject*** the null hypothesis and

conclude there is an ARCH effect in the ARMA model. If ***TR²*** is smaller than the Chi-square

table value, we ***do not reject*** the null hypothesis.

6. Empirical Results

Descriptive Statistics

The below table1 indicates the descriptive statistics for the Sensex and Dow jones series for the study period 2001 to 2014. The mean of the Sensex series is higher than the Dow

jones series during the study period. The standard deviation is higher for Sensex rather than Dow jones indicates the indian market is more volatile than American market during the study period. The kurtosis value of the Dow jones index is much higher than Sensex reveals that more return values are clustered near the mean return value. The returns of the Sensex series is distributed as more scattered. Both distributions are negatively skewed and Dow jones is more negatively skewed than the Sensex.

Table 1

	Sensex	Dow jones
Mean	0.301631544	0.058450649
Median	0.585634392	0.251709657
Standard Deviation	3.486583978	2.615087539
Sample Variance	12.15626784	6.838682835
Kurtosis	2.053429381	6.42291509
Skewness	-0.28366444	-0.696488078
Range	30.03180491	29.44220676
Minimum	-15.95416691	-18.15129322
Maximum	14.077638	11.29091354

Correlation co efficient between the movements of Sensex and Dow jones = 0.60

The correlation between Sensex and Dow jones is 0.60 during the study period.

ADF-test results

The result of the ADF-test is exhibited in the table 2. It clearly shows that the Sensex and Dow jones series are stationary in their first difference at 1 % significance level. Hence the null hypothesis of no stationarity is rejected. It was computed by using wegreg a excel add in. so this stationary time series data is available for further analysis.

Table 2

ADF – test results			
SENSEX	t-statistic		-14.285855
DOW JONES	t-statistic		-15.134151
Test critical values:	1% level		-3.441638
	5% level		-2.866402
	10% level		-2.569400

Regression Analysis

Table 3 indicates that the regression analysis of Dow jones and Sensex, taking the Sensex as explained variable and Dow jones as exploratory variable. The impact of Dow jones on Sensex is not statistically significant. The coefficient of Dow jones impacts the Sensex, having probability of 0.77 which is more than the 0.05 level. Hence the null hypothesis is rejected. So the DJIA is not significantly impact Sensex during the study period. Also the R – square statistics shows that there is a poor model fit.

Table 3

	Coefficient	Std. Error	t-ratio	p-value
const	0.302532	0.145805	2.0749	0.03844
Return DJIA	-0.0159967	0.0558292	-0.2865	0.77458
R squared	0.000144			

The residuals of the regression series in tested with autocorrelation function. The chart 1 shows that Autocorrelation Function (ACF) it shows that as the lag period increases the auto correlation getting lower level indicates the residuals are stationary.

7. Conclusion

The present study made a relationship analysis between Sensex and Dow jones during the period 2001-2014. Weekly data have been used for the analysis frequency of the data is quite high, the study takes nearly 572 obervations. Both the Sensex and DJIA series are stationary at their first difference . The regression analysis shows that the impact of DJIA movements on Sensex is very low and it is not statistically significant. The residual auto correlation function reveals that over the time period there is no serial correlation in the residuals. The Dow jones movements does not have the forecasting information of Sensex. So the investors and traders cannot use Dow jones movements to predict the Sensex it does not have meaningful predictable information.

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