Abstract

Financial Markets in the current Scenario do not operate in a vacuum. Globalisation has opened doors to other countries and any policy change in one country affects another country in one way or the other. This Paper attempts to analyze the cointegration between American Stock Market, Indian Stock Market and Chinese Stock Market. Stock Market Indices from NYSE (S&P 500), BSE (Sensex) and Shanghai Stock Exchange(S&P 300) are used for the study. The extent of co integration is analysed using Engle Granger cointegration test. Data is collected for the time period 01/01/2006 to 31/12/2015. The study will be helpful to understand the extent of interdependence these markets have with each other.

1. INTRODUCTION

The S&P 500 is considered to be the leading indicator of U.S. equities and is meant to reflect the risk/return characteristics of the large cap universe. The S&P500 index is weighted by market value and its performance is thought to be representative of the stock market as a whole. This index provides a snapshot of the overall U.S. equity market; 70% of all U.S. equity is tracked by the S&P 500. The index selects its companies based upon their market size, liquidity, and sector. S&P BSE SENSEX, first compiled in 1986, was calculated on a 'Market Capitalization-Weighted' methodology of 30 component stocks representing large, well-established and financially sound companies across key sectors. The base year of S&P BSE SENSEX
was taken as 1978-79. S&P BSE SENSEX today is widely reported in both domestic and international markets through print as well as electronic media. It is scientifically designed and is based on globally accepted construction and review methodology.

The S&P/CITIC 300 serves as a barometer for the China A-share market’s performance. Index constituents are composed of 300 enterprises, with the largest float-adjusted market capitalization and liquidity, drawn from the entire universe of listed A-share companies in China. Index constituents are composed of the 50 largest blue chip enterprises among the constituents of the S&P/CITIC 300 index. Stocks included in the S&P/CITIC 100 and the S&P/CITIC 200 aggregate to form the S&P/CITIC 300. Stock markets are one of the indicators of the overall economic growth of a country. If the economy grows, it results in and implies that the companies have fared well and the stock markets have risen. The stock markets are governed by the interaction of demand and supply. More demand, higher prices; more supply, lower prices. US economy is the largest economy in the world. Economies of many small and large nations (especially China) depend to a large extent on exports to American markets. Hence any change in US economy affects these economies.

Although Indian economy was mainly driven by domestic consumption, post liberalization the share of Indian trade to global trade is growing at a rapid pace. A large number of Indian companies are getting involved in exporting their products to global markets, raising funds by listing on foreign stock exchanges (NYSE, London Stock exchange and NASDAQ etc.). The percentage of revenue of Indian companies coming from foreign markets is growing year on year. Therefore, share price movements of these companies are likely to be affected by developments in world economy. Rapid development in technology (especially in the last one decade) is another major driver of linking the various markets across the world. Internet has enabled the investors to virtually trade/invest in any developed market across the world. The cointegration test of American Stock Market, Chinese Stock Market and Indian Stock Market thus assumes significant importance as it helps the investors to know the extent to which these markets are cointegrated.

2. RESEARCH METHODOLOGY

Weekly Stock Prices of Indian, American and Chinese Stock markets are chosen for the study. The weekly stock index returns of S&P 500(NY Stock Exchange), Sensex (Bombay Stock Exchange) and S&P 300 (Shanghai Stock Exchange) are obtained from the website “https://in.finance.yahoo.com”. The analysis and interpretation is done for a period of 01/01/2006 to 31/12/2015.

3. OBJECTIVE OF THE STUDY

i.) To find out the cointegration of American and Indian stock market
ii.) To find out the cointegration of American and Chinese stock market
iii.) To find the cointegration of Chinese and Indian stock market.
4. EMPIRICAL ANALYSIS

An Augmented Dickey Fuller (ADF) test is carried out on the variables and is found that all the variables are stationary at first level of difference. Engle Granger cointegration test is used to analyse the cointegration between the variables. Two variables are said to be cointegrated when the linear combinations of two variables is stationary implying that there is a long term relationship existing between them.

- \( H_0 = \text{There is no linear dependence among Sensex and S&P500} \)
- \( H_0 = \text{There is no linear dependence among S&P 300 and S&P 500} \)
- \( H_0 = \text{There is no linear dependence among Sensex and S&P 300} \)

Testing for cointegration involves testing the residuals from an Ordinary Least Square regression for the time series (Sensex & S&P 500, S&P300 & S&P 500, Sensex & S&P 300) and residuals are obtained.

\[ Y_t = \beta_0 + \beta_1 X_t + \beta_2 Z_t + \epsilon \]

Regress y on x and z. The residuals are obtained from the Ordinary least square and an Augmented Dicky fuller unit root test is carried out to check for unit root. If a unit root is not present the residuals are stationary and the variables are cointegrated. The results of the unit root test, t-statistics has to be compared with specially calculated critical values. If the estimated values exceed any of these critical values the null hypothesis that there is no cointegration among the variables can be rejected.

The test of cointegration is applied to Sensex (BSE), S&P 500(NYSE) and S&P300 (SSE) index and the results are as follows:

**Table 1: Engle Granger Cointegration between Sensex and S&P 500**

<table>
<thead>
<tr>
<th>Index</th>
<th>p value</th>
<th>Test Statistic CR DF</th>
<th>1% EG Critical Value</th>
<th>5% EG Critical Value</th>
<th>10% EG Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensex-S&amp;P 500</td>
<td>0.3865</td>
<td>-2.3865</td>
<td>Do not reject ( H_0 )</td>
<td>Do not reject ( H_0 )</td>
<td>Do not reject ( H_0 )</td>
</tr>
</tbody>
</table>

**Interpretation:**

The estimated t-values exceeds all of these critical values and p values for ADF test conducted on the residuals of the OLS regression equation is 0.3865 which is greater than 0.01,0.05 and 0.1, this means that unit root hypothesis is not rejected, which means that the series are not cointegrated.

**Table 2: Engle granger cointegration test between S&P 300 and S&P 500**

<table>
<thead>
<tr>
<th>Index</th>
<th>p value</th>
<th>Test Statistic CR DF</th>
<th>1% EG Critical Value</th>
<th>5% EG Critical Value</th>
<th>10% EG Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 300-S&amp;P 500</td>
<td>0.07687</td>
<td>-3.23884</td>
<td>Do not reject ( H_0 )</td>
<td>Do not reject ( H_0 )</td>
<td>Reject ( H_0 )</td>
</tr>
</tbody>
</table>

Dr. S. Nirmala, Deepthy. K: A Study Of Cointegration Between Indian, American And Chinese Stock Markets
Interpretation:
The estimated t-values exceed the 1% and 5% critical values but the t-value is less than the 10% critical value. The p-value is 0.07687 which is greater than 0.01, 0.05 but less than 0.1. Thus, Null hypothesis is not rejected at 1% and 5% significance level, but is rejected at 10% significance level.

Table 3: Engle Granger Cointegration test between S&P 300 and Sensex

<table>
<thead>
<tr>
<th>Index</th>
<th>p value</th>
<th>Test Statistic CR DF</th>
<th>1% EG Critical Value</th>
<th>5% EG Critical Value</th>
<th>10% EG Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 300 - Sensex</td>
<td>0.478</td>
<td>-2.2196</td>
<td>Do not reject H₀</td>
<td>Do not reject H₀</td>
<td>Do not reject H₀</td>
</tr>
</tbody>
</table>

Interpretation:
The estimated t-values exceed all of these critical values and p-values for ADF test conducted on the residuals of the OLS regression equation is 0.478 which is greater than 0.01, 0.05 and 0.1, this means that unit root hypothesis is not rejected, which means that the series are not cointegrated.

5. CONCLUSION

The cointegration of Indian stock market, American stock market and Chinese stock market has been studied using Engle granger cointegration test. The study is made to find the extent to which these stock markets are cointegrated with each other. The weekly closing values of S&P 500, Sensex and S&P 300 are taken into account. The interdependence was examined for the period 01/01/2006 to 31/12/2015. The study shows that there is no significant cointegration between US and Chinese stock market with Indian Stock market. But Chinese stock market is having a cointegration with US stock market at 10% significance level.

6. REFERENCES

[8] www.investing.com