Are Karachi Stock Exchange and Bombay Stock Exchange Co-integrated?

Nawaz Ahmad   Aamir Firoz Shamsi
Professors at IoBM, Karachi

Abstract
The research paper was aimed to find the integration between Karachi Stock Exchange and Bombay Stock Exchange. A daily data of stock prices from Nov 2009 to Dec 2012 has been obtained and their geometric returns are calculated as mentioned in Ahmad and Husain (2007). Stock returns were found integrated of order zero. Johanson Cointegration test is applied over historical returns of both the stock market returns in order to capture existence of cointegration. Result shows that, Trace-statistics and Eigen-values, fall within the critical region, i.e. their p-value is less than 0.05, and hence it is concluded on the bases of stochastic process and econometric evidence that Karachi Stock Exchange and Bombay Stock Exchange are not cointegrated.
Keywords: KSE, BSE, Cointegration

1. Introduction

Co-integration is a statistical property of time series variables. Two or more time series are co-integrated if they share a common stochastic drift. If two or more series are individually integrated (in the time series sense) but some linear combination of them has a lower order of integration, then the series are said to be integrated.

Karachi Stock Exchange

Karachi Stock Exchange (Guarantee) Limited (KSE), currently the biggest and most liquid stock exchange in Pakistan, was established on September 18, 1947. It was incorporated on March 10, 1949. Only five companies were initially listed with a total paid-up capital of 37 million rupees

As on April 21st, 2013 there are 588 companies listed in KSE and the total market capitalization is Rs. 4,492.481 billions. The listing is done on the basis of strict rules and regulations laid out by Securities Exchange Commission of Pakistan (SECP) & Karachi Stock Exchange (Guarantee) Limited. All the listed companies are categorized in various main business sectors. There are total 36 sectors listed on Karachi Stock Exchange. Out of these, 32 sectors contribute towards the market capitalization and all the listed companies (excluding their future contracts) are divided among these. Rest of the 4 sectors is allocated for indexes, futures bonds etc.

These non-market capitalization contributing sectors are as follows;

- Bonds
- Future Contracts
- Non Equity Inv Instruments
- Stock Index Future Contracts

As on April 21st, 2013 there are 588 companies listed in KSE and the total market capitalization is Rs. 4,492.481 billions. The listing is done on the basis of strict rules and regulations laid out by Securities Exchange Commission of Pakistan (SECP) & Karachi Stock Exchange (Guarantee) Limited. All the listed companies are categorized in various main business sectors. There are total 36 sectors listed on Karachi Stock Exchange. Out of these, 32 sectors contribute towards the market capitalization and all the listed companies (excluding their future contracts) are divided among these. Rests of the 4 sectors are allocated for indexes, futures bonds etc.

The KSE-100 Index was introduced in November 1991 with base value of 1,000 points. The Index comprises of 100 companies selected on the basis of sector representation and highest market capitalization, which captures over 90% of the total market capitalization of the companies listed on the Exchange. Out of the above mentioned 36 Sectors, 32 companies are selected i.e. one company from each sector (excluding the non market capitalization contributing sectors) on the basis of the largest market capitalization and the remaining 68 companies are selected on the basis of largest market capitalization in descending order. This is a total return index i.e. dividend, bonus and rights are adjusted.

Bombay Stock Exchange

Bombay Stock Exchange is Asia's first Stock Exchange and one of India's leading exchange groups. Over the past 137 years, BSE has facilitated the growth of the Indian corporate sector by providing it an efficient capital-raising platform. Popularly known as BSE, the bourse was established as "The Native Share & Stock Brokers' Association" in 1875. BSE is a corporatized and demutualised entity, with a broad shareholder-base which includes two leading global exchanges, Deutsche Bourse and Singapore Exchange as strategic partners. BSE provides an efficient and transparent market for trading in equity, debt instruments, derivatives, mutual funds. It also has a platform for trading in equities of small-and-medium enterprises (SME). More than 5000 companies are listed on BSE making it world's No. 1 exchange in terms of listed members. The companies listed on BSE Ltd command a

total market capitalization of USD 1.32 Trillion as of January 2013. It is also one of the world's leading exchanges (3rd largest in December 2012) for Index options trading (Source: World Federation of Exchanges).

BSE's popular equity index - the S&P BSE SENSEX - is India's most widely tracked stock market benchmark index. It is traded internationally on the EUREX as well as leading exchanges of the BRCS nations (Brazil, Russia, China and South Africa).

BSE has won several awards and recognitions that acknowledge the work done and progress made like The Golden Peacock Global CSR Award for its initiatives in Corporate Social Responsibility, NASSCOM - CNBC-TV18's IT User Awards, 2010 in Financial Services category, Skoch Virtual Corporation 2010 Award in the BSE Star MF category and Responsibility Award (CSR) by the World Council of Corporate Governance. Its recent milestones include the launching of BRICSMART indices derivatives, BSE-SME Exchange platform, S&P BSE GREENEX to promote investments in Green India.

1.1 Objective of the Study

The objective of this research is to find out the co integration between the historic data of Karachi Stock Exchange 100 Index and Bombay Stock Exchange 100.

1.2 Problem Statement

To examine the co integration between Karachi Stock Exchange 100 Index and Bombay Stock Exchange 100.

1.3 Hypothesis

H_0: Karachi Stock Exchange and Bombay Stock Exchange are not Co-integrated.

2. Literature Review

To know about the relationship of foreign reserves with stock market is important because international reserves accumulation has been the preferred policy recently adopted by developing economies to achieve financial stability. The aim of this policy is to increase liquidity and thus reduce the risk of suffering a speculative attack. (Cruz & Walters, June 2008).

Nishat and Shaheen (2004) analyze long-term equilibrium relationships between groups of Macroeconomic variables and the Karachi Stock Exchange Index. The macroeconomic variables are represented by the industrial production index, the consumer price index, M1, and the value of an investment earning the money market rate. They used vector error correction model to explore such relationships during1973 to 2004. Their results indicate a "causal" relationship between the stock market and the economy and show that industrial production is the largest positive determinant of Pakistani stock prices, while inflation is the largest negative determinant of stock prices in Pakistan. They found that macroeconomic variables Granger-caused stock price movements, the reverse causality was observed in case of industrial production and stock prices. Furthermore, he found that statistically significant lag lengths between fluctuations in the stock market and changes in the real economy are relatively short.

Most studies suggest that the macroeconomic surroundings has a significant effect on the stock market capitalization rate such as gross domestic product, exchange rates, interest rates, current account and money supply (Kurihara, 2006; Ologunde et al., 2006). Maintaining macroeconomic stability has been of the main challenges for developing countries .This paper explains the relationship between foreign exchange reserves of India and BSE market capitalization on the basis of annual data from fiscal year1990-91 to 2010-11. Both of the variables under consideration are very important because foreign exchange reserve is the crucial element out of the major supports to stable the value of home currency against foreign currencies and market capitalization shows the overall investment in stock market. Hussain etal. (2009) analyzed the "Impact of Macroeconomics Variables on Stock Prices: Empirical Evidence in Case of KSE" they consider the quarterly data of several economic variables such as foreign exchange rate, foreign exchange reserve, industrial production index, whole sale price index, gross fixed capital formation, and broad money M2 , these variables are obtain from 1986 to 2008 period. The result shows that after the reforms in 1991 the influence of foreign exchange rate and reserve effects significantly to stock market whiles other variables like IIP and GFCF are not effects significantly to stock prices.

Issam and Murinde (1997) studied the causal relationship between exchange rates and stock prices in India, Korea, Pakistan and Philippines. This was based on the bivariate vector autoregressive model. They first tested for stationary and the order of integration of the time series data used. They found that all the variables were non-stationary in level forms and stationary after they have been differenced once. Thus, they concluded that the variables were non-stationary. Next, they tested for co-integration between exchange rates and stock price index. They found that the two variables were co-integrated in the Philippines and India, only. Hence, they applied Granger-causality tests in Korea and Pakistan where exchange rates and stock prices were not co-integrated and error-correction model in the Philippines and India where the two variables were co-integrated. Among the findings of interest were that exchange rates Granger-cause.

Rahman and Uddin (2009) investigated the interactions between stock prices and exchange rates in three emerging countries of South Asia namely, Bangladesh, India and Pakistan. There data were the average monthly nominal exchange rates of US dollar in terms of Bangladeshi Taka, Indian Rupee and Pakistani Rupee and monthly values of Dhaka Stock Exchange General Index, Bombay Stock Exchange Index and Karachi Stock Exchange All Share Price Index for period of January 2003 to June 2008. They found that exchange rates and stock prices data series are non stationary and integrated of order one. Thus, they applied Johansen procedure to test for the possibility of a co-integrating relationship. Their results show that there is no co-integrating relationship between stock prices and exchange rates. Finally, they applied the Granger causality test to study any causal relationship between stock prices and exchange rates. Evidence provided indicated that there is no causal relationship between stock prices and exchange rates in the countries.

In a recent study Bhattacharya and Mukherjee (2003) investigated Indian markets using the data on stock prices and macroeconomic aggregates in the foreign sector including exchange rate concluded that there is no significant relationship between stock prices and exchange rates. In another study, Muhammad and Rasheed (2003) examined the relationship between stock prices and exchange rates of four South Asian countries named as Bangladesh, India, Pakistan and Sri-lanka and found that there is no significant relationship between the variables either in short-run or long-run in Pakistan and India. But they found a bidirectional relationship in case of Bangladesh and Sri-lanka.

Kurihara (2006) suggests that stock market capitalization rate is significantly influenced by the macroeconomic environment factors such as gross domestic product, exchange rates, interest rates, current account and money supply.

Bhattacharya et. al. (2001) conducts a case study to analyze "Causal Relationship between Stock Market and Exchange Rate, Foreign Exchange Reserves and Value of Trade Balance". They used methodology of Granger non-causality recently proposed by Toda and Yamamoto (1995) for the sample period April 1990 to March 2001. In this study, the Bombay BSE Sensitive Index was used as a proxy for the Indian stock market. The three important macroeconomic variables included in the study are real effective exchange rate, foreign exchange reserves and trade balance. The analysis reveals interesting results in the context of the Indian stock market, particularly with respect to exchange rate, foreign exchange reserves and trade balance. The results suggest that there is no causal linkage between stock prices and the three variables under consideration.

Murnde (1993) argued that, the exposure of firms to exchange rate risks has increased. Two different types of risks under an independently floating exchange rate regime are identified in the existing literature. First transaction exposure, which arises due to gains or losses arising from settlement of investment transactions stated in foreign currency terms. Second, economic exposure, which arises from variation in the firm's discounted cash flows when exchange rates fluctuate. Thus, the exchange rate risks affect the risks and returns and hence the value of the firm. Hence, theoretically changes in the exchange rates causes changes in stock prices.

Bahmani-Oskooee and Sohrabian (1992) used monthly values of S&P 500 index and US dollar effective exchange rate for the period of 1973-88 and used co-integration and Granger causality test to detect the relationship between the variables. They found bidirectional causality in the short run. They found no long-run relationship between the variables. Nieh and Lee (2001) supported the findings of Bahmani-Oskooee and Sohrabian (1992) and reported no long-run significant relationship between stock prices and exchange rates in the G-7 countries. Roll (1992) also studied the US stock prices and exchange rates and found a positive relationship between the two markets. On the other hand, Chow et al. (1997) examined the same markets but found no relationship between stock returns and real exchange rate returns. They repeated the exercise with a longer time horizons and found a positive relationship between the two variables.

Ajayi and Mougoue (1996) showed a negative short-run and positive long-run impact of stock prices on domestic currency value. Yu (1997) studied Hong Kong, Tokyo and Singapore markets by using daily data for a period of 1983-94. They traced bidirectional relationship in Tokyo, no causation in the Singapore markets and also found that changes in exchange rates Granger cause changes in stock prices.

Abdalla and Murinde (1997) employed co-integration test to examine the relationship between stock prices and exchange rates for four Asian countries named as India, Pakistan, South Korea and Philippines for a period of 1985 to 1994. They detected unidirectional causality from exchange rates to stock prices for India, South Korea and Pakistan and found causality runs from the opposite direction for Philippines.

3. Methodology

3.1 Method of Data Collection

Secondary data has been used for the study. The data comprises of the link between, "Karachi Stock Exchange 100 Index and Bombay Stock Exchange 100". Furthermore, we had taken the data from Nov 2009 to Dec 2012, the data is taken on monthly bases in order to check the co-integration between Karachi Stock Exchange 100 Index and Bombay Stock Exchange 100, Co-integration Model has been applied with the help of Microsoft Excel.

3.2 Data Sources
- http://www.bseindia.com/indices/IndexArchiveData.aspx
- http://www.zhvsec.com/kseindex-history.aspx

4. Results and Discussion

Co-integration is a statistical property of time series variables. Two or more time series are co-integrated if they share a common stochastic drift. In case of co-Integration between Karachi Stock Exchange and Bombay Stock Exchange, the result suggests there is no integration between Karachi Stock Exchange and Bombay Stock Exchange.

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.227605	11.53322	15.49471	0.1807
At most 1	0.052046	1.977632	3.841466	0.1596
Trace test indicates no co-integration at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

The output above displays a table that shows us the analysis of any form of co-integration in the overall model. This table is produced as a result of E-views calculation of the co-integration models which was applied in this research. In a co-integration test, it is supposed that the combination of integrated variables/series which indicate that the model is giving you a stationary process. The table tells us that the model itself does not have overall significance which interprets that the theoretical framework developed for this research does not match the statistical framework and results seen above. The Trace statistic section seen above tells us that here the value is greater than the critical value which is 11.53 which indicate that the model is not giving you a stationary process. This contemplation is supported by the probability. Probability tells us that the value is above the usual cut off of critical value 0.05indicating that the model and statistical framework is insignificant.

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.227605	9.555589	14.26460	0.2428
At most 1	0.052046	1.977632	3.841466	0.1596
Max-eigenvalue test indicates no co-integration at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

The output above displays a table that shows us the analysis of any form of co-integration in the overall model. This table is produced as a result of E-views calculation of the co-integration models which was applied in this research. In a co-integration test, it is supposed that the combination of integrated variables/series which indicate that the model is giving you a stationary process. The table tells us that the model itself does not have overall significance which interprets that the theoretical framework developed for this research does not match the statistical framework and results seen above. The max-Eigen statistics section seen above tells us that here the value is greater than the critical value which is 9.555 which indicate that the model is not giving you a stationary process. This contemplation is supported by the probability. Probability tells us that the value is above the usual

cut off of critical value 0.05 indicating that the model and statistical framework is insignificant.

5. Conclusion

Co-integration is a statistical property of time series variables. Two or more time series are co-integrated if they share a common stochastic drift. If two or more series are individually integrated (in the time series sense) but some linear combination of them has a lower order of integration, then the series are said to be integrated. The research paper was aimed to find the integration between Karachi Stock Exchange and Bombay Stock Exchange. After a detailed analysis of the survey conducted, the results signify that there is no integration between Karachi Stock Exchange and Bombay Stock Exchange. From previous data of Karachi Stock Exchange and Bombay Stock Exchange, it is concluded that Karachi Stock Exchange 100 index and Bombay Stock Exchange are not integrated.

6. References

Abdalla, I. S. & Murinde, (1997). Exchange Rate and Stock Price interactions in emerging financial markets:Evidence on India, Korea, Pakistan and Philippines. *Applied Financial Economics*, 7, 25-35.

Ahmad, N. & Husain, F. (2007). The Relation between Stock Prices and Money Supply in Pakistan: An Investigation. *Journal of Independent Studies and Research (JISR), 5*(2), 30-32.

Ajayi, R. A. & Mougou, M. (1996). On the dynamic relation between stock prices and exchange rates. *The Journal of Financial Research*, *19*, 193-207.

Bahmani, O. M. & Sohrabian, A. (1992). Stock Prices and the effective exchange rate of the dollar. *Applied Economics*, *24*, 459-464.

Bhattacharya B, Mookherjee J (2001), Causal relationship between and exchange rate, foreign exchange reserves, value of trade balance and stock market: case study of India. Department of Economics, Jadavpur University, Kolkata, India.

Bhattacharya, B. & Mukherjee, J. (2003). Causal Relationship between Stock Market and Exchange Rate. Foreign Exchange Reserves and Value of Trade Balance: A Case Study for India, Paper presented at the Fifth Annual Conference on Money and Finance in the Indian Economy, January 2003.

Cruz, M., & Walters, B. (2008), Is the Accumulation of International Reserves good for Development,*Cambridge Journal of Economics*, *32* (665–681)

Hussain, D. I. (2009). Why does Pakistan have to accumulate foreign reserves?

Issam, S.A.A. and Murinde, (1997). Exchange rate determination and Stock price interactions in emerging financial markets: evidence on India, Korea, Pakistan and the Philippines. *Applied Financial Economics, 7*, 25-3 5

Kurihara, Y. (2006), "The relationship between exchange rate and stock prices during the quantitative easingpolicy in Japan,"*International Journal of Business*, *11*(4), (375-86).

Murinde, V. (1993). Development Banking and Finance, Auebury, Aldershot.

Nishat, D. M., & Shaheen, R. (2004), Macro-Economic Factors and Pakistani Equity Market. *Pakistan Development Review 43*(4).

Rahman, L. & Uddin, J. (2009), Dynamic Relationship between Stock Prices and Exchange Rates: Evidencefrom Three South Asian Countries, *International Business Research 2*(2) (167 – 174).