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A STUDY ON STOCK MARKETS OF DEVELOPING COUNTRIES' INTEGRATION & RELEVANCE WITH DEVELOPED COUNTRIES' STOCK MARKETS

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ABSTRACT

Globalization and liberalization has made investors to invest and earn more in international stock markets. The trade relationship between the stock markets of developed counties and developing countries are increasing extensively. However, stock markets of those countries' have some little concern and that's where the domestic investors have diversification opportunity in international stock markets. So the present study examines the co-integration of stock prices of developed and developing counties and also identifies diversification opportunity for Indian investors. To investigate the relationships, researcher has examined the stock indices of developed counties like United States (S & P 500), United Kingdom (FTSE) and Japan (Nikkei) and developing countries like Brazil (BOVESPA), Russia (RTS), Chine (SSE) and India (NSE). Further, the study employs monthly closing price data which is ranging from 1st January, 2008 to 31st June, 2014. Stock price linkages were examined through Johansen co-integration test to study the long term equilibrium relationships and further tested for VAR (Vector Autoregression). The result shows there is no long term relationship exists among developed and developing markets and further VAR (1) indicates all independent variables are insignificant. However, it is good news for Indian international investor that they will benefit from international diversification.

KEY WORDS: BRIC Stock Markets, Stationary and Non stationary, Correlation and Co-integration

INTRODUCTION

Financial markets have drastically accelerated during the last decades in terms of global business. Further liberalization and deregulation

of stock markets across countries has lead to increasing co-movements of financial assets like equity, mutual funds, debt funds and many more. This process requires investors who portfolios. However, due to the enormous increase of integration of stock markets, the possibility to diversify internationally has decreased significantly. Researcher tries to deal with problem by analyzing the possibility of diversification opportunity across emerging markets and emerged markets through Co-integration analysis. So now let us understand the concept of co-integration.

The concept of co-integration was first introduced by Granger (1981) and elaborated further by Engle and Granger (1987), Engle and Yoo (1987), Phillips and Ouliaris (1990), Stock and Watson (1988), Phillips (1986 and 1987) and Johansen (1988, 1991, 1995), among others. Working in the context of a bivariate system with at most one co-integrating vector, Engle and Granger (1987) give the formal definition of co-integration among two variables as follows:

When two time series that have unit roots co-integrate, meaning that there is a stationary linear combination between them; and this is a nice property to have because it allows us to find equilibrium relationships between two series that have trend behavior. Katrina Juselius (The Co-integrated VAR model, 2006) defines the role of co-integration analysis in the following way: co-integration identifies stationary linear combinations between non stationary variables so that an I (1) model can be reformulated exclusively in stationary variables. In economics, we are always trying to find equilibrium relationships, and that is exactly what co-integration allow us to do with two series that otherwise could not be modeled because of the individual non stationary properties on them.

possess the stocks of some country and bear the risk attached to political and economic environment of that state to rebalance their

The remainder of paper is organized as follow. In Chapter 2 represents the literature concerning the problems of integration in line of various international stock markets. Chapter 3 describes the data and methodology for investigating co-integration relation. Chapter 4 dedicated to methodological estimation of empirical co-integration model. Results and their implications are posted in Chapter 5. Finally, conclusion is in Chapter 6.

LITERATURE REVIEW

It was found few studies that have analyzed the co-integration of developed and developing counties stock market for Indian investors. Thus further literature is extended towards co-integration methodology to identify the international diversification opportunity with special reference to Indian investors.

Research conducted by Bose S., Mukherjee P., (2005) on A Study of Inter linkages between The Indian Stock Market and Some Other Emerging and Developed Markets. They tried to examine the co-movement of the Indian stock market with developed markets like US, Japan and other Asian market. The degree of integration that is found to be not very high implies that the nature of integration with emerging Asian markets does not yet warranty any immediate concern for India regarding possible contagion and also shows that there is still much scope for reaping benefits of portfolio diversification, by investing in Indian markets. Further research was conducted by Seshaiah, S. Venkata, (2006) on Indian Capital Market Integration with Selected Developed and Developing Countries. This paper empirically investigates into the long-run equilibrium relationship and short run dynamic linkage between the Indian stock

market indices and the stock markets of seven developed and developing countries. it is concluded that Indian stock market get influenced by most of the developed countries stock markets as well as by most of developing countries stock markets under study barring Japan and Taiwan.
India's stock market integration may not be complete, a finding attributable to the inadequate role of domestic investors. B J Queensly Jeyanthi & Punithavathy Pandian (2008) analyzed an Empirical Study of Cointegration and Correlation among Indian, Emerging and Developed Markets. The findings suggest that the stock prices in major Asian markets and the United States are weak-form of efficiency, individually and collectively, in the long run. It also implies that international investors can achieve substantial risk diversification benefits in Indian markets.

However most of this research idea was taken from master thesis by Jose Balarezo (2010) on international diversification using co-integration and modern portfolio theory. They argue that investors looking to diversify internationally need to be very selective in reference to which countries they invest into since international diversification will benefit the investor only in the cases that the home country does not co-integrate with the foreign market. The study was also concluded that they did not find any indication that BRIC counties share a long run equilibrium relationship which is excellent news for investors they could invest in any or all of these markets and rip the benefits of being exposed to these emerging economies while being fully diversified. Lian an and Dean Brown (2010) examined the co-movement and indicate that there is some cointegration between the United States and China, while there is no cointegration between the US and the other emerging markets by themselves. Therefore, all of the BRIC stock markets, with the exception of

Further Raj J. and Dhal S, (2008) analyzed Integration of India's stock market with global and major regional markets. The lack of evidence of integration of stock markets in terms of local currency gives rise to a concern that

China provide attractive portfolio diversification opportunities for global investors.

Further research idea regarding phase wise study was drawn from the research conducted by Norasyikin Abdullah Fahami (2011) on the structure of linkages and causal relationships between BRIC and developed equity markets. He examined structure of linkages and causal relationship world's fastest emerging BRIC economies and other developed countries. The period of study under analysis was in three different samples as pre-crisis period, crisis period and post crisis period. The results show that all the stock markets under study are co-integrated in pre-crisis, during crisis and post crisis period.
Dr. S. Vanitha, P. Srinivasan and V. Karpagam, An attempt has been made in this study to analyse the integration between different BRIC countries and developed countries. The test results revealed that the returns of the BRIC Countries were higher during the period, which gives better place for investment by consistent returns. Further they have concluded that investing in BRIC Countries for the long-run will be beneficial.

OBJECTIVES & DATA

The study examines co-integration of Indian stock market with other developing countries (Brazil, Russia and China) and developed countries (USA, UK and Japan) through Johansen co-integration test. However, selected indices for each developing country are BOVESPA - Brazilian market, RTS - Russian

Trading System, SSE - Shanghai Stock Exchange for china and NSE - National Stock Exchange for Indian market. For developed country are S&P 500 – United States, FTSE – United Kingdom and Nikkie – Japan. To conclude upon mentioned objectives, the sample is taken from 1st January, 2008 to 31st June, 2014. Some of adjustments have made in monthly data because different holidays were found in different other developed and developing nations. The whole analysis was carried out in EVIEWS 6. Following are some tools used for the analysis of the study.

- Unit Root Test (ADF Test)
- Johansen Co-integration Test
- VAR Model

However, a series is said to be stationary if the mean and auto-covariance of the series do not depend on time. While performing ADF test we proceed by considering the constant and deterministic trend in the data.

The null hypothesis H_o: γ=0 i.e. presence of unit roots for each of these equations is been tested. The test statistics against the critical values are checked and the null hypothesis is accepted or rejected if t-statistics is greater or less than the critical value respectively. Once we get the order of integration using the ADF test, we proceed with the method of co-integration to test the presence of co movement between the different stock market indices.

The Johansen co-integration test:

The Johansen method is used to determine the presence of co-integrating vectors in non stationary time series; it can be applied in a bi-variate or multivariate setting. In the case of a multivariate setting, it has the advantage of finding and providing estimates for all the co-integrating vectors within a Vector Autoregressive model (VAR). Before we move forward, it is important to define what a Vector Autoregressive Model is. A VAR (k) model is simply an extension of the AR (p) model where there is more than one dependent variable under study and thus more than one equation. In the model, each equation has as explanatory variables lagged values of all variables under study. A deterministic trend could also be included in the model. The model is used to find the evolution and interdependences between several time series, therefore, it is a theory free model because economic theory is simply limited to selecting the equations in the model, and we let the VAR find any relationship between the variables.

countries stock market. The necessary monthly closing price data have been sourced from yahoo finance.

METHODOLOGY

To satisfy the above objectives and data collected, various time series econometrics models were applied to study the long term equilibrium relationship between India and

UNIT ROOT TEST

The first step in the co-integration analysis is to check whether the series considered are stationary or not at level and if it is non-stationary then to find out the order in which they are integrated. Augmented Dickey Fuller (ADF) test is widely used in literature, so the present study also revealed ADF test statistics.

A (k) order VAR has the following representation:

$$Xt = \mu o + \delta o t + \pi 1 Xt-1 + \dots + \pi k Xt-k + \epsilon t \quad \dots\dots (1)$$

Where Xt is a (nx1) vector of variables, δ a deterministic trend and ϵt is a white noise process. The Johansen method is based on the error correction representation of the VAR, the so called Vector Equilibrium Correction Model (VECM) that reformulates in terms of differences, lagged differences and levels of the process to obtain:

$$\Delta Xt = \Gamma 1\Delta Xt{-}1 + \pi Xt{-}1 + \epsilon t \quad \text{..... (2)}$$

We can see that the left hand side is stationary. Since a stationary variable cannot be equal to a non stationary expression, the only option is that the right hand side also has to be stationary. For this to happen, either π = 0, or it must have a reduced rank. To test the restrictions in π, Johansen defines two matrices α and β, both of dimensions n x r where r is the rank of π and n the number of variables. The properties of α and β are such that:

$\pi = \alpha\beta'$ so above formula revised as follows:

$$\Delta Xt = \Gamma 1\Delta Xt{-}1 + \alpha\beta' Xt{-}1 + \epsilon t \quad \text{..... (3)}$$

Generally, there are three cases of interest in the π matrix.

- If r = n, then Xt is stationary and there is no need to express the system as VECM, standard inferences apply.
- If r = 0, there are not co-integrating relationships between the variables, that is the variables have no stochastic trends in common and do not move together over time.
- If n > r > 0, there are r co-integrating relationship among the n variables. In contrast with the Engle Granger method, the Johansen method can find more than 1 co-integrating relationship between the variables.

VAR MODEL:

Sims (1980) first introduced VAR models as an option to the large scale macro econometric models. Since then the methodology has gained wider application in applied macroeconomic research. Vector autoregressive models (VARs) are widely used further for understanding the effects of monetary policy on the economy. The VAR can be estimated through single equation methods like OLS and here researcher has used NSE as a dependent variables after checking the normality of the errors. The reduced form of final VAR equation is follows:

$$Zt = \alpha + \beta * zt\text{-}1 + \beta * zt\text{-}2.... + \beta * zt\text{-}p + e \quad \text{..... (4)}$$

Finally if the variables are not co-integrated, we can't use VECM, so further research has been concluded on the basis of VAR model by taking lag values of Indian Stock Market and other developed and developing countries' stock markets.

EMPIRICAL RESULTS

Results of Stationary – ADF Unit Root Test:

Ho: Unit Root exists (Non Stationary Data)

Ha: Unit Root does not exist (Stationary Data)

Table 1 ADF Unit Root Test Statistics

ADF Test Statistics (With Constant and Trend)					
Variables		Levels		First Difference	
	Lag (SIC)	Test Stat	Prob.	Test Stat	Prob.
LBOVESPA	1	-2.5002	0.3273	-6.5216	0.0000
LRTS	1	-2.5224	0.3168	-5.7066	0.0000
LSSE	0	-1.7191	0.7333	-9.0708	0.0000
LNSE	0	-1.9873	0.5987	-8.0408	0.0000
LSP	0	-0.5805	0.9773	-7.1447	0.0000
LFTSE	0	-1.4635	0.8336	-8.4489	0.0000
LNIKKEI	0	-1.1956	0.9042	-7.3441	0.0000

Source: E - Views Output. The critical values for ADF test is -3.47, significant at 5% level.

The table number 1shows all the market indices are non-stationary because all ADF test statistics are higher than ADF critical value at level. On in the series. However, unit root tests reject the same null hypothesis in the first-differenced form of the series which indicate that in first differenced form, all the series are stationary. Therefore, each stock market index is integrated in order one, or I (1). So the following is the result of multivariate Johansen co-integration test which strongly demands that all variables must be in same order.

the contrary, all probability values are also greater than 0.05. So we fail to reject null hypothesis and interpret that unit root presence THE TEST RESULTS OF LAG SELECTION CRITERIA:

To perform Co-integration test the issue of finding optimum lag length is very important because we have standard normal error terms. The most common procedure in choosing the optimal lag length is to estimate a VAR model including all variables in levels. Following is the VAR lag order selection criteria.

Table 2 VAR Lag Order Selection Criteria

Lag	AIC	SIC	HQ
0	-12.76119	-12.53985	-12.67307
1	-23.16317	-21.39243*	-22.45824*
2	-22.82934	-19.5092	-21.50758
3	-23.40819	-18.53865	-21.46961

4	-23.53912	-17.12018	-20.98372
5	-23.52111	-15.55278	-20.34889
6	-24.21606*	-14.69833	-20.42702
* indicates lag order selected by the criterion			
AIC: Akaike information criterion			
SC: Schwarz information criterion			
HQ: Hannan-Quinn information criterion			

Source: E - Views Output.

The table number 2 represents the VAR (2) model for optimal lag selection criteria. Maximum 6 lags to be selected where AIC value is minimum while SIC and HQ has selected 1 lag. Further to choose the optimal lag, AIC, SIC and Co-integration test carried out with optimal lags one as follows.

HQ is widely used in literature. So looking to the above result, we can choose 1 lag length for further co-integration analysis which is suggested by SIC and HQ where both the values are minimum at lag one. So finally the further

RESULTS OF CO-INTEGRATION TEST:

Table 3 Co-Integration Test Statistics

No. of CE(s)	Eigen value	Trace Statistics	Critical Value (0.05)	Prob.
None	0.4164	114.0355	125.6154	0.2041
At most 1	0.2733	73.1085	95.7537	0.6133
At most 2	0.2663	48.8445	69.8189	0.6871
At most 3	0.1455	25.3117	47.8561	0.9101
At most 4	0.1016	13.3606	29.7971	0.8744
At most 5	0.0647	5.2174	15.4947	0.7853
At most 6	0.0018	0.1361	3.8415	0.7122
No. of CE(s)	Eigen value	Max-Eigen Statistics	Critical Value (0.05)	Prob.
None	0.4164	40.9270	46.2314	0.1660
At most 1	0.2733	24.2640	40.0776	0.8115
At most 2	0.2663	23.5328	33.8769	0.4901
At most 3	0.1455	11.9511	27.5843	0.9347

At most 4	0.1016	8.1432	21.1316	0.8947
At most 5	0.0647	5.0813	14.2646	0.7315
At most 6	0.0018	0.1361	3.8415	0.7122
Trace test and Max-Eigen indicates NO co-integrating eqn(s) at the 0.05				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: E - Views Output.

The table number 3 shows the results for co-integration and it reveals that there is no significant co-integrating relationship between stock markets under study. Both the Trace and Max-Eigen statistics indicate zero co-integrating ranks which can be seen from probability values. We fail to reject the null at any co-integrating equation where all probability values are greater variables needs to be co-integrated but we found from co-integration test that no co-integration than 0.05. Further we can prove it from trace statistics which is less than its critical value at 5% and also Max-Eigen Value is less than its critical value at all co-integrating equation. This shows the long run equilibrium relation does not exist between India, Brazil, Russia, China, USA, UK and Japan Stock markets. so further to perform Vector Error Correction Model, all exists. So further we can develop VAR Model as follows.

Table 4 Vector Auto-regression

Variable	Coefficient	t-Statistic	Prob.
C(1)	0.703583	6.36431	0.0000
C(2)	-0.083067	-0.478616	0.6337
C(3)	0.130375	1.579396	0.1188
C(4)	-0.05349	-0.537463	0.5927
C(5)	0.014561	0.06426	0.9489
C(6)	0.248629	0.754207	0.4533
C(7)	-0.047716	-0.593521	0.5548
C(8)	1.102513	0.694283	0.4898
Source: E - Views Output			
R-squared	0.899658	Durbin-Watson stat	2.007381
Adjusted R-squared	0.889478	Jarque - Bera (P Value)	0.063266
F-statistic	88.37819		
Prob. (F-statistic)	0.000000		
LNSE = C(1)*LNSE(-1) + C(2)*LBOVESPA(-1) + C(3)*LRTS(-1) + C(4)*LSSE(-1) + C(5)*LS_P(-1) + C(6)*LFTSE(-1) + C(7)*LNIKKEI(-1) + C(8)			

The table number 5 represents the results of VAR (Vector Autoregression) model with one lag. Almost all variables are positive except C(2), C(4) and C(7). But all the variables are statistically insignificant as t statistics are very low and corresponding probability values are greater than 0.05 so here we fail to reject the null hypothesis at 5% significance level. Only first variable i.e. C(1) is statistically significant and it is nothing but one lag value of NSE.

Looking to the diagnostic checks for the model, Adjusted R- Squared value is 0.8895 which means total variance explained by all independent variable to dependent variable is 88.95%. F statistic is 88.37819 with significance value of 0.000 which is less than 0.05 so we reject the null hypothesis and interpret that model can be fit with these independent variables.

diversification of international investors aiming to share their investment among India and other stock markets considered here. It may also be considered in the present study. Further co-integration does not exist so VAR model has been developed by taking NSE as dependent variables with one lag but all independent variables are insignificant at 5% confidence level.

So finally study concludes that there is long term diversification benefits exist for international investors as in the long run they will not converge and investors may have benefit in the long run by investing in these developed and developing markets.

Moreover, Durbin-Watson statistic is 2.007381 which is almost 2 that indicates there is no auto-correlation among variables. And further Jerque – Bera Probability value is 0.0632 which is greater than 0.05 that means we fail to reject the null hypothesis that error terms are normally distributed.

CONCLUSION

The study examines the co-integration between the stock prices of India and other developed and developing countries' stock markets.

Based on the multivariate co-integration results, the study concludes that the long term relationship among developed and developing countries' stock markets does not exists at lag one chosen by SIC and HQ. So we can inferred that the absence of an equilibrium relationship does not the potential benefits from portfolio added that the absence of equilibrium relationship may be due to weaken trade relations among India and the other countries

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