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Co -Movements of U.S. Eu and Indian Equity Markets: Portfolio Diversification Implications

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Abstract
An integration of planet's financial market has been the distinctive feature of the global development. The last two decades has witnessed hastening in financial globalization represented by an increase in cross-country foreign assets. The present study has focused on the co-integration aspect of American, European and Indian market. The results of the study indicate significant co-integration relationship among markets.

Introduction

Correlation between stock return is key for successful strategies of investment diversification, as shown by Markowitz in the fifties. Since then stock return correlation has been considered to be a decisive factor in risk estimation of financial (and real portfolios (Costa et al. 2007). The same can be extended to potential earnings from internationally diversified portfolios. Several studies in this regard show that non-negligible profits are available to those diversifying their investments in capital markets abroad.

The literature on international portfolio diversification has developed in three major branches. The first one used in the current study focuses on the study of gains from international diversification. It is based on the estimation of a covariance (or correlation) matrix of stock market return indices for the countries. Here negative and low correlations between markets track the benefits from international diversification. Early studies have detected potential profits from international diversification (e.g. Grubel 1968, and Levy and Sarnat 1970).

Grubel (1968) studied stock market indices of eleven industrialized countries and finds huge diversification potential. Using Markowitz's efficient frontiers, Levy and Sarnat (1970) showed that inclusion of emerging countries in the group of investment opportunities heightens the gains of an international investor. The latter finding is unlikely to continue to hold in the more recent period, as barriers to foreign investment have been lifted or softened. Certainly greater globalization seems to have increased the co-movements of international markets, thereby reducing profit opportunities (Errunza et al. 1994, and Bekaert and Harvey 1995). Employing models of international asset pricing, Bekaert and Harvey(1995) realized that several markets present time varying integration and show correlation greater than those of previous studies. Evaluating changes in the relationships of markets over time, Jeon and Von Furstenberg (1990) found that international stock market indices have become more integrated since October 1987 and Meric et al. (1998) showed that correlations between Latin America and the US have been on the increase, thereby lessening the opportunities of diversification. Thus whether the correlations are stable as time goes by is discussed in greater detail in the second major branch of this type of literature (e.g. Makridakis and Wheelwright 1974, Watson 1980, Maldonado and Saunders 1981, Bekaert and Harvey 1995, Longin and Solnik 1995, and Bracker and Koch 1999). Most studies find that the correlations between (developed) stock markets are inter-temporally unstable.

The third branch usually employs multivariate analysis techniques to track the stock market co-movements, keeping an eye on potential earnings from international diversification. One popular technique is principal component analysis (PCA) (e.g. Lessard 1973, Philippatos et al. 1983, Meric and Meric 1989, and Meric et al. 1998). Unlike the correlation coefficient, that measures co-movements of two stock markets at a time, PCA captures the behavior of a number of stock markets at once. The three branches of literature above mostly concentrate on developed capital markets. Co-movements of emerging stock markets with both each other and the developed markets have been given relatively scant attention.

The co-movements across the eighties and nineties of the stock markets of Latin America and Asia are contrasted with those of selected developed countries. Researcher had employed correlation analysis to track such co-movements and check for their inter-temporal stability with the help of stability tests and PCA.

Literature Review

Srivastava (2007) examined the integration structure of the major world equity markets in the era of globalization. The study suggested that integration vary considerably through time and are highest during last few years. The analysis suggested that the periods of globalization have both benefits and drawbacks for

international investors. They expand the opportunity set, but diversification relies increasingly on investment in emerging markets. Arshanapalli et al. 1995; Ghosh, Saidi and Johnson 1999; Siklos and Ng 2001; showed that The US stock market is proven to have a significant influence on the Asia-Pacific markets and the integration is shown to have started after the stock market crash of 1987and/or the Gulf War of 1991.

Phylaktis and Ravazzolo (1998) examined stock market linkages of a group of Pacific-Basin countries with US and Japan using different techniques (ARCH and moving average) to verify the movement and evolution of the linkage. They demonstrated that these markets have attracted more international investment because of the portfolio diversification opportunities provided.

Hungarian Economist Balassa (1960), stated that as the barriers of trade between markets diminishes, economic integration increases. Moreover, Balassa believed that supranational common markets, with their free movement of economic factors across national borders, naturally generate demand for further integration, not only economically (via monetary unions) but also politically. Several previous studies were conducted to test for this impact and the Co-integration between the developed stock markets and emerging markets especially after what is called “Black Monday”. These studies indicated that Co-movements or integration among stock markets have increased the possibilities for national markets to be influenced by the changes in international ones.

Meric, Lemeal, Ratner, and Meric (2001) and Yang, Kolari, and Min (2003) provided empirical evidence indicating that the crisis affected the Co-movement patterns of the world's stock markets significantly and that the benefits of portfolio diversification to global investors with the emerging stock markets decreased considerably after the 1997-1998 crisis. Nath (2003) analysed the effect of financial liberalisation on the integration of the Indian stock market with other developed countries. For this purpose, he compared the National Stock Exchange with six markets including Tokyo and NASDAQ. He took the standard deviation from the mean of the daily returns data as the proxy for the degree of integration and concludes that the markets are integrated and move in tandem. Nath and Verma (2003) examined the interdependence of the three major stock markets in South Asia (India (NSE-Nifty), Singapore (STI) and Taiwan (Taiex)), from January 1994 to November 2002. On employing bivariate and multivariate co-integration analysis to model the linkages among the stock markets, no co-integration was found for the entire period. Hence, they conclude that there is no long run equilibrium.

Suchismita (2005) examined the dynamic interaction among Asian equity markets and equity market of US with a special emphasis on Indian equity market. Results revealed that Indian equity market is integrated with Asian and the US markets. Further, Indian equity market is also found influencing stock returns in some important Asian markets. However, degree of integration between the Indian equity and equity markets of the Asian region is not very high so possibility of portfolio diversification still exists.

Naeem (2000) examined the inter-linkages among South Asian equity markets and equity

markets of United States and United Kingdom for the period 1/94 to 12/99. In these study monthly stock market indices of Pakistan, India, Sri Lanka, Bangladesh, United States, and United Kingdom has been investigated by using bivariate and multivariate co-integration analysis. Results discovered that no long term relationship exists among these markets in full sample period. However, in pre-nuclear test period co-integration is observed. It is significance mentioning that south Asian markets are not co-integrated with equity markets of the United States and United Kingdom. So potential for diversification of portfolio exists by structuring a portfolio that comprises of investment in equity markets of U.S. or U.K. and any one of the South Asian equity market.

Lamba (2005) investigated the presence of long run relationships among South Asian equity markets and the developed equity markets for the period 7/1997 – 12/2003 by using multivariate co-integration framework. Results revealed that Indian market is influenced by developed equity market of US, UK and Japan. However Pakistani and Sri Lankan equity markets found relatively independent from the influence of equity markets of developed markets during the entire sample period. Researcher also argued that the three South Asian equity markets are becoming more integrated with each other but at a relatively slow pace.

Bailey and Stulz (1990) investigated the markets of Malaysia, Korea, Singapore Hong Kong, Japan, Philippines, Taiwan and Thailand market indices from January 1977 to December 1985. Their results showed that the degree of correlation between US and Asian equity returns depended upon the period specification, whether daily, weekly or monthly.

Nath and Verma (2003) examined the interdependence of the three major stock markets in south Asia stock market indices namely India (NSE-Nifty) Taiwan (Taiex) and Singapore (STI) by employing bivariate and multivariate co integration analysis to model the linkages among the stock markets, No co -integration was found for the entire period (daily data from January 1994 to November 2002).

Ayuso and Blanco (1999) weekly returns on seven selected stock exchanges viz; New York, London, Paris, Madrid, Frankfurt, Milan and Tokyo during 1990-94 and 1995-99 periods. It is shown that during the 1990’s the linkages between national stock exchanges seem to have increased. Not only as the weight of foreign assests in agents’ portfolio increased but also have the correlation between stock indices and the ability of each

market return to explain the behavior of returns on other markets.

Park (1999) found that the degree of International financial integration has been increasing modestly in the recent decades both for the developed and developing countries. Among the developed countries the variance of international financial integration is relatively large vis-à-vis developing countries. The author concluded that among the developing countries India is the least active in the process of integration at least through 1997.

Tripaty (2006) examined the relationship between the world market and developed markets. He found that the world market is having an impact on developed markets and he concluded that the world stock market is efficient and co-integrated with developed market, indicating long-run equilibrium relationship.

Liu and Mei (1998) analysed the possible integration of real estate markets (and stock markets) across six countries – the US, UK, France, Japan, South Africa and Australia. The researchers found there were diversification benefits, but these benefits were primarily driven by unanticipated returns that, in turn, were partially driven by changes in exchange rate risk. They found that, from a US investor's viewpoint, investing in international real estate securities provided additional diversification benefits over and above that associated with holding international stocks.

A study by Goetzman and Wachter (1996) on the real estate crash in the early 90s found that there were no safe havens for property investors – i.e. diversification did not help. These authors had conjectured that risk exposure was due to a global GDP effect, but had insufficient data to test the claim.

Cumby and Glen (1990) found that the internationally diversified mutual funds have superior performance when compared to the U.S. stock market. After testing these funds against an international index, they concluded that there is "no evidence that the funds, either individually or as a whole, provide investors with performance that surpasses that of a broad, international equity index over this same period". They also find that the funds systematically under-perform the indexes during the October 1987 stock market crash.

Divecha, Drach, and Stefek (1992) showed that modest investments in emerging markets are likely to reduce overall portfolio risk. Khanna (1996) recommended investing in emerging markets because their rapid economic growth provides for good returns. Even though the returns are volatile, these markets are poorly correlated to developed markets and, thus, offer good portfolio diversification benefits.

Speidell and Sappenfield (1992) discussed the fact that global diversification depends on the correlations among countries. They suggest that as the developed markets move less independently of each other, the correlations among them increase. This decreases the potential for diversification benefits. On the other hand, emerging markets are less correlated with the developed markets; this increases their relative diversification advantage.

Grubel (1968) studied stockmarket indices of eleven industrialized countries and finds huge diversification potential. A typical investor in the New York Stock Exchange, for instance, could increase his annual returns by 68 percent, while keeping his risk exposure constant, if he invested in international markets.

Redel (1997) concentrated on the capital market integration in developing Asia during the period 1970 to 1994 taking into variables such as net capital flows, FDI, portfolio equity flows and bond flows. He observed that capital market integration in Asian developing countries in the 1990's was a consequence of broad-based economic reforms, especially in the trade and financial sectors, which is the critical reason for economic crises which followed the increased capital market integration in the 1970s in many countries will not be repeated in the 1990s. He concluded that deepening and strengthening the process of economic liberalization in the Asian developing countries is essential for minimizing the risks and maximizing the benefits from increased international capital market integration.

Clark and Tunaru (2001) measured the impact of political risk on portfolio investment when the political risks are multivariate and correlated across countries and find that individual political risks are not uncorrelated with each other. Harvey (2000) suggested that in segmented markets expected returns are determined by non-diversifiable risk of each asset in the local national context, whereas in integrated markets expected returns are determined from the perspective of an integrated market portfolio and not with respect to individual national markets.

Markowitz discovered that it is the covariance that determines the risk of a portfolio and

not the variance of individual assets in the portfolio. The best portfolio will consist of assets which are perfectly negatively (inversely) correlated. Markowitz proposed that investors should instead consider variances of return along with expected returns, and choose portfolios that offer the highest expected return for a given level of variance.

Cooley, Hubbard, and Walz (2003) examined the differences in success rates between the

overlapping period and Monte Carlo simulation analysis. When examining a 30-year withdrawal length for this period, there are only 27 overlapping periods in their data, and none of the periods are independent of each other. They suggested that a Monte Carlo simulation may be a better alternative to the overlapping period method because of the limited number of historic returns available.

Ervin, Filer, and Smolira (2004) examined the question of international diversification in

withdrawal portfolios. They use the overlapping period approach to examine portfolios consisting of large capitalization stocks, corporate bonds, and the S&P/IFC Composite Global Index for the period January 1930 to December 2001. They find that the conflicting evidence for the diversification effects of international equities. For the entire period, the inclusion of international equities decreases the ability of a portfolio to support withdrawals. However, over the latter part of the sample, the portfolios containing international equities often have a larger terminal value.

Levy and Sarnat (1970) analysed international correlations for the 1951-1967 period, and demonstrate the diversification benefits from investing in developed and developing equity markets. Investors are conscious of the fact that international stocks have different characteristics so that by diversifying between different countries or industries in countries, the performance of the portfolio can be improved.

Rajan and Friedman (1997) use a two-factor CAPM consisting of a world stock index and country risk factor to show that an international portfolio contains a statistically significant country risk premium. Clark and Tunaru (2001) measured the impact of political risk on portfolio investment when the political risks are multivariate and correlated across countries and find that individual political risks are not uncorrelated with each other.

Eichholtz and Koedijk (1996) pointed out that the combined market value of all listed real estate companies in the world was under $20 billion in the mid-80s – generally considered to be too small to construct a well diversified international portfolio and be treated seriously by institutional investors. By the mid-90s the combined market value had risen to about $240 billion and to $350 billion towards the end of the 90s, making it possible to construct portfolios that were fine tuned to exposure by region and type of real estate.

Ozdemir et al. (2008) found long term relationship (cointegration) for 8 of the 15 emerging markets they examine. For the remaining 7, including Turkey, they do not find evidence of cointegration, but they document granger causality from the US, but not vice versa.

In an interesting comparison of the international diversification benefits of real estate compared with stocks and bonds, Eichholtz (1996) found significantly lower cross country correlations for real estate returns than for either common stock or bond returns, there by asserting that international diversification improves the efficiency of the real estate portfolio more so than for equity or bonds. Eichholtz suggested that a possible reason for the lower correlations for real estate may be that real estate is more influenced

by local factors than is the case for either stocks or bonds. The study included monthly data over the period January 1985 to August 1994 and included a host of countries, such as France, the Netherlands, Sweden, the UK, Hong Kong, Japan, Singapore, Canada and the US. Compared with a single-country holding of real estate securities, Eichholtz found that an internationally diversified portfolio had higher expected returns at lower risk. A potential difficulty with the research, however, is that it was undertaken in local currency based returns, therefore automatically assuming a perfectly hedged currency exposure.

Levy and Sarnat (1970) showed that inclusion of emerging countries in the group of investment opportunities heightens the gains of an international investor. Cooley, Hubbard, and Walz (1998, 1999, 2001) have examined the effects on diversification on sustainable withdrawal rates. Their research shows the importance of a diversified portfolio in funding retirement withdrawals.

Cooley, Hubbard, and Walz (2003) examined the differences in success rates between the overlapping period and Monte Carlo simulation analysis. They suggest that a Monte Carlo simulation may be a better alternative to the overlapping period method because of the limited number of historic returns available.

Ervin, Filer, and Smolira (2004) examined the question of international diversification in withdrawal portfolios. They find that the conflicting evidence for the diversification effects of international equities. For the entire period, the inclusion of international equities decreases the ability of a portfolio to support withdrawals. However, over the latter part of the sample, the portfolios containing international equities often have a larger terminal value.

Maghyereh and Al-Zuobi (2005) carried a study to examine the market linkage between Jordan and US after the signed FTA between the two countries using DCC model of Engle (1992). They proved that FTA has considerably the linkage between the Jordanian and US equity markets. Chung and Liu (1994) conducted a study to examine the common stochastic trend among national stock prices of the US and five East Asian countries Japan, HK, Singapore, Taiwan and Korea. Their study suggests that except Taiwan, all other countries in the sample has a strong linkage with US market and holds same speed of adjustments from short term disequilibrium.

Evans and Archer (1968) examined how the portfolio risk for randomly selected portfolios can be reduced as a function of the number of securities included in the portfolio. They find that 10 randomly selected stocks can functionally achieve diversification and thus raise the doubt concerning the economic justification of increasing portfolio size beyond 10 stocks. Elton and Gruber find that conventional wisdom that most of the advantages of diversification with 10-20 stocks in a portfolio may be misleading. They showed that the portfolio variance can be significantly reduced by increasing the number of stocks from 15 to 100. Mayshar (1979) first noticed the issue of over-diversification and argues that diversification is meaningless if the marginal costs of

diversification, such as increasing transaction costs, exceed the marginal benefits in risk reduction. He develops an equilibrium model that shows it is optimal to limit the number of assets in the presence of transaction costs.

Lee (2003) emphasized the lower the level of correlation between assets, the greater the

potential for portfolio risk reduction and increased returns. The success of a particular diversification strategy consequently depends on the quality of the estimated correlation between assets. Hamelink et al (2000) argued that the classification of property markets defines the dimensions of market risk. If however, the type or area groupings used do not define the dimensions of market risk then optimal diversification will not be achieved.

Reisen (2000) concluded that international diversification reduces risk better than domestic diversification because securities exhibit stronger correlations as a result of their joint exposure to country specific shocks. In fact, globalisation is expected to raise the expected return for a given risk level. The diversification benefits consist therefore of reduced risk resulting in markets that are relatively uncorrelated or negatively correlated.

Bekaert, Erb, Harvey and Viskanta (1996) explained that the main differences between investment in developed markets and emerging markets are accountable to regulatory changes, currency devaluation, failed economic plans, level of corporate governance and national financial shocks.

Sappenfield and Speidell (1992) observed an increase in the correlation between developed countries. During international events or international financial crisis, the isolation of these markets helps in fulfilling their role in diversifying risks. Hence, it is optimal to include emerging markets in an international portfolio because of their low correlation with other markets.

Arouri (2004) considered that international diversification is often considered as the best instrument to improve portfolio performance. More recently, the oil dominated economies of the Middle Eastern gulf region have launched a number of initiatives to liberalize their financial markets (Abraham, Seyyed and Al-Elg (2001).

Aggarwal (2003) examined the integration of the three participating equity markets before and after the 1993 passage of NAFTA. Results indicated that stock prices are non-stationary but stock returns are generally stationary for all three markets for all three periods. However, daily, weekly, and monthly equity prices in the three NAFTA countries are cointegrated only for the post-NAFTA period. Similarly, US stock prices are more integrated with both Canadian and Mexican stock prices after the passage of NAFTA.

Narayan, Smyth and Nandha (2004) examined the dynamic linkages between the stock markets of Bangladesh, India, Pakistan and Sri Lanka using a temporal Granger causality approach by binding the relationship among the stock price indices within a multivariate cointegration framework. He also examined the impulse response functions In the long run, stock prices in Bangladesh, India and Sri Lanka Granger-cause stock prices in Pakistan. In the short run there is unidirectional Granger causality running from stock prices in Pakistan to India, stock prices in Sri Lanka to India and from stock prices in Pakistan to Sri Lanka. According to them Bangladesh is the most exogenous of the four markets, reflecting its small size and modest market capitalization.

Amanulla & Kamaiah (1995) conducted a study to examine the Indian stock market efficiency by using Ravallion co integration and error correction market integration approaches. The data used are the RBI monthly aggregate share indices relating five regional stock exchanges in India, viz Bombay, Calcutta, Madras, Delhi, Ahmedabad during 1980-1983.According to the authors, the co integration results exhibited a long-run equilibrium relation between the price indices of five stock exchanges and error correction models indicated short run deviation between the five regional stock exchanges. The study found that there is no evidence in favour of market efficiency of Bombay, Madras, and Calcutta stock exchanges while contrary evidence is found in case of Delhi and Ahmedabad.

Objectives: The objective of the study was to find out whether the market under study are co-integarted or not.

Research Methodology

The study was empirical in the nature. The population of the study was of all the stock indices of U.S., EU and India. The sampling frame of the study included all the stock indices of U.S., EU and India. Sample Size was of sixteen stock indices. Individual representative index of U.S., fourteen EU countries and India were used in study. Therefore in all there will be sixteen indices. Individual representative Stock index of U.S., fourteen EU countries and India during the study period of 1999-2009 acted as sample element. Purposive sampling technique was used. Secondary data of individual daily index return from 1999-2009 was collected from official website of each Stock Exchange. The granger causality test was used to determine if the weekly index returns of sixteen equity markets follow random walk.

Results and Discussion:

The weekly index returns of each stock index were used for analysis purpose for the study time period. Firstly the average returns of each index were calculated and it was found that the average returns were maximum for BSE. Rest all indices showed almost similar average returns. Further the standard deviation was calculated for

each index and minimum deviation in returns was from NASDAQ and BSE and BTX showed maximum and almost similar deviation. The results can be seen from the below given table.

Table 1: Showing Average returns and Standard Deviations of Returns

INDICES	AVERAGE	STANDARD DEVIATION
BSE	1.003647	0.051434
NASDAQ	0.991043	0.024856
DOW JONES	0.992049	0.038107
NYSE	0.991753	0.040598
FTSE	0.990154	0.03621
SWIT	0.990348	0.039279
GER	0.990348	0.046024
BTX	0.98739	0.051154

Further, to fulfill the objective of finding out the cointegration between the U.S., EU and INDIAN stock markets, granger causality test was applied.

GRANGER-CAUSALITY TEST

An independent variable x Granger causes changes in dependent variable y , if y can be forecasted with past values of x and y , than just with past values of y alone. The causality in the Granger sense does not imply a cause and effect relationship, but one of predictability. In several current studies, Granger-causality technique is used to predict the future index returns of other equity market. In this the Granger-causality tests to study the linkages between the U.S., EU and INDIAN stock markets during the January 1999-January 2009 period. The results of Granger causality test for hypothesis of zero coefficients on all three lags for each equity market are presented.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	Significance level	Model-fit	t-value	R square	Beta	Significance-level	Regression-equation	Null Hypothesis Accepted / rejected.
BSE(dependent)									
NASDAQ(independent)	3.65	2.9	True	.430	0.44	0.44	6.8	Y=.590+.067xNASDAQ	Rejected
DOW JONES(independent)	6.58	0.2	True	2.39	0.088	0.235	1.8	Y=.122+.660xDOW JONES	Accepted
NYSE (independent)	10.9	0.0	True	3.72	0.146	0.363	0.0	Y=-.156+1.049Xnyse	Accepted
FTSE (independent)	5.64	0.5	True	1.98	0.074	0.19	5.0	Y=.185+.575xFTSE	Accepted
SWIT (independent)	4.10	1.9	True	1.01	0.051	0.101	31.2	Y=.395+.223xGER	Rejected
GER (independent)	3.66	2.9	True	.467	0.44	.047	64.1	Y=.572+.082xBTX	Rejected
BTX (independent)	6.73	0.2	True	2.44	0.090	0.24	1.6	Y=.240+.551xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, BSE investors should avoid investing in the above equity markets with significant lead/ lag linkages.

From this table it can seen that BSE (dependent variable) granger cause the stock markets movements of NASDAQ, SWIT, GER. (independent variable) Whereas there is no such relationship between BSE (dependent) and the stock markets of DOW JONES, NYSE, FTSE, BTX. From the results, it can be seen that BSE investors should avoid investing in NASDAQ, SWIT, GER.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	Significance	MODEL FIT	t-value	R square	Beta	Significance-level	Regression-equation	Null hypothesisAccepted / rejected.
NASDAQ (Dependent)									
BSE (independent)	2.53	8.4	False	1.66	0.026	0.17	9.9	Y=.629+.272xBSE	Rejected
DOW JONES (independent)	4.14	1.8	True	2.43	0.051	0.29	1.6	Y=.238+.839xDOW JONES	Accepted
NYSE (independent)	9.87	0.0	True	4.14	0.133	0.47	0.0	Y=-.138+1.401xNYSE	Accepted
FTSE (independent)	3.19	4.5	True	2.01	0.037	0.24	4.6	Y=.304+.722xFTSE	Accepted
SWIT (independent)	1.40	24.9	False	0.78	0.077	0.08	45.7	Y=.605+.241xSWIT	Rejected
GER (independent)	1.34	26.5	False	0.65	0.066	0.09	51.3	Y=.720+.167xGER	Rejected
BTX (independent)	6.47	0.2	True	3.23	0.086	0.32	0.2	Y=.262+.759xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future

monthly index returns of another equity market. To maximize the portfolio diversification benefit, NASDAQ investors should avoid investing in the above equity markets with significant lead/ lag linkages.Ffrom this table we can see that NASDAQ(dependent variable) granger cause the stock markets movements of BSE, SWIT, GER. (independent variable) Whereas there is no such relationship between BSE(dependent) and the stock markets of DOW JONES, NYSE, FTSE, BTX. From the results, it can be seen that BSE investors should avoid investing in BSE,SWIT,GER.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	Significance	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Null hypothesis Accepted / rejected.
DOW JONES (Dependent)									
BSE (independent)	7.05	0.1	True	2.07	0.095	0.20	4.1	Y=.276+.264xBSE	Accepted
NASDAQ (independent)	4.75	1.0	True	-0.20	0.061	-0.2	0.839	Y=.329-.031xNASDAQ	Accepted
NYSE (independent)	16.5	0.0	True	4.67	0.212	0.95	0.0	Y=.082+2.317xNYSE	Accepted
FTSE (independent)	4.73	1.1	True	-0.94	0.061	0.01	92.5	Y=.344-.36xFTSE	Rejected
SWIT (independent)	5.51	0.5	True	-1.19	0.072	-0.1	23.3	Y=.447-.392xSWIT	Rejected
GER (independent)	5.05	0.8	True	-0.77	0.065	-0.1	43.9	Y=.297-.165xGER	Rejected
BTX (independent)	8.43	0.0	True	2.61	0.114	0.31	1.0	Y=.244+.603xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, DOW JONES investors should avoid investing in the above equity markets with significant lead/ lag linkages. From this table it can seen that DOW JONES(dependent variable) granger cause the stock markets movements of FTSE,SWIT,GER. (independent variable) Whereas there is no such relationship between BSE(dependent) and the stock markets of DOW JONES, NYSE, FTSE, BTX.

In general from the results, DOW JONES investors should avoid investing in FTSE, SWIT, GER.

Null Hypothesis:- There is predictive relationship between dependent and independent variable.

	f-value	SIGNIFICANCE	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Null hypothesis Accepted / rejected.
NYSE (Dependent)									
BSE (independent)	11.8	0.0	True	3.59	0.157	0.34	0.0	Y=-.005+.844xBSE	Accepted
NASDAQ (independent)	11.9	0.0	True	-1.29	0.159	-0.148	19.7	Y=-.037-1.87xNASDAQ	Rejected
DOW JONES (independent)	16.3	0.0	True	-3.01	0.210	-0.6	0.3	Y=.102-1.456xDOW JONES	Accepted
FTSE (independent)	15.7	0.0	True	-2.84	0.203	-0.4	0.5	Y=.190-1.067xFTSE	Accepted
SWIT (independent)	17.9	0.0	True	-3.41	0.226	-0.4	0.1	Y=.269-1.057xSWIT	Accepted
GER (independent)	14.9	0.0	True	-2.58	0.194	-0.3	1.1	Y=-.116-.501xGER	Accepted
BTX (independent)	11.4	0.0	True	0.84	0.152	0.11	0.402	Y=.007+.213xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, NYSE investors should avoid investing in the above equity markets with significant lead/ lag linkages.

from this table it can seen that NYSE(dependent variable) granger cause the stock markets movements of NASDAQ (independent variable), whereas there is no such relationship between BSE(dependent) and the stock markets of DOW JONES, NYSE, FTSE,SWIT,GER BTX. In conclusion, NYSE investors should avoid investing in NASDAQ.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	significance	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Null Hypothesis Accepted / rejected.
FTSE (Dependent)									
BSE (independent)	5.58	0.5	True	2.42	0.073	0.24	1.7	Y=.430+.312xBSE	Accepted
NASDAQ (independent)	2.84	6.3	False	0.78	0.031	0.09	43.4	Y=.522+.120xNASDAQ	Rejected
DOW JONES (independent)	4.53	1.3	True	1.96	0.057	0.30	5.2	Y=.375+.716xDOW JONES	Rejected
NYSE (independent)	15.4	0.0	True	4.96	0.199	0.76	0.0	Y=.207+1.843xNYSE	Accepted
SWIT (independent)	2.53	8.4	False	-0.16	0.026	-0.02	86.9	Y=.501-.62xSWIT	Rejected
GER (independent)	2.59	7.9	False	0.37	0.027	0.05	71.0	Y=.517+.086xGER	Rejected
BTX (independent)	10.4	0.0	True	3.89	0.140	0.54	0.0	Y=.498+1.046xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, FTSE investors should avoid investing in the above equity markets with significant lead/ lag linkages.
from the table it can see that FTSE(dependent variable) granger cause the stock markets movements of NASDAQ,DOW JONES,SWIT, GER. (independent variable) Whereas there is no such relationship between FTSE(dependent) and the stock markets of BSE, BTX. So generalization of results says that BSE investors should avoid investing in NASDAQ, DOW JONES, SWIT and GER.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	significance	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Null Hypothesis Accepted / rejected.
SWIT (Dependent)					.				
BSE (independent)	6.163	0.03	True	2.729	0.082	0.266	0.07	Y=.424+.345xBSE	Accepted
NASDAQ (independent)	3.242	4.3	False	1.352	0.054	0.146	17.9	Y=.516+.184xNASDAQ	Rejected
DOW JONES (independent)	5.715	0.4	True	2.566	0.075	0.342	1.2	Y=.323+.807xDOW JONES	Accepted
NYSE (independent)	17.565	0.0	True	5.420	0.222	0.688	0.0	Y=.125+1.669xNYSE	Accepted
FTSE (independent)	3.458	3.5	True	1.499	0.041	0.230	13.7	Y=.401+.563xFTSE	Rejected
GER (independent)	3.494	3.4	True	1.522	0.041	0.225	13.1	Y=.609+.333xGER	Rejected
BTX (independent)	13.511	0.0	True	4.645	0.177	0.612	0.0	Y=.488+1.173xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, SWIT investors should avoid investing in the above equity markets with significant lead/ lag linkages.

From this table it can be seen that BSE(dependent variable) granger cause the stock markets movements of NASDAQ, FTSE, GER. (independent variable) Whereas there is no such relationship between SWIT(dependent) and the stock markets of BSE,DOW JONES,NYSE BTX. So BSE investors should avoid investing in BSE,DOW JONES,NYSE and BTX index.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	Significance	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Accepted / rejected.
GER (Dependent)									
BSE (independent)	3.438	3.6	False	1.613	0.040	0.162	11.0	Y=.550+.238xBSE	Rejected
NASDAQ (independent)	2.206	11.5	False	.474	0.020	0.067	63.6	Y=.666+.096xNASDAQ	Rejected
DOW JONES (independent)	3.906	2.3	True	1.872	0.048	0.271	6.4	Y=.307+.723xDOW JONES	Rejected
NYSE (independent)	10.819	0.0	True	4.104	0.160	0.0	0.0	Y=-.126+1.518xNYSE	Accepted
FTSE (independent)	2.407	9.0	False	.842	0.025	0.131	40.1	Y=.492+.363xFTSE	Rejected
SWIT (independent)	2.100	12.7	false	.138	0.019	0.021	89.0	Y=.647+.057xSWIT	Rejected
BTX (independent)	7.534	0.1	True	3.24	0.101	0.409	0.2	Y=.283+.888xBTX	Accepted

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, GER investors should avoid investing in the above equity markets with significant lead/ lag linkages.

From this table it can be seen that GER (dependent variable) granger cause the stock markets movements of BSE, NASDAQ, DOW JONES, FTSE and SWIT. (Independent variable) Whereas there is no such relationship between GER(dependent) and the stock markets of NYSE and BTX. So we get that BSE investors should avoid investing in BSE, NASDAQ, DOW JONES, FTSE, and SWIT.

Null Hypothesis:- There is no predictive relationship between dependent and independent variable.

	f-value	Significance	Model fit	t-value	R square	Beta	Significance-level	Regression-equation	Null hypothesis Accepted / rejected.
BTX (Dependent)									
BSE (independent)	7.75	0.1	True	1.52	0.104	0.148	13.2	Y=.272+.203xBSE	Rejected
NASDAQ (independent)	6.48	0.2	True	-0.16	0.086	-0.02	87.1	Y=.352+.022xNASDAQ	Rejected
DOW JONES (independent)	6.47	0.2	True	0.108	0.086	0.013	91.4	Y=.331+.033xDOW JONES	Rejected
NYSE (independent)	9.34	0.0	True	2.27	0.126	0.304	2.5	Y=.036+.776xNYSE	Accepted
FTSE (independent)	7.92	0.1	True	-1.61	0.107	-0.231	11.0	Y=.572-.594xFTSE	Rejected
SWIT (independent)	8.70	0.0	True	-2.005	0.117	0.273	4.7	Y=.625-.702xSWIT	Accepted
GER (independent)	7.34	0.1	True	-1.255	0.099	-0.158	21.2	Y=.365-.247xGER	Rejected

Results:- Although the F statistic shows that in above case the coefficient of an independent variable is significant, it indicates that the past monthly index returns of that equity market can predict (or lead) the future monthly index returns of another equity market. To maximize the portfolio diversification benefit, BTX investors should avoid investing in the above equity markets with significant lead/ lag linkages. From this table it can be seen that BTX(dependent variable) granger cause the stock markets movements of BSE, NASDAQ, DOW JONES, FTSE and GER. (independent variable) Whereas there is no such relationship between BTX(dependent)

and NYSE, SWIT the stock markets of . So if we combine the results we get that GER investors should avoid investing in BSE, NASDAQ, DOW JONES, FTSE and GER. F statistic shows that the coefficient of an independent variable (an equity market) is significant , it indicates that the past monthly index returns of that equity market can predict the future monthly index returns of another equity market (dependent variable).

Conclusion

The sample of the study taken for study of cointegration was of selected stock indices of U.S., EU and India. The findings of the present study indicated that among the eight equity markets, the BSE equity market has the highest volatility and the NASDAQ has the lowest volatility. The BSE equity market provides the highest return per unit of volatility risk and the NASDAQ equity market provides the lowest return per unit of volatility risk. The Granger-causality test shows that the for maximizing the effect portfolio diversification the investor of Indian market (BSE investors) should invest in these DOW JONES, NYSE, FTSE, BTX and should not invest in NASDAQ, SWIT, GER. The investor of the U.S. markets NASDAQ should invest in these DOW JONES, NYSE, FTSE and BTX and should not invest in BSE, SWIT and GER. The investor of DOW JONES should invest in BSE, NASDAQ, NYSE and BTX and should not invest in DOW JONES, FTSE, SWIT and GER. The investor of NYSE should invest in BSE, DOW JONES, FTSE, SWIT, GER BTX and should not invest in NASDAQ. The investor of the EU MARKETS i.e. FTSE should invest in BSE, NYSE, BTX and should not invest in NASDAQ, SWIT, GER. The investor of SWIT should invest in BSE, DOW JONES, NYSE, BTX and should not invest in NASDAQ, GER.The investor of GER should invest in NYSE, BTX and should not invest in BSE, NASDAQ, DOW JONES, FTSE, SWIT. The investor of BTX should invest in NYSE and should not invest in BSE, NASDAQ, DOW JONES, FTSE, SWIT, GER.

References

Bekaert, G., and C. R. Harvey (1995) “Time-varying world market integration” *Journal of Finance* 50, 403−444.
Bracker, K., and P. D. Koch (1999) “Economic determinants of the correlation structure across international equity markets” *Journal of Economics and Business* 51, 443−471.
Errunza, V. R., K. Hogan, O. Kini, and P. Padmanabhan (1994) “Conditional heteroskedasticity and global stock return distribution” *Financial Review* 29, 293−317.
Grubel, H. G. (1968) “Internationally diversified portfolios: welfare gains and capital flows” *American Economic Review* 58, 1299−1314.
Harvey, C. R., and A. H. Roper (1999) “The Asian Bet”. In: Harwood, A., R. E. Litan, and M. Pomerleano (eds.) *Financial Markets and Development: The Crisis in Emerging Markets*, Brookings Institution Press: Washington, DC.
Jeon, B. N., and G. M. Von Furstenberg (1990) “International co-movements in stock price indexes” *Quarterly Review of Economics and Business* 30, 15−30.
Johnson, R. A., and D. W. Wichern (1998) *Applied Multivariate Statistical Analysis*, Prentice-Hall: Englewood Cliffs.
Lessard, D. R. (1973) “International portfolio diversification: a multivariate analysis for a group of Latin American countries” *Journal of Finance* 3, 619−633.
Levy, H., and M. Sarnat (1970) “International diversification of investment portfolios”, *American EconomicReview* 60, 668−675.
Longin, F., and B. Solnik (1995) “Is the correlation in international equity returns constant: 1960-1990?” *Journal of International Money and Finance* 14, 3−26.
Makridakis, S. G., and S. C. Wheelwright (1974) “An analysis of the interrelationships among the major world stock exchanges” *Journal of Business, Finance, and Accounting* 1, 195−216.
Maldonado, R., and A. Saunders (1981) “International portfolio diversification and the inter-temporal stability of international stock market relationships, 1957−78” *Financial Management* 10, 54−63.
Meric, I., and G. Meric (1989) “Potential gains from international portfolio diversification and inter-temporalstability and seasonality in international stock market relationships” *Journal of Banking and Finance* 13, 627−640.
Meric, I., M. Ratner, R. P. C. Leal, and G. Meric (1998) “Co-movements of Latin American equity markets” *International Journal of Finance* 10, 1163−1178.
Philippatos, G. C., A. Christofi, and P. Christofi (1983) “The inter-temporal stability of international stock market relationships: another view” *Financial Management* 12, 63−69.
Watson, J. (1980) “The stationarity of inter-country correlation coefficients: a note” *Journal of Business, Finance, and Accounting* 7, 297−303.
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