CHAPTER-I

INTRODUCTION

1.1 PROLOGUE

Portfolio risk can be reduced to a substantial extent with the judicial mix of assets. This is what the model of portfolio selection developed by the pioneers Harry Markowitz (1952) and James Tobin (1958) suggests. It is, till date, accepted as the standard theory, well discussed and available in any text book. The model precisely suggests, nature of co movement among the security returns is the prime variable that influences scope of portfolio risk reduction. Diversification could eliminate risk if the returns of the assets are not or negatively correlated with each other. However, as the diversification increases, the risk of the portfolio decreases but not proportionally. In fact, the portfolio risk can never be reduced below a certain level even with a very large number of stocks, because, there is, in general, a strong tendency among the stocks within an economy to move more or less in unison. If all the share prices of a country tend to move together, the rate of return on any reasonably well diversified portfolio will be highly correlated with that of the market as a whole. Thus, domestic diversification can hardly eliminate risk during the periods of economic difficulties. International diversification of assets offers an excellent opportunity to substantially reduce risk, the benefit that is otherwise not available if funds were simply invested in local market. However the slogan 'go beyond national boundaries and reduce risk' works well only when assets of the countries differ in their price movements. If the movements in stock price of two different countries are unrelated, then, while securities of one country are doing worse than expected, another market is likely to be doing better, hence, offsets the losses of portfolio [Gruebel and Herber (1968), Levy and Sarnat (1970), Solnik (1974)]. To put it in other way, when business cycles that are expected to influence stock returns of the countries behave differently then only risk reduction is possible by investing beyond national boundaries (Viskanta et al, 1994). Thus, economists believe that, there is a need to redefine traditional concept of risk, which should be refurbished specifically in an open economic set up. They suggest that, market risk which is measured by 'beta' (β) [(i)] have different implications in national and international context. According to modern financial economists, 'beta' (β) which can hardly be reduced by domestic diversification can be eliminated to a substantial extent by global diversification, if funds are invested in the

markets which are segmented enough, that means the markets are not moving in the same direction. In this context Bruno Solnik (1974) felt a serious need to remodel the capital asset pricing model (CAPM) based on domestic beta (Sharp, 1964). In an open economic set up where funds can move freely across the national boundaries, traditional concept of risk, pricing of capital assets, law of one price, arbitrage operation, etc, gradually lose relevance. The concept can be illustrated without reference to any specific asset pricing model but for the sake of simplicity we assume that the assets are priced according to well-known Arbitrage Pricing Technique (APT) model. Under this model each [ex post] asset price is equal to the sum of the products of a number of random factors [the source of risk] multiplied by their coefficient [generally called risk prices] plus the realization of an idiosyncratic shock. If markets are perfectly integrated these random factors have to be equally priced in each market. Accordingly, an increase in the degree of integration between markets that were previously segmented should increase the co movements of their prices due to the reduction in the differences between the prices of the common risk factors [Blanco and Juan (1991)]. Many scholars empirically proved how the portfolio risk reduces by allocating fund globally taking the advantage of market segmentation [Lessard (1976), Hillard (1979), Bekaert et. al (1995), Nilsson et. al (2002), Arouri (2002), Lingfeng et. al (2004)]. International investors can only enjoy the benefit when markets are segmented, while markets gradually become integrated benefits through diversification gradually decline, when they are totally integrated, assets possessing the same risk characteristics enjoy same price even if they are traded in different markets, hence, benefits of international diversification disappears [(ii)]. With perfect cross market integration, it may be noted that law of one price will rule over international market and the scope of arbitrage opportunity will disappear. While elaborating the concept of Solnik (1974) some scholars added some unique and important dimension useful for fund managers when they opined that capital markets of the countries may be integrated to each other, yet cross border diversification is possible and it may deliver benefit if co movement of industry returns differ [Baca et. al (2000), Cavaglia and Moroz (2002)]. It is not necessary that economy and each of its sectors will move in tandem, hence, they advocated more in favour of which is

popularly known as Top-Down approach (sector rotation strategy) than country level allocation. Basic themes of this approach are;

I. Target industry of foreign countries,
II. Find pattern of co movement of earnings with domestic sector and
III. Assess the scope of risk reduction through cross border investment.

However, we restrict our study only to country level discussions ignoring sectors, in a sense, we attempted to develop an industry neutral, and risk adjusted international portfolio diversification strategy. Over the last 30 years aspects of investing beyond national boundaries drew considerable attention of academic researchers but the credit of quantitative analysis on benefit of cross border investment even dates back at least to Henry Lowenfeld's (1909) study. Despite the benefits of international diversification it is observed that, transaction cost which is substantially high in less developed economy along with the syndrome of home bias often restrict investors to navigate in the unknown terrain of global market.

International capital market linkages have macroeconomic implications too. While contributing to build up foreign exchange reserve, portfolio investment across the national boundaries can affect the exchange rate, inflation, growth of the economy etc. (Agarwal et. al 2005). Stock market integration can also lead to 'shock- spill over'; adverse role of this notorious but frequent event on economic growth is a matter of serious concern of development economists [iii]. Thus, the economists who oppose the case of ruthless opening up of the economy suggest that there is a need to monitor, discipline, and intervention in the financial market if required (Stieglitz and Weiss, 1981). International flow of capital, critics argue, does not allow economy to follow its independent monetary policy (Classen and Howes, 1996) thus the concept of sovereignty becomes farcical (Fabian Global Forum, 2002). The issues are important. Policy initiative based on serious research can only help to deal with frequently observed adverse impact [iv] of financial market integration that we witnessed in the recent time. However ignoring all these issues, we decided to concentrate, in this thesis, to measure capital market integration to study its implication on risk reduction.

There is a strong belief among market experts, popular press, policy makers and investors in general that it is the activities of foreign institutional investors that are contributing in rising volatility of Indian stock market. The belief, which has yet not been verified and tested rigorously, cannot be accepted as such. Hence, we attempt to test the reliability of this popular notion applying some simple statistical tools and techniques. Our attempt will serve twin objectives; first, it will help to verify authenticity of the popular notion that destiny of our market is grossly determined by in and outflow of foreign fund that in a sense imply, despite several restrictions Indian capital market is poised to join in the movement of global capital market integration. Rise in GDR/ADR issue, foreign portfolio investment, increase in foreign listing of shares roughly indicate that rejecting the theory of 'go alone'; Indian capital market is gradually embracing the policy of 'move together'. However, the transformation process is incomplete; still it is substantially de coupled from the international markets (Roy and Ray, 2011) hence, all the benefits of investing in a segmented market to improve portfolio performance are still available in India. Secondly, what is the significance of integration or no integration for Indian fund managers interested to invest beyond national boundaries? Detailed strategy for cross border investment will largely depend on our clear understanding about the pattern of relationship of our market with that of the other markets of the world, nature of variation of this relationship, if any, and its impact on portfolio risk. No or partial integration of Indian market with that of the others broadly implies that the business cycle of the nations are not moving in unison hence benefits of risk reduction is achievable.

1.2 REVIEW OF LITERATURE

The international capital market linkage and its implication in global portfolio diversification has become the focal theme of modern financial economics. Virtually, capital movement across countries has multifaceted social and economic implications and scholars cutting across the disciplines toiling to enrich our understanding about global finance. Some scholars are specially interested to measure extent of unification of world financial market to test relevance of the concept of global finance, that is, metamorphosis of economic and financial openness is at the core of these studies [Bordo et. al, (1998), Rourke et. al, (1998)].

Why capital movement flared prior to World War I, followed by a period of suspension and we witness rejuvenation of movement at present? Why there is frequent switching from 'frustration to recovery of confidence' on benefits of global finance. Why the course of economic and financial integration looks like U shaped pattern? Why many of the less developed economies not totally convinced about the benefits of global finance are still reluctant to buy this concept? Evidences are there that free movement of global fund ensures better utilization of world economic resources but there are equally strong proof of shock spill over in global economy that has enormous cost. These are few among many other issues under the integration of markets that are extensively researched by scholars. The quantitative analysis of international diversification dates back at least to Henry Lowenfelds' (1909) study of equal weighted, industry neutral, risk adjusted, international diversification strategies using price data from the trading of global securities on the London Exchange around the century. The author concluded that, it is significant to see how entirely all the rest of the Geographically Distributed stocks differ in their price movement from the British stock. It is this individuality of movement on the part of each security, included in a well diversified Investment list, which ensures the first great essential of successful investment, namely, Capital Stability. The observation suggests that, benefit of international diversification of funds was recognized nearly 200 years ago. There is a popular belief that it is just over the last five decades since the publication of brilliant academic work of Grubel and Herber (1968), investing community started

realizing benefits of global diversification. In fact we owe much to Lowenfelds (1909) and his predecessors whose immaculate research provoked successor for thorough scrutiny about the possible rewards from international investments and the strategies to be followed. Thus, in historical perspective, researchers interested to study - how the issue of international diversification actually fared, the potential for cross border investment changed and to what extent our predecessors influenced current state of research of cross border investments [Goetzman et. al (2005) and Andrew et. al (2002)].

During early seventies when the percept of globalization was gradually gaining ground, a number of brilliant studies by Grubel and Herber (1968), Levy and Sarnat (1970), Grubel and Fadner (1971), Solnik (1974) and many others tried to prove that growing opportunity of investing beyond national boundaries would help fund managers to minimize portfolio risk more efficiently. The work of Grubel and Herber (1968) is pioneer in this field in true sense of the term. Calculating the correlation coefficients of USA and other eleven developed markets around the world and taking it into account he constructed an efficient internationally diversified portfolio and posited that 'international diversification of portfolio is the source of an entirely new kind of world welfare gain from international economic relation'. Later, Levy and Sarnat (1970) extended the work of Grubel and Herber (1968) and offered exhaustive evidences in support of the benefit of international diversification of funds. They suggested that instead of investing funds only in developed markets much better results could be obtained if it were invested in both developed and developing countries. Grubel with Fadner (1971) showed that, foreign assets are desirable for US investors because returns on foreign assets are influenced by the internal economic, political and natural factors which are completely different from USA. Besides that, the study suggests exchange rate variation may also deliver some benefit while investing across the boundaries. Bruno Solnik (1974) then developed international asset pricing model as against capital asset pricing model to show that the systematic risk which is not diversifiable in domestic market can be reduced to a substantial extent through international diversification. Later, studies by Lessard (1976) and Hilliard (1979) using variance covariance structure and spectral analysis found low

correlation between stock markets is ideal for international diversification. The link between national stock markets drew utmost attention in the wake of October 1987 crash. Eun and Shim (1989) found evidences of co movements between the US stock markets and other world equity markets. However, conflicting evidences on global capital market integration that ranges from no [Richards (1995), Malliaris and Urrutia (1992)] - partial to complete correlation [Eun and Shim (1989), Koch and Koch (1991)] among markets disturbed economists. Some methodological problems in the earlier studies were rightly pointed out by Solnik (1977), Kohlhagen and Garmen (1983) and Khoury et al. (1987) to explain this contradictory evidence. It is still unclear that between high or low return which one should be taken to measure international capital market linkage. Schollammer and Sand (1985) and Eun and Shim (1989) also expressed doubt over the previously used techniques because their study revealed stock price indices of different countries are non-stationary in nature. Although to address the problem of non stationerity, normal econometric practice is to take the first differences of the series but the problem is that first differencing process *imposes too many unit roots which virtually filter out the important information* regarding long term relationship [Eun and Shim (1989)]. Later on, the model developed by Engle and Granger (1987) provided a new way to measure the long term linkages of the international stock market indices even if they are non-stationary. Many of the scholars then followed the Granger cointegration and causality techniques to measure the interdependence of stock price indices; [Arshanapalli et. al, (1995), Raktovicova, (1999), Chen et. al (2002), Masih and Masih (2001), Jeyanthi, and Pundian, (2008)]. Applying the Granger Causality and Cointegration Technique Arshanapalli et. al (1995) found that, three major European stock markets were strongly linked with U.S stock market during the post-crash period. Study of Bekaert et. al (1995) revealed integration and segmentation of many emerging markets vary with time. Another study that requires special mention was conducted by Miriam Raktovicova (1999). Using the correlation, along with Univariate and Multivariate cointegration technique she has examined the equity markets of the representative group of six countries of emerging Europe. While summarizing all the results she concluded that there is a positive relationship between the market performance and its integration. Study also revealed that smaller countries are segmented while the larger

ones are integrated to each other. Later Campbell and Harvey (2002) used the VAR conditional correlation structure to provide evidence of increased correlation in bear markets of sample countries. Drodz et. al (2008) using 60 companies' data and applying monitored cross correlation concluded that DAX and Dow Jones are typically interrelated while DJ dictated the trend.

Most of the above mentioned studies are based on 'silo' or 'top-down' approach which primarily emphasizes on the selection of country. The basic theme or suggestion of the studies to fund managers is - target countries, next, assign weights on the basis of relative attractiveness of them and then allocate funds accordingly. This approach is very appealing, as it is well founded that country factors are primary determinants of security returns (Sonney, 2007).

However, there is other group of scholars who provided evidences in support of 'bottom-up' approach that means while allocating the fund, fund managers should select the industries beyond the national boundaries first then consider the country factor [Baca et al (2000), Jeffrey (1994)], Cavaglia et al (2000)]. Their main focus is on the increasing importance of the global industry factors as determinants of security returns. All these scholars tried to prove that, sector rotation strategy provides greater risk reduction opportunity than country based approach. Another group of researchers found that, the investors, in practice, rely on both cross country and cross industry diversification to improve portfolio performances [Cavaglia et al (2000) Carrieri et al (2000) Cavaglia and Moroz (2002, 2004)].

To test market integration and to assess the scope of benefiting from international diversification another group of researchers relied on International Capital Asset Pricing Model. Under the assumption of fully integrated capital markets, the price of an asset will depend on its covariance or beta with the return on a mean variance efficient benchmark portfolio. This approach has been used extensively, for example, by Harvey [(1989), (1991)] and De and Gerard (1997) through a world CAPM. In a more recent work Emiris (2004) imposing a dynamic factor analytical model for the returns on currency and stock portfolio on eight European markets concluded that the economies are integrated.

Studies of Butler and Joaquin (2002), Loretan and English (2000) deserve special mention as it mainly deals with the issue of extreme movement of asset price, correlation break down, the downside risk in bear market when international correlation among markets remain higher than normal, hence, cross border investment may fail to yield benefits when they are needed most. Findings of these studies along with J. P. Morgan's Risk metrics may help fund managers to control downside risk efficiently in turbulent international financial environment.

Most of the studies mentioned above are based on the experiences of the major developed countries of Europe and America. There are very few works on emerging markets of Asia, especially South Asian countries. Theses of Leong and Felmingham (2001), Manning (2002) are few earlier studies that considered the case of regional integration of Asia. Using the correlation analysis and Johansen's (1991) multivariate co integration technique, particularly the study of Leong and Flemington (2001) found a degree of interdependence between five countries of East Asian region (Japan, Singapore, Korea, Hongkong and Taiwan). Findings of the study suggest a trend of gradual regional integration of South Asian markets. Among the recent studies on Asian markets, works by Shazali et al. (2010) and Do and Konya (2011) are worth mentioning .Using the data set of pre-crash and post-crash period of five Asian markets (Indonesia, Malaysia, Thailand, Philippines, Singapore), Shazali et. al (2010) found evidence of partial cointegration in pre-crash and complete integration in post-crash period which indicates that the opportunity for diversification is gradually tend to zero. Taking into account nearly same Asian markets, other researchers found conflicting evidences [Do and Konya (2011)]. However, the period of research is marginally different and they have adopted slightly different methodologies, their findings suggest some of these six ASEAN stock markets are not highly integrated with international markets and the investors can use assets from these ASIAN countries to diversify their investment portfolios.

Only a few studies have examined the co-movement of Indian market with international markets. For examples, Sharma and Kennedy (1977) examine the price behavior of Indian market with the US and UK markets and found no evidence of

systematic cyclical component or periodicity for the Indian stock index. The gains estimate from either the US or the Japan indices are 'independent' and hence they conclude that the relationship of Indian market with international markets is poor. Undeniably findings of the studies of nearly four decades earlier have little relevance in the present context when Indian economy has been considerably opened up. How Indian capital market, one of the biggest market of the world, is, at present, interconnected with other Asian and global markets? How it influences and is influenced by others? During the post liberalization period along with other changes some researchers tried to asses – does Indian capital disobeying the rule of the new regime still prefers to follow 'stand alone policy'? But the studies conducted so far suggest conflicting results. Study of Agarwal (2000) reveals that; Indian capital market is not sufficiently liberalized; hence, it is very poorly integrated to other developed markets of the world. Hansda and Ray (2002) looks into the price interdependence of 10 Indian companies that have floated American Depository Receipts (ADR) and found that quotes of both the markets share not only stock wise bidirectional causality but are also efficient in processing and incorporating the pricing information. Naeem (2002) in his paper concluded that, major stock markets of South East Asia (including India) are co integrated with each other but they are not integrated with two giant markets of the world that are US and UK. Agarwal et. al, Wong and Du (2005) using Engel and Granger co integration tests, VAR tests and Johansen's co integration test concluded that after liberalization Indian stock market has become more integrated to major markets like, US, UK and Japan. Using Johansen and Juselius (1991, 1994) co integrating ranks and variance decomposition analysis along with response accounting, Chatterjee and Behera (2006) found no co integration between India and other developed markets like USA, UK, and Japan. In contrary to Chatterjee and Behera, using more or less similar techniques Chittedi (2008) found existence of strong long term relationship between India and other developed markets of the world like USA, UK, Japan, Australia. Jeyanthi and Pundian (2008) using Engel-Granger (1987) cointegration test and cross correlation test found no cointegration among India and other major South Asian emerging markets. Indian market is totally segmented from other major world markets like USA, UK and Germany. The findings of Raj and Dhal (2008) are unique in nature. They measured

the co integration of India and other developed markets along with some emerging Asian markets for three separate time periods 1) 1994-98 (March): the period of Asian crises; 2) 1998 (April) - 2002 (March): the crisis in Russia and Turkey and 3) 2002 (April) - 2008 (March) which depicts the rapid growth of Indian capital market along with other emerging markets. The study relies on both daily and weekly data expressed in both domestic currency as well as DOLLEX. Evidences found suggest cointegration is highest during the latest time span in daily data but the results based on weekly data are not supporting the presence of cointegration. Cointegration among stock markets is found for the stock prices in US dollars for both weekly and daily data. However, when stock price indices are measured in local currency, the evidence of cointegration among stock prices is not robust. The problem with this study is that the division of time period has been chosen arbitrarily and the findings are inconclusive.

It seems from the above literatures that, issue of 'integration or no integration' of Indian market with others is still a matter of debate, which needs to be settled. The question arises-why the research findings are contradictory? It may be either because of methodological problems or problems that are related to dataset selection (high or low frequency of data). However, the conflicting results, inspired us for an in depth study of the issue. Besides measuring the interrelationship of Indian stock market with the other major markets of Asia pacific region along with US and UK, we would attempt to show how functioning of Indian stock market is sensitive to other markets of the world and vice-versa. Findings of the study, we believe, will help portfolio managers to diversify their fund throughout the globe more efficiently. If fund managers of the countries truly behave in this optimal fashion, it would finally help to develop an efficient global financial system and satisfy the claim of neo-liberalists. A synoptic view of research work on interdependency of world stock market is shown in the table below;

Table -1.1

A Synoptic View of Select Research Works on International Capital Market Integration and Risk Diversification

Study	Market	Period	Methodology	Results
1. Grubel & Herber (1968)	USA, Canada, UK, Germany, France, Italy, Belgium, Netherlands, Japan, Australia, South Africa	1959-1966	Correlation, Efficient frontier	International diversification of portfolios is the source of an entirely new kind of welfare gain.
2. Levy &Sarnat (1970)	28 countries of world including emerging and frontier nations	1951-1967	Correlation, Efficient frontier	Risk reduction can be Facilitate by diversifying securities portfolio internationally.
3. Solnik (1974)	USA, UK, Germany, France, Italy, Belgium, Netherlands, Australia, Switzerland, Global	1966-1971	Correlation	Internationally well diversified portfolio would be one-tenth as risky as a typical security and half as risky as a well diversified portfolio of US stocks.
4. Eun and Shim (1989)	Australia, Canada, France, Germany, Hong-Kong, Japan, Switzerland, Britain, USA	1980-1985	VAR model Impulse responses	Market Interdependency, USA exerts dominant influence.
5.Taylor and Tonks (1989)	Britain, Germany, USA, Holland, Japan	1973-1979 1979-1986	Cointegration and Granger test	Market cointegration between Britain, Germany, Japan and Holland after the abolishment of currency restrictions in Britain 1979 Interdependency between markets within a 24 hour period. Also the geographic proximity influences positively the interdependency.
6. Koch and Koch (1991)	Japan, Australia, Singapore, Hong-Kong, Switzerland, Germany, Britain, USA	1972, 1980, 1987	Dynamic System of Simultaneous Equations Cointegration Test	The USA markets exert dominant influence in most of the cases under examination.
7. Cheung and Mak (1992)	USA, Japan, Hong-Kong,	1978-1988	Cointegration test	No Granger Causality among markets before

	Malaysia, Indonesia, Philippins, S. Korea, Taiwan, Tailand			and after the crash of October 1987. The dominant role of USA is not confirmed.
8. Malliaries and Urrutia (1992)	USA, Japan, Britain, Hong-Kong, Singapore, Australia	1987-1988	Granger Causality Test	The stochastic trend behind the long- run movement of markets is more important in Japan and less important in Canada.
9. Kasa (1993)	USA, Britain, Germany, Japan, Canada	1974-1990	Error correction model	Before 1987 crash there was no dependency among the European stock exchanges and that of.
10. Arshanapalli, et. al (1995)	Britain, Germany, USA, France, Japan	1980-1990	Cointegration Test	The degree of international comovement of stock price indices have been increased substantially after 87 crash except for Japan
11. Bayers and Peel (1993)	USA, Britain, Germany, Japan, Holland	1979-1989	Cointegration Test	There is no interdependency among the 5markets and as a result there is no long run relationship among them.
12. Solnik (1994)	Australia, Austria, Canada, France, Germany, Denmark, Hong-Kong, Italy, USA, Japan, Britain, Sweden, Switzerland, Holland, Norway, Spain	1971-1992	Correlation, Markowitz Efficient Frontier	Prudent long-term investment strategy for institutions for retirement provision is to be extensively diversified
13. Blackman, Holden and Thomas (1994)	Several Stock Markets of World	1970-1984 & 1984-1989	Cointegration Test	There is cointegration during second period under examination.
14. Richards (1995)	Australia, Austria, Canada, France, Germany, Denmark, Hong-Kong, Italy, USA, Japan, Britain, Sweden, Switzerland,	1970-1994	Cointegration Test	There is no interdependency among the markets under investigation

	Holland, Norway, Spain			
15. Hassan and Naka (1996)	USA, Britain, German, Japan	1984-1991	Vector Error Correction Model (VECM)	There is an increasing interdependency among the markets in the short as well as in the long run. The dominant role of the USA is established.
16. Koutomos (1996)	Britain, France, Germany, Italy	1986-1991	Multivariate VAR-EGARCH model	There is interdependency among European markets. There is an asymmetry in the transmission mechanism of the Error Variance.
17. Booth, Martikain and Ken (1997)	Denmark, Norway, Sweden, Finland	1988-1994	EGARCH model	There is an asymmetry in the transmission mechanism of the error variance.
18. Chowdhry (1997)	Argentina, Brazil, Chile, Colombia, Mexico, Venezuela, USA	1989-1993	Cointegration Test	The Markets are Co integrated with or without the presence of the USA which appears to exert dominant influence.
19. Elyasiani, Perera and Puri (1998)	Sri Lanka, Taiwan, Singapore, Japan, S. Korea, Hong-Kong, India, USA	1989-1994	Multivariate VAR model	The market of Sri Lanka is not influenced by any other market.
20. Millionis, Moschos & Xanthakis (1998)	Britain, USA, Greece	1990-1992	Autoregressive model	The changes of S&P 500 of New York contribute to improved predictions in the movement of the Athens Stock Exchange The changes in the Athens Stock Index are attributed mainly on domestic factors.
21. Janakiraman and Lamba (1998)	Australia, Hong-Kong, Japan, New Zeeland, Singapore, USA, Indonesia, Malaysia, Thailand	1988-1996	VAR	Countries which are geographically close with strong economic ties appear to be financially interdependent and highly integrated. The dominant role of the USA market is confirmed.
22.	Czech Republic,	1987-	Correlation	Positive relationship

Raktovikova (1999)	Estonia, Hungary, Latvia, Poland, Slovakia	1998	Univariate Multivariate Cointegration	exists between market performance and its integration. Larger countries are integrated while smaller are segmented.
23. Huang, Yang and Hu (2000)	USA, Japan, China, South Growth Triangle (Hong-Kong, Taiwan, South China)	1992-1997	Cointegration Test, Granger Causality Test	There is no cointegration among the countries of the SCGTand also no long run relationship is found among the countries of the SCGT and Japan or the USA. In the short run the USA market leads the rest.
24. Chen, Firth, and Rui (2000)	Brazil, Mexico, Chile, Argentina, Colombia, Venezuela	1995-2000	Cointegration Test	There is cointegration among the markets under examination up to 1999. Since then though this long-run relationship breaks down.
25.Loretan and English (2000)	Germany, Britain	1992-2000	Correlation and volatility	Increases in volatility of returns are generally accompanied by an increase in sampling correlation.
26. Masih and Masih (2001)	USA, Britain, Japan, Germany, S. Korea, Singapore, Hong-Kong, Taiwan, Australia	1992-1994	Cointegration Test	There is interdependency among the Asian markets and the already developed countries of the OECD. The markets of the USA and Britain have a dominant role both in short and long run.
27. In, Kim, Yoon and Viney (2001)	Hong-Kong, Korea, Thailand	1997-1998	Multivariate VAR-EGARCH model	Cointegrated markets. Hong-Kong plays a dominant role.
28. Campbell & Harvey (2002)	USA, UK, France & Germany	May 1990-Dec 1999	VAR Models and Conditional Correlation	Correlation is comparatively high in bear markets than that of bull markets.
29. Lane & Ferretti (2003)	22 developed countries of Europe including Japan, Australia and New eland	1976-1990	Correlation, financial and trade integration ratio	Financial integration is very high in case of developed countries

30. Goetzman, Li and Rouwenhorst (2005)	Combined sample including markets from Europe, North and South America, South & East Asia Africa & Australia	1860-2000	Correlation, variance, covariance analysis	Globalization is associated with relatively high correlation and increase in the investment opportunity.
31. Naeem (2002)	Pakistan, India, Sri Lanka, USA, UK	Jan 94 - April 98	Johansen Multivariate conintgration	South Asian capital market is integrated regionally. No integration is found with USA and UK.
32. Agarwal, Wong and Du (2005)	India, USA, UK, Japan	1991-2003	Vector Auto regression Model, Johansen Multivariate conintgration	Indian stock market is integrated with mature markets and sensitive to the dynamics of those markets in the long run. In short run both USA and Japan Granger Cause India but vice versa is not found to be true.
33. Knif, Kolari& Pynnonen (2005)	USA, Japan, UK, Germany Switzerland, France, Netherlands, Denmark, Sweden, Norway, Finland and World Index	1999-2005	Modeling Time varying conditional correlation as a function of conditional volatilities and possible additional explanatory variable via logit type regression unit roots test, cointegration	Time varying correlations between stock markets are primarily dependent on national and world market volatilities
34. Chatterjee & Behera (2006)	India, USA, UK, Japan	1999-2005	Vector Auto regression Model, Variance Decompositio n, Impulse Response Function.	Indian stock market is not at all integrated with the world markets.
35. Kumar, A. P (2007)	MSCI Europe, Australia, Far East, Emerging Market, ACWI	1969-2007	Correlation, variance, Efficient Frontier	International investing has been beneficial in providing risk diversification and additional sources of return. The evolution of

				international investing has required constant revisions to the investment universe and hence updates to the indices that represent that opportunity set.
36. Raj & Dhal (2008)	India, USA, UK, Hong-Kong, Singapore, Japan	1993-2008	Correlation, Johansen Cointegration, Variance Decomposition	Cointegration among stock markets could be supported for stock price in US Dollars for both weekly and daily data. When stock price indices are measured in local currency, the evidences of cointegration are not robust.
37. Bekaert, Hodrick, and Zhang (2010)	23 Developed markets around the world	1980-2005	Parsimonious risk-based factor models, Heston-Rouwenhorst model.	There is no evidence for upward trend inreturn correlations; except for the European stock markets. , the increasing importance of industry factors relative to country factors was a short-lived phenomenon. Large growth stocks are more correlated across countries than are small value stocks and the difference has increased over time.
38. Shazali; Lau, Evan; Puah, Hong and (2010)	Indonesia, Malaysia, Thailand, Phillipines, Singapore	1987-1997 1997-2007	GARCH, J-J Cointegration	Partial market integration for the pre-crisis; whereas in the post-crisis, complete integration prevails. Hence, diversification benefits are reduced.
39. Do & Konya (2011)	Six ASIAN stock markets (Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam) with four international stock markets (US, ASEAN bloc, Asia and world)	Dec 1999-Dec 2010	Cointegration	Some of these six ASIAN stock markets are not highly integrated with international markets and the investors can use assets from these ASIAN countries to diversify their investment portfolios.

1.3 RESEARCH QUESTIONS AND HYPOTHESIS

To keep in touch with discussions of the earlier section, now it becomes imperative to spell out in clear terms the objective of the present study. After long hibernation, Indian stock market, following regime shift, appeared as one of the major players of our financial system. Upsurge in the interest of foreign institutional investors and eagerness of our corporate sector to go abroad for raising much-needed funds changed the total complexion of Indian capital market. Now it is more global than what it was earlier. Nature of interaction of Indian capital market with other markets of the world and its possible implications on asset management is the primary focus of our study. Very specifically the questions to be addressed by the present thesis are:

I. Whether Indian stock market is interlinked with the other major markets of Asia-Pacific region along with two epicentres of world economy-USA and UK.
II. Does inter-linkage among markets remain constant or it is time varying. If it is time varying, what causes the variation?
III. What is the implication of integration and no integration on asset market development? How the nature of relationship influences risk reduction of international portfolio?

Thus, we hypothesize;

1. Due to unrestricted movement of foreign capital, Indian market at present is highly developed.
2. Indian stock market is closely interlinked individually with the markets of the select sample countries.
3. Risk reduction by portfolio manager may not be profitable by cross-country diversification of fund.

The case of integration, no integration, strength and direction of relationship and relative sensitivities of the indices will be discussed in the context of efficient portfolio management framework.

As the current study basically aims to answer-Is Indian capital market segmented or integrated with the world market?, we feel it is essential to discuss some of the prominent features of these two type of markets and its implications on asset pricing and investment management.

1.4 PLAN OF THE STUDY

Apart from the present one the study contains five more chapters.

- Chapter II deals with the economic and financial status of the sample countries. Very specifically the section deals with the steps initiated and measures yet to be taken by each country to allow free flow of capital. An attempt will be made to carefully study direct, indirect barriers and country specific risk of sample countries that deter the market to couple with others. Techniques used though mostly descriptive in nature are widely used to study the causes of isolation of any market [Bordo et. al (1998), Kurtzman and Yago (2009)]. A descriptive microstructure table of the several countries around the world including sample countries is presented at the end of the chapter.

- An attempt will be made in Chapter III to derive the relationship of development and financial integration of a country. We will examine how a country shifts from emerging economy to a developed one. What are the principal factors responsible for countries' development? And how development leads to integration? This chapter deals with these questions and tries to answer them with some ratio analysis.

- In the chapter IV we tried to measure the linkages of Indian capital market with that of the other sample countries for different period applying simple correlation technique and try to determine that whether the correlation is time varying or not.

- Chapter V relates to the benefits of portfolio diversification on the perspective of Indian Investors.

- Finally, in the Chapter VI, we conclude with brief description of all the observations, their analysis and policy implications for asset management.

1.5 DATA TIME PERIOD AND METHODOLOGY

DATA AND TIME PERIOD:

To measure cointegration between markets one commonly used data series is index number of share prices [Schwert (1989), Brown and Raines (1999), Arshanapalli et al, (1995)]. Hence, the data used in the study are based on different share price indices collected from respective official website published by specific countries' stock exchanges.

This study concentrates on the Asia's most active and largest eight stock exchanges: Hong kong [Hangseng (HIS)], Korea (KOSPI), Japan (Nikkei 225), Malaysia (KLSE), Singapore [Straight Times, (STI)], Indonesia [Jakarta Composite Index, (JKSE)], Taiwan (TWI) and India (BSE 200) along with world's most important exchanges - New York (S & P 500) and London (FTSE 100). Daily closing data have been used for all the ten exchanges. The indices are mostly broad based and cover more widely the functioning of the markets under study. The reason for selecting the countries are: firstly the 'look-east' policy of our government and the increasing bilateral trades with select sample countries inspired us to select those seven countries of the Asia-Pacific region. Secondly, the select countries represent near about 90% of the market capitalization of the region and nature of interaction of Indian market with all others will help us to understand evolving nature of regional integration [(v)]. The issue is important in the sense that a country may settle for a lower degree of integration though it failed to achieve full integration of capital market (Ibrahim, 2009). Presumably, all these economies are less co integrated that may offer excellent opportunity to our fund manager to diversify their fund and reduce risk that are otherwise unavoidable in national context. Finally, US and UK markets have been chosen because they are the two major epicentres of world economy. Developed countries are more or less integrated to each other (Raktovikova, 1999). India's relationship with US and UK will indicate our market's linkage with other developed

markets of the world which ultimately can be considered as the weak empirical evidence of being a developed economy.

Earlier researchers on capital market integration showed their positive preference for shorter period ranging from 5-10 years [Arshanapalli et. al (1995); Karolyi and Stulz (1996)] ignoring any longer horizon. The reason behind is any result based on longer horizon has little relevance in international finance research because the degree of co integration of financial markets changes over time (Karolyi and Stulz, 1996). Furthermore, no wonder that fund managers will be interested in short term analysis based on current experiences particularly when their own performance is measured by the investors quite frequently. Hence, for the present study we considered a period of exactly 15 years ranging from 1st January 1997 to 31st December 2011 and daily closing price of the indices were collected accordingly. The time period under our study is a steady time period, where presumably there was no major structural break in the select economies. The sample consist nearly about 34000 observations. We focus on daily co movements for several reasons. First, the daily horizon is important for risk management purpose and for portfolio managers whenever dynamic hedging strategies are used. Focusing on daily data or high frequency data allow us to implement more powerful tests of cross-country co movements (Karolyi et. al 1996). However, there are studies that relied on weekly data, which we believe causes loss of information [Agarwal et al, (2005), Raj and Dhal (2008)]. Further, lower frequency data smooth variation between adjacent observations resulting in smoothed estimates of correlation and volatility that discard important information (Knif et al, 2005). One worth mentioning point is that, London and New-York stock markets operate in different time zones with different opening and closing times (10 and 12 hrs behind form India, respectively), thus to accommodate this typical feature one day lag is considered in case of above two indices to ensure that there is no trading overlap. Four to six hours differences in case of other markets are ignored deliberately.

METHODOLOGY:

To measure the interrelationship between the markets of sample countries we resorted to simple correlation coefficient technique of Karl Pearson. Later, we compute efficient frontiers of the markets under study using Markowitz's risk return model (1952). These two techniques are widely known and easily available in any primary text book of statistics and portfolio management, hence further elaboration may not be required. The daily index returns are defined by log differences as $r_t = 100 \times \log\left(\frac{I_t}{I_{t-1}}\right)$ where log is natural logarithm and I_t of the index value of day t. Some other tools and techniques used in chapter-iii, chapter-iv and chapter-v are elaborately discussed in the respective chapters.

END NOTE:

i. The formula for the beta of an asset within a portfolio is $\beta_a = \frac{\mathrm{Cov}(r_a, r_b)}{\mathrm{Var}(r_b)}$, where r_a measures the rate of return of the asset, r_b measures the rate of return of the portfolio benchmark, and cov (r_a, r_b) is the covariance between the rates of return.

ii. Gradually, changing concept of risk and its impact on asset pricing, cost of capital, creation of productive assets became the central theme of research in international economics [Bekaert and Harvey' 2000].

iii. a. Asian financial crisis which started around the month of July, 1997 with the devaluation of the Thai baht affected Asian countries and especially, the currencies of South Korea, Philippines, Indonesia and Malaysia.

b. The late - 2000s recession (or the Great Recession) was a severe economic recession that began in the United States in December 2007 and ended in June 2009 (as determined by the US National Bureau of Economic Research) It spread to much of the industrialized world, and has caused a pronounced deceleration of economic activity.

iv. If there is a market failure then barriers to trade may increase GDP (Overseas Development Institute, December, 1999)

v. There is a growing movement for regional integration in West Africa, European Union to enjoy the benefit of faster economic growth and greater welfare for participating countries.