Impact of Portfolio Performance on International Portfolio Diversification

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Abstract

Investment opportunity is what we all are looking for every now and then, avenues that can generate maximum return with minimum of risk. International Portfolio diversification may not fulfill aspiration of investors with globalization spreading its wings in each sphere of economic activity. The study has been conducted from the perspective of Indian Investor taking into account 22 foreign markets (11 emerging and 11 developed). The countries have been selected from two points of view; firstly on the basis of market capitalization and secondly on the basis of availability of data. Emerging markets chosen for the study contribute more than 80% in Emerging market Index which is sufficient to generalize the results to the whole. Geographical regions have also been taken into consideration in order to benefit from regional diversification; these are Asia-pacific with 13 markets, 8 markets from Europe, 3 from Latin America and USA. Firstly, portfolios with different investment objective would be chosen on the basis of sampled countries. Then testing co-integration study would help in elimination of those countries generating co-integrating vector. Hence, Indian investor would be benefited by the study to find out whether globally diversified portfolio is better or not as compared to domestic portfolio. International portfolio diversification can be suggested for Indian investor in the wake of its performance during structural breaks.

Keywords: *Capital, Investor, Management, Market, Portfolio.*

INTRODUCTION

Financial markets have undergone changes over the past thirty years, which present opportunities and difficulties for global portfolio management. It is natural to dispute how the unrestricted efficient frontier allocates assets because invisibility and legal restrictions differ between nations [1]. Additionally, as the global financial markets have become more integrated, structuring dynamic portfolio rebalancing helps to understand changes in the advantages of international diversification techniques. In order to reduce portfolio risk, modern portfolio theory (MPT) chooses assets based on statistical methods that quantify the degree of diversification by calculating expected returns, standard deviations of individual securities to assess their risk, and by calculating the actual coefficients of correlation between assets, allowing a better choice among assets that have a negative or no correlation with other assets in the portfolio [2]. Modern portfolio management differs from traditional portfolio management in that it use quantitative methods to lower portfolio risk by generating the maximum return for a given risk while posing the lowest risk for the same return [3]. By choosing an effective portfolio also referred to as an optimal portfolio that offers the maximum satisfaction and return for an investor while taking into account investors' risk profiles, returns can be maximized for investors.

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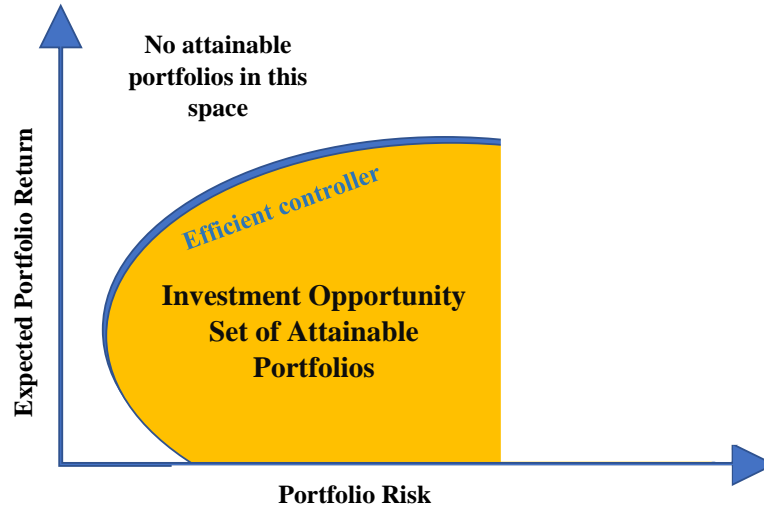
Figure 1: Portifolio risk assessment

Since portfolios, as depicted in figure 1, can contain any number of assets with various amounts of each asset, there is a large range of risk to return ratios. The entire region would be made up of all conceivable portfolios that are attainable if the investment possibilities set were displayed as an area of a graph with expected portfolio return on the vertical axis and expected portfolio risk on the horizontal axis. There will be portfolios with the best returns for each risk level in this set of realizable portfolios, or there will be portfolios with the highest returns that are practicable for each risk level. The efficient frontier is the collection of all feasible efficient portfolios that can produce the best return for a particular degree of risk [4]. This frontier can be used in conjunction with an investor's utility function to produce an optimal portfolio for that investor, one that meets their needs and offers the best return for the risk.

The portfolios that make up the efficient frontier have the lowest risk, as determined by the variation of their returns; for this reason, they are known as minimal variance portfolios, which also have the lowest returns, and maximum return portfolios with the highest risks. A savvy investor does not choose portfolios that are below the efficient frontier for investing since they provide lower returns for the same level of risk [5]. By combining Assets A and B, which had expected returns of 14% and 8%, as well as standard deviations of 6% and 3%, respectively, for each portfolio, Figure 2 was created. Combining two assets that are shown on the graph below, the Investment Opportunity Set was created. The minimal variance portfolio to the greatest return portfolio are both on the efficient frontier.
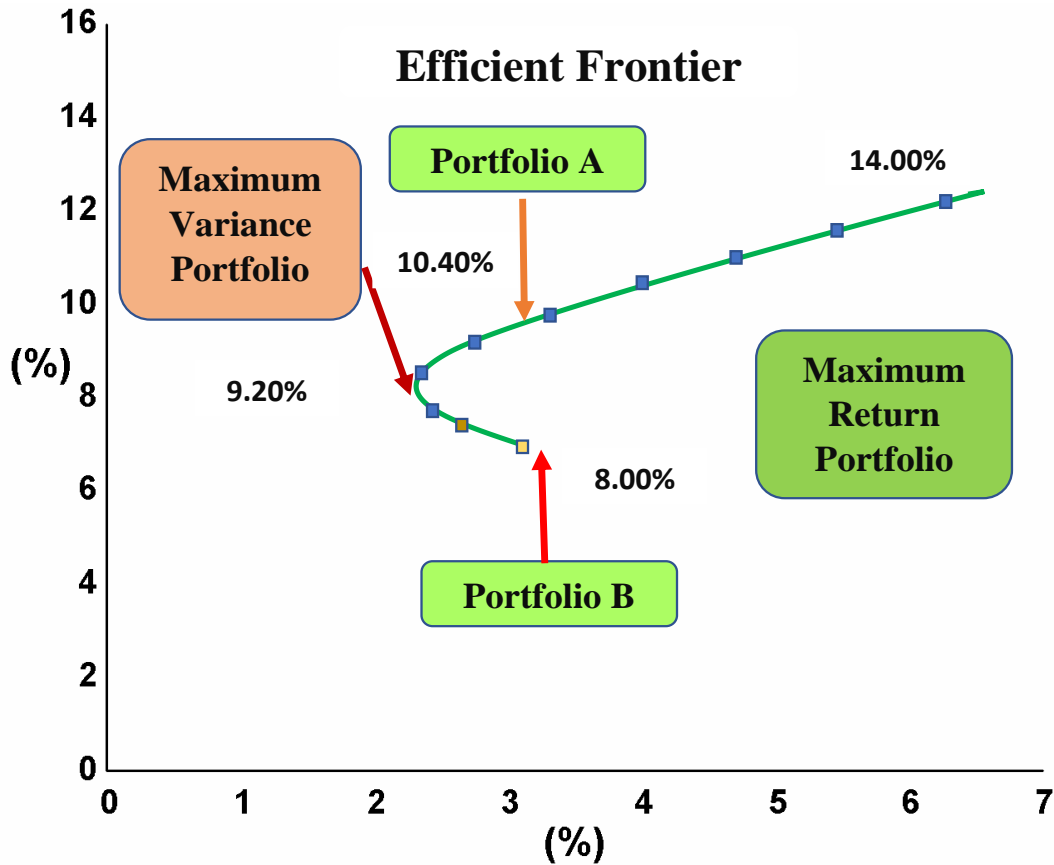
Figure 2: Investment opportunity

The efficient frontier is below two of the portfolios. Portfolios that are below the efficient frontier will produce a lower return for a given level of risk than those that are beyond it. If an investor does not want to take on more risk than what Portfolios A and B offer, Portfolio A is the obvious pick over Portfolio B because it delivers the maximum possible return of 10.4% compared to the 8% return provided by Portfolio B. If only Asset A and Asset B are invested in, variance cannot be lowered. However, with an effective portfolio, a minimum variance portfolio can be established, providing the best-projected return with the least amount of risk.

Role of International Portfolio Diversification

 After detailed analysis, a portfolio is formed with5-6 scrip's from durable segments to capital goods and real estate that was generating good returns with low risk. Again being more curious it may be thought that "Is it possible to earn even more with same risk profile or equal return with low risk profile?" The answer would definitely be yes. Little more effort needs to be plunged in and here comes either higher return or low risk. This is International Portfolio Diversification. The question here arises is how can investor achieve a higher level of satisfaction when he is already on efficient frontier? The answer lies in the fact that countries tend to be weakly correlated with each other then individuals scrip's in the same economy and low correlation leads to reducing risk profile of the portfolio and an investor can go higher on efficient frontier [6].

Popular Methods of International Investment

As an investor, international investing can present several options. There are numerous possibilities to pick from if you're thinking about investing internationally. The most widely used strategies for foreign investing are listed below [7]. The use of mutual funds is one of the most well-liked methods for engaging in foreign investment. Exchange traded funds (ETF) with same characteristic of mutual fund are easily available for the underlying market of interest wherein investor can invest easily without much hassles. While an ETF and a mutual fund are comparable, they differ in a few ways that you should take into account. The fact that an ETF can be exchanged on the stock exchange is their main distinction [8]. As long as the exchange is open, you can buy or sell shares of almost any ETF, according to this. In the case of a mutual fund, your order for a share will be processed at the fund's current net asset value at the close of business. You may get real-time price quotes and buy or sell shares right away with an exchange-traded fund [9]. This implies that you will be better equipped to profit from changes in the market. For instance, if a significant news event occurs during the day, you can sell your shares right once to avoid a decline in value. The American depository receipt (ADR) offers a means of participating in foreign investment. An American financial institution uses this method to buy a specific amount of shares in a foreign corporation [10].

Optimizing the Portfolio's

Investors with international portfolios of shares and bonds are generally aware that their decisions on asset allocation, the percentages of funds they invest in various asset classes, and the degree of currency hedging are the most crucial ones [11]. They typically feel at ease making the simplifying assumption that their goal is to maximize expected return for a specific degree of risk when choosing the proper allocation (subject or various types of constraints). One might anticipate that, in today's computerized world, quantitative models would predominate in the process of global allocation given the straightforward mathematics of this optimization problem, the numerous correlations among global asset classes required to measure risk, and the significant amounts of money involved [12]. Sadly, when investors have attempted to apply quantitative models to aid in optimizing the crucial allocation choice, the results have frequently foiled their efforts due to their irrational nature. The algorithms almost invariably approve sizable short positions across a wide range of assets when investors place no restrictions. The models frequently propose "corner" solutions with zero weights in many assets and unreasonable big weights in the assets of marketplaces with tiny capitalizations when limitations forbid short positions [13].

The Growing Importance of Emerging Economies

It is notable how important emerging markets and so-called "emerging economies" are becoming from a demographic and economic standpoint, as well as at the macroeconomic and microeconomic levels. Over 80% of people on the planet live in emerging economies [14]. In addition, many of the rising economies are dealing with fast urbanization and significant rural-to-urban migration as a result of the fundamental economic transitions currently underway. Although these countries have large populations, their economic weight is also growing in importance. The share of emerging nations in the global GDP is already over 45%, up 13 percentage points from the early 1990s, if purchasing power parity (PPP) is adopted, which accounts for variations in cost of living. These economies are already substantial, but they are still expanding quickly [15]. The international economy, which can now depend more than ever on the dynamism of developing economies, benefits from the pace of expansion in emerging economies as well as from their enhanced resilience to economic and financial volatility. Higher living standards are a result of this rapid progress for people in emerging economies. These nations' GDP per capita increased by almost 70% between 2000 and 2021, while starting out at modest levels [1-7]. Emerging economies have quickly assimilated into the global marketplaces for goods and services. Some of these analyses suggest that by 2025, the combined economies of Brazil, Russia, India, and China could

be larger than the six greatest industrialized economies of today.

Why to Invest in Emerging Market

The three key characteristics of emerging countries high growth potential, sizable foreign reserve and low foreign debt make them more juicy and delicious than more developed markets around the world. The International Monetary Fund's most recent projections indicate that developed economies, as a whole will only have had GDP growth of 1.3% in 2020, with growth anticipated to reach 1.5% in 2021. In terms of Purchasing Power Parity, developing markets made up barely 37% of the global GDP in 2011; by 2022, this percentage is anticipated to rise to 50%. In contrast, it is anticipated that emerging Asia's GDP will increase by 6.1% in 2020 and 6.8% in 2021. Less reliance on developed countries like the US and the Eurozone is being placed on emerging markets in terms of trade [16,17]. According to IMF predictions, 10 of the 20 economies with the fastest five-year growth rates will be located in Sub-Saharan Africa, and two will be in North Africa. India's foreign portfolio investment has grown significantly in recent years. India received 2.15 US billion in foreign investment in 2019, and by the end of 2021, it had received more than 32 US billion. According to recent data, once transaction costs and restrictions on short sales are taken into account, the benefits of international diversification for American investors are minimal [18]. Global diversity, however, might be even more crucial for investors in tiny, emerging nations than it is for American investors. Therefore, this study examines whether expanding domestic stock investment options results in benefits for diversification for a domestic investor who only invests in local stocks. It also measures the economic size of these diversification benefits for a large cross-section of countries with both large and small stock markets. These benefits of diversification represent the utility gain that would be realized by investors who are technically limited to investing in domestic equity alone.

Table 1: Market Capitalization of Sampled Emerging Markets

(in US billion$)			
Country Name\Year	**2011**	**2016**	**2021**
World	17788.16	64471.81	53163.89
Brazil	147.636	1370.377	1229.85
Chile	73.86	212.9102	313.3253
China	42.055	6226.305	3697.376
Czech Republic	15.664	73.42008	37.16326
India	127.199	1819.101	1263.335
S. Korea	181.955	1123.633	1180.473
Malaysia	222.729	325.663	476.34
Mexico	90.694	397.7246	525.0567
Pakistan	9.286	70.26223	43.67629

Philippines	58.9297	103.2243	264.1429
Russia	15.863	1503.011	874.6595
Sri Lanka	1.998	7.55317	17.04599
Thailand	141.507	196.0462	382.9991

Results drawn from the statistics of Table 1 is extracted from world bank databases, establishes importance of emerging markets which has grown from around 7% (in 2011) to 21% (in 2021) of world market cap and particularly of BRIC, an acronym for (Brazil, Russia, China, India) with a growth path in market cap of contributing to world market cap to approximately 18% in 2021from 2% in 2011. BRIC contributes 25% of world land, 40% of total population, 15% of international commerce and 33% of total world resources.

Economic Blowback

Emerging markets face crunch when western policy makers denied the role of developed markets in annual bankers meeting for problems prevailing in emerging market. Emerging countries contribute 60-70% of global economic growth [13]. Because of the slowdown in developed economies exports in these countries have decreased as well as earnings too. International banks which have financed to the troubling countries will be facing losses [4]. Emerging market has US $7.4 trillion foreign exchange reserve. If the banks decide to sell hedging of these reserves to support the weak currencies, it will increase financial stress in the economy [1].

Research Questions

Present study would take up exchange movements into consideration and how portfolio's performance can be enhanced by hedging portfolio. The study is an attempt to answer some of basic question from the point of view of an Indian investor.

Whether it is feasible to invest in foreign market for a retail investor? If yes, what are the methods through which investor can enter into foreign market?

How meaningful is to take up the pain of econometric study of co-integration? Does it help in improving investment decision?

What makes a difference when co-integration is added with MPT?

Research Gaps

A concept propounded many years ago may not necessary hold its ground in the present. It may lose its charm with changing scenario provoking analysts to test its relevance in the changing circumstances. International Portfolio diversification may not fulfill aspiration of investors with globalization spreading its wings in each sphere of economic activity. Also few studies are able to connect practicality of co-integration concept with choosing optimum portfolio creating interest in researcher for exploring this aspect that would be helpful for an Indian investor.

Research Objectives

The study has been planned to achieve the following objectives:

To test the co-movement of stock indices among the sample countries.

To examine whether globally diversified portfolio outperform domestic portfolio.

To measure the impact of hedging exchange risk on portfolio performance.

To decide optimal size for the portfolio and design ex-ante portfolio strategy

METHODOLOGY

The study has been conducted from the perspective of Indian Investor taking into account 22 foreign markets (11 emerging and 11 developed). The countries have been selected from two points of view; firstly on the basis of market capitalization and secondly on the basis of availability of data. Emerging markets chosen for the study contribute more than 80% in MSCI Emerging market Index which is sufficient to generalize the results to the whole. Geographical regions have also been taken into consideration in order to benefit from regional diversification; these are Asia-pacific with 13 markets, 8 markets from Europe, 3 from Latin America and USA. The geographical presentation is represented in Table 2.

Table 2: Classification of countries on the basis of regions

Regions	Countries included in the study
Asia-Pacific	India, China, Malaysia, S. Korea, Japan, Singapore, Taiwan, Hong-Kong, Philippines
Europe	Germany, UK, Spain, France, Greece, Switzerland, Russia, Czech Republic
Latin America	Brazil, Mexico,
America	USA

We start collecting the data from a particular date (05/07/2016 up to 31/12/2021) from where synchronization of data for all the sampled countries was possible with two perspectives: one to measure the level of co-integration and second to construct portfolio. Monthly data has been used for study and has been collected from internationally and nationally accepted sources namely (www.econstats.com), (www.nseindia.com), (in.finance.yahoo.com).

Classification of indices on the basis of status of development is shown in Table 3.

Table 3: Countries with their respective indexes

Emerging Markets	Developed Markets
India(S&P CNX Nifty)	Japan(Nikkei 225)
China(Shanghai Composite Index)	Germany(DAX 30)
Taiwan(TWII)	USA(S&P 500)
Philippines(PSEi)	UK(FTSE 100)
Korea(KOSPI 200)	Singapore(Straits Time Index)

Brazil(BOVESPA Index)	France(CAC 40)
Russia(RTSI)	Spain(IBEX)
Mexico(IPC)	Australia(All Ordinary)
Thailand(SET)	Switzerland
Czech Republic(PX50)	Greece(ATG Composite)
Chile(IPSA)	Hong-Kong(Hang-Seng)
Malaysia(KLSE)	

Scope And Relevance of the Study

The study has tried to answer some of the basic question of a common investor about the international portfolio investment. Firstly, portfolios with different investment objective would be chosen on the basis of sampled countries. Then testing co-integration study would help in elimination of those countries generating co-integrating vector. This addition of co- integration study with MPT has not been much studied out and moreover, not been tested in Indian context. Hence, Indian investor would be benefited by the study to find out whether globally diversified portfolio is better or not as compared to domestic portfolio. It will be explored thatwhether investors from emerging markets should diversify in developed market or not.

Limitations of the Study

Some assumptions can be considered to generalize the facts; in the present study two assumptions has been considered as limitations of the study as discussed under:

First basic limitation of the study is that investment barriers have not been taken into account. International investment is restricted in some of the countries. This fact has not been given due consideration in the present study. It is presumed that boundaries are open for all international investors.

All the member countries of the respective MSCIEM and MSCIDM indices are not a part of the study; hence it is a generalization of the facts on the basis of some sampled countries.

RESULTS AND DISCUSSION

International portfolio diversification has been widely researched over the years. Present study is an attempt to find out possible benefit from diversifying internationally. It is a saying that globally securities tend to be less correlated with each other than being ondomestic ground. With a vast sample size of 22 countries (11 emerging and 11 developed markets), the study tries to explore that whether global diversification is better than domestic diversification and if yes how it can be improved by using co-integration technique. Long duration of 10 years from 2011 to 2021 has been taken into consideration to make a strategy for a buy hold investor. Recent trends in economic transformations of the world indicates growing co-operation among the countries. Hence, it is of utmost importance to test the benefit of diversifying internationally in present scenario. The study has been conducted fromthe point of view of Indian investor. How fruitful is investing abroad for Indian investor, so that level of satisfaction can be taken to a higher level as compared to being on domesticlevel.

Emerging Markets

Overall, descriptive statistics of the study for whole sample period suggest that emerging market generates very high rate of return but at the same time, level of risk is also high. Turkey has emerged out as the best performing country with return of 20.84%. Greece is posing highest negative return among the sampled set. Expected rate of return has exceeded actual return in six cases out of eleven markets. Main purpose ofportfolio diversification is to prepare a portfolio where risk can be minimized and return can be increased. Thus four perspectives have been taken into consideration to form a portfolio e.g. 1) Mini risk portfolio 2) Return = India 3) Risk= India 4) Maximum return portfolio. Mini risk portfolio has generated return of 7.38% with 21.2% risk.

Pre-crisis situation suggest that returns are much higher than in whole sample period so asrisk of individual market. Correlation among the sample set tends to be low compared to the whole sample period. In pre-crisis era, results are better for expected return compared towhole sample period. Nine countries beat expectation level out of eleven sampled markets. However, during pre-crisis period portfolio generated higher returns than in whole sample period and risk too was comparatively lower. Table 3 clearly indicates that pre-crisis periodhas been more attractive as compared to whole sample period. Before sub-prime mortgage crisis markets tend to be less integrated with each other, hence portfolio diversification ismore in this period. Efficient frontier suggests that out of eleven markets only four markets lies above the curve. Rest of seven markets can take benefit of portfolio diversification including India.

Post-crisis is a period when basic need of diversification is felt so that loss incurred on one market can be offset by profit of another. Most of the markets are either in the negative zone or with very little rate of return in this period. Greece has been highly hit by crisis withalmost 34.82% negative rate of return. Correlation tends to be very high in this duration asit's a saying that world market become small at time of crisis and come together. Five countries have outperformed their expected rate of return. However considering MPT investor can minimize risk at their domestic level. Mini risk portfolio is giving a return of 1.60% with 21.80% standard deviation, opposite to this maxi return portfolio is generating a return of 2.03% with 29.15% level of risk. If taken from the point of view of Indian investor International diversification is highly beneficial. All the countries except Malaysia is underperforming globally diversified portfolio and far away from efficient frontier indicating that at time of crisis it is highly advisable to invest at international front.

Table 3: Risk Return Comparison in Three Phase of Analysis

	Whole sample period:		Pre-crisis period:		Post-crisis period:2011-2021 2017-2021		2011-2016	
	Ret	**Risk**	**Ret**	**Risk**	**Ret**	**Risk**	**Ret**	**Risk**
Mini Var	7.38%	21.2%	10.10%	15.50%			1.60%	21.80%
E(r)=India	8.98%	26.25%	10.82%	20.79%			Not feasible*	

Risk=India	9.03%	26.60%	12.23%	24.90%	0.92%	29.59%
Maxi Ret	12.40%	75.50%	19.60%	76.90%	2.03%	29.15%

(*return equal to India is not achievable)

Testing of Co-Movement Among Markets

Co-integration approach is testing long lasting relation among the sampled group. From Indian investor point of view, it is advisable to check the linkage of India with rest of the world, because if countries are found co-integrated, diversification benefit is reduced. Correlation is initial step for a layman investor who wants to diversify globally. Though it's not appropriate for econometric analysis but gives a purview of direction. Correlation matrix in emerging markets suggests that countries are not highly linked with each other. Low correlation suggests that global diversification can be beneficial if given a due consideration. Hence, co-integration approach has been used to test whether countries share common trendin the long-run. Growing co-operation is not desirable for portfolio diversification. Johansen co-integration approach has been used to test long run movements among the countries. Five countries have been found to be co-integrated with India in the long run namely Brazil, S. Korea, Malaysia, Mexico and Turkey. Brazil corrects itself up to 0.96% monthly and S. Korea, Malaysia, Mexico, Turkey correct 0.45%, 0.18%, 0.99% and 0.69% respectively. If these countries are put out of the sampled group, no co-integration can be found among the markets.

Adding Co-Integration Study with MPT and Currency Effect

Earlier efficient frontier was reached with the help of portfolio formed with combination of eleven countries. Now after removal of six countries from sample, again portfolios areformed to test whether co-integration study can further improve the results by excludingthose countries, which are creating co-integration vector in the data set. Also reducing number of countries can lower research and effort to put on international investment. Currency risk can be minimized when sample size reduces. Reduction in number of countries for investment lowers currency risk of the portfolio and less effort is required to track the performance of individual countries. Currencyhedging for the whole sample period is not beneficial for Indian investor as INR has appreciated against emerging market currencies. But for pre and post crisis results show drastic result with improving the performance of portfolio with hedging effect.

Optimal Size of Portfolio

Size of the portfolio is important consideration for diversifying portfolio because increased size of portfolio brings with it higher exchange risk, political risk and many more international barriers. Results of the study suggest that the lesser the number of securities, better is the return of portfolio. 3-4 scrip's are enough for international portfolio diversification in our sample of eleven countries.

Developed Market

US holds more than 50% share in MSCI DM index which shows that the country is dominating the index. For pre-crisis Singapore is the best performing market with lesser of risk as compared to the emerging market. Correlation matrix suggests that countries are highly linked with eachother. Portfolios formed in this duration are in better position than in the whole sampleperiod. Mini risk portfolio is generating a return of 4.20% with 11.90% of risk, which ishigher than the return earned during the whole sample period. To

achieve this level of satisfaction investor need to invest 36.70% of his total fund in Canada, 11.70% in Netherland,51.70% in US. As opposed to this maxi return portfolio is giving a return of 5.20% with arisk of 27% with pure investment in Germany. All the countries except Germany can take advantage from investing abroad as each of the market lies under the ambit of efficient curve.Post-crisis is a period to look out for. As the sub-prime mortgage crisis started out indeveloped market and then spread its wing in rest of the world each of the market is in the negative zone in this duration. Risk has increased in this duration as volatility is increased. Correlation is also very high which can reduce benefit of diversification. Formation ofportfolio gives the investor negative return but important consideration is that how domestic negativity can be reduced by investing globally. Except Switzerland efficient frontier isgiving advantage to the member countries. In Table 4, performance in each of three phases is compared. As per table 4, it is clear that in the pre-crisis period return is highest. For long hold, investor residing in India it's not exciting to look at this table as this much of return is easily available at domestic ground which doesn't require research of international phenomenon. Emerging market investment is giving fruitful return especially beneficial at time of crisis.

Table 4: Risk Return Comparison in Developed Market

	Whole sample period: 2011-2021		Pre-crisis period: 2011-2016		Post-crisis period: 2017-2021	
	Ret	Risk	Ret	Risk	Ret	Risk
Mini Var	2.20%	16.70%	4.20%	11.90%	-1.40%	19.70%
E(r)=India	Not feasible*		Not feasible*		Not feasible*	
Risk=India	2.37%	26.61%	5.01%	24.09%	-2.02%	26.69%
Maxi Ret	2.40%	30.40%	5.20%	27.00%	-0.89%	21.33%

(*return equal to India is not achievable)

Correlation matrix of developed market suggests that countries are not highly linked witheach other; also from Indian point of view countries are not much correlated. Low correlationmay be because Indian economic ties has not been so strong since long except from last few year boundaries have been opened up by countries for easy trade which will graduallyincrease co-operation among the world. If the countries are linked with each other diversification benefit may get reduced, Multivariate Johansen co-integration suggest that at most five co- integrating vector can be found in the group. When three countries are removed from the group, a sample set can be arrived at where no co-integration exists. Talking about currency hedging INR has depreciated heavily against all the major developed market currencies, hence significant return can be added if currency hedging is given due consideration in all the three phase ofthe study. Reducing number of markets for investment significantlyreduce other risk associated with international investment.

Multi-variate Johansen Co-integration Test

Multivariate test will explore co-movement of the market among each other as a group of assets. If countries would be moving together as a group, diversifying internationally may not be as fruitful as described earlier in the section. It is clear from the above discussed bi-variate table that India is co-integrated with five

countries in the long-run, multi-variate test will respond co-movement as a whole in sampled markets.

Table 5: Multi-variate Johansen Co-integration Test: 2011-2021 (Whole sample period)

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.
None *	0.429565	357.1007	285.1425	0.0000**
At most 1 *	0.329976	258.2992	239.2354	0.0051**

(*Trace test indicates 2 co-integrating eqn (s) at the 0.05 level)

Table 6: Multi-Variate Co-integration Test with Restriction on 5 Countries: 2011-2021 (Whole sample)

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.254579	158.3454	159.5279	0.0579
At most 1	0.197494	105.9525	125.6194	0.4143

(Trace test indicates no co-integration at the 0.05 level)

As per table 5, two co-integrating equation have been found out. Eleven emerging market are found to be co-integrated in the long run with at most two co-integrating equation. Portfolios constructed on the basis of co-integrated group may not be optimum and their must exist some more opportunity if a group can be explored where no co-integration exist. Multivariate Johansen co-integration test excluding five countries is described in table 6. Test suggests no co-integration among the group. Portfolio optimization solution in table 7 has been found out with same investment objectives.
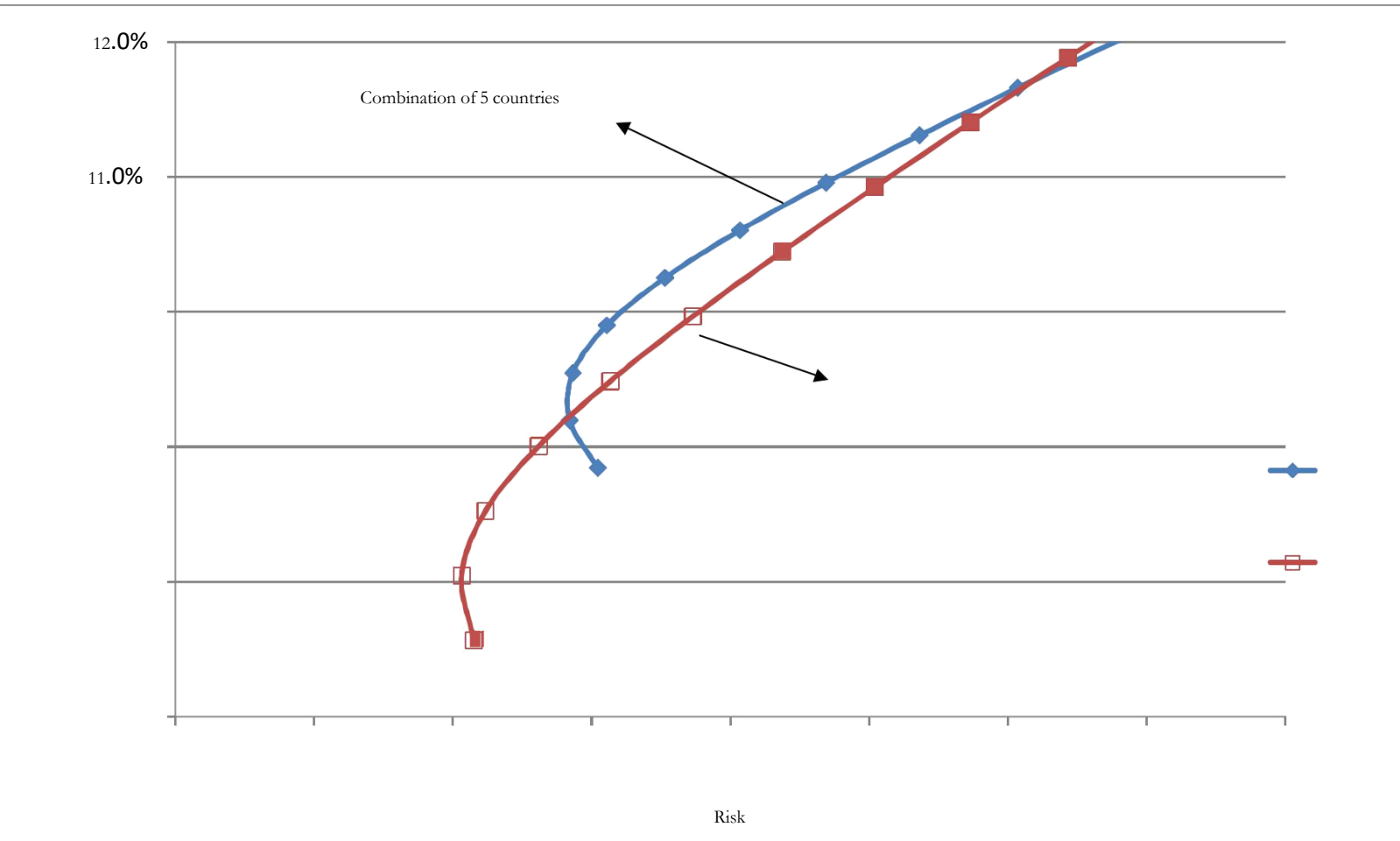
Table 7: Portfolio Optimization with Co-integration Approach for the Period: 2011-2021 (Whole Sample Period)

Country\Investment Objective	Mini Risk	E(r)=India	Risk=India	Maxi ret
E(r)	8.8%	8.98%	-	12.40%
Risk	30.5%	-	26.60%	71.50%
China	15.8%			-

Greece	-		-
India	-	Not Feasible*	Not Feasible*	-
Indonesia	-		-
Russia	-		100.00%
Taiwan	84.2%		-

(Note: * denotes that the investment objective has not been taken into consideration)

Efficient frontier without Co-int

7.0%

0.0%   10.0%   20.0%   30.0%   40.0%   50.0%   60.0%   70.0%   80.0%
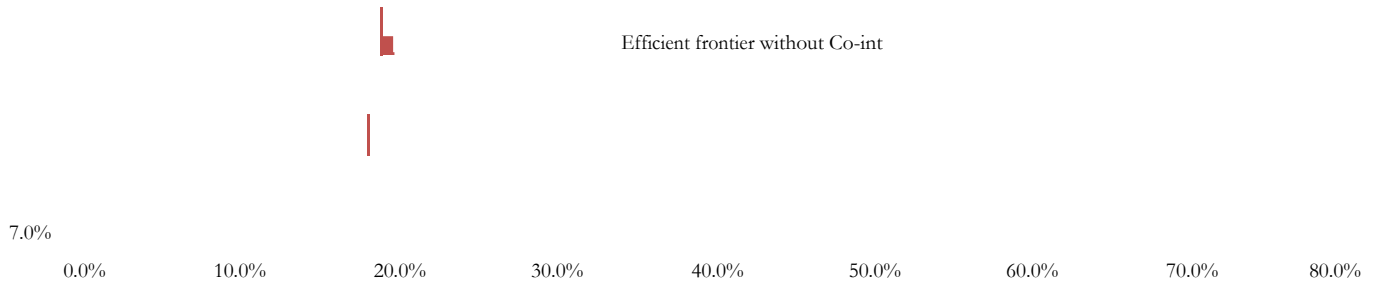
Figure 3: Portfolio Optimization Graph with Co-integration: 2011-2021 (Whole Sample Period)

After combining MPT with co-integration, efficient frontier could shift slightly upward in the curve in Figure 3, but important consideration is that the frontier is arrived at with combination of only five countries as compared to original curve wherein eleven countries are used. Naturally if co-integration technique is given some pain, it comes up with some fruitful results which helps in reduction of transaction cost, investment barrier, exchange risk and so on. Even if not useful for Indian investor, this curve is positive indication of including co-integration study with MPT. Reduction in sample size will surely help an investor in taking investment decision. Figure 4 shows how Indian market has performed compared to Morgan Stanley Capital International Emerging Market (MSCIEM) index in pre-crisis scenario with actual and expected return.
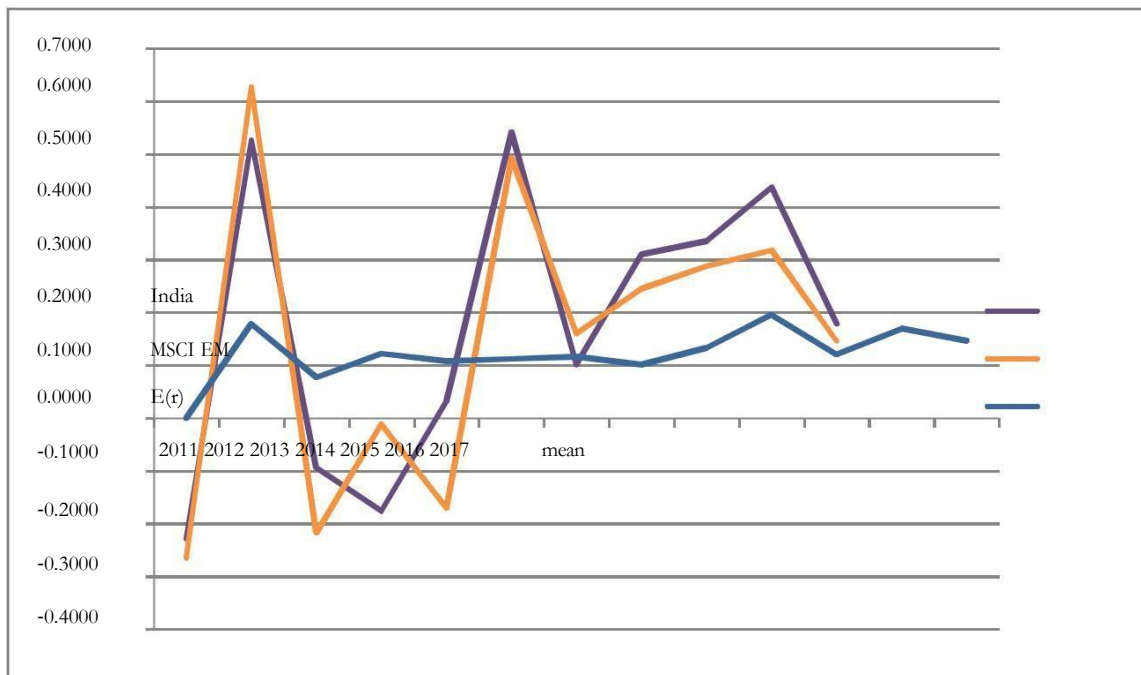

Figure 4: India, MSCIEM and E(r) Comparative Test

Pre-crisis (2011-2016)India has outperformed MSCIEM index in growth during 2011-2016. For rest of the period under study, Indian performance has been close to MSCI index which shows that domestic return is as beneficial as of well internationally diversified index from emerging countries.

Table 8: Correlation Matrix: 2011-2016(Pre-crisis)

Brazil	China	Greece	India	Indonesia	S. Korea	Malaysia	Mexico	Russia	Taiwan	Turkey	MSC
1.000											**0.92**
0.197	**1.000**										**0.32**
0.405	0.106	**1.000**									**0.41**
0.376	0.162	0.300	**1.000**								**0.46**
0.445	0.078	0.227	0.359	**1.000**							**0.46**
0.378	0.067	0.233	0.335	0.476	**1.000**						**0.50**
0.360	0.172	0.157	0.166	0.432	0.351	**1.000**					**0.48**
0.683	0.168	0.343	0.322	0.416	0.424	0.474	**1.000**				**0.77**
0.620	0.169	0.224	0.192	0.470	0.309	0.402	0.616	**1.000**			**0.66**
0.481	0.262	0.210	0.336	0.292	0.464	0.501	0.495	0.448	**1.000**		**0.71**
0.492	0.020	0.392	0.260	0.220	0.300	0.167	0.455	0.529	0.312	**1.000**	**0.57**
0.928	0.320	0.410	0.468	0.467	0.508	0.483	0.776	0.669	0.713	0.572	**1.00**

Correlation Matrix in Table 8 is indicating extraordinary opportunity to diversify at first place as correlation among the countries during pre-crisis period shows that countries do not have much co-operation with each other. However, correlation is not a statistically sound technique to test long run sharing in time series model but a glance over the results produces some early indications. This is the moment when hopes build up from diversification to out beat dwindling domestic crisis from outer world positivity. With a great emphasis, it should be beneficial for the investors who have been worst hit by domestic pressure. The study has tried to answer this basic question for investors specifically restricted to emerging markets like India that what could be expected from International Diversification when they need it the most.
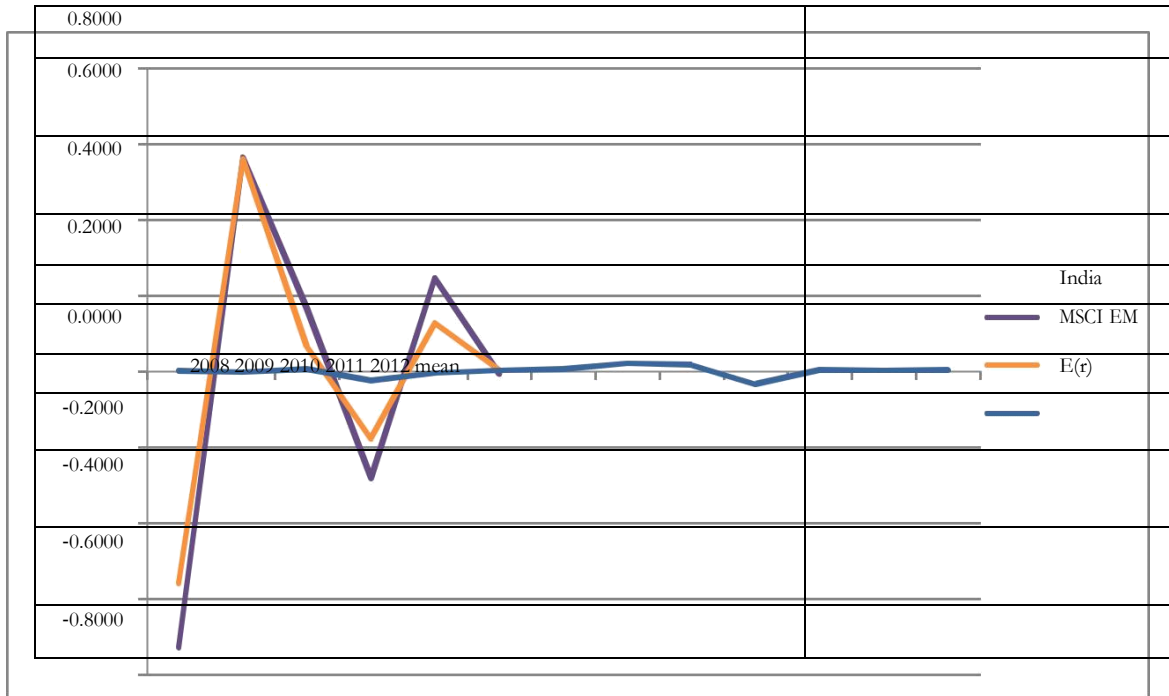
Figure 5: India vs. MSCIEM vs. E(r) in Post Crisis Period (2017-2021)

Figure 5 is comparative performance of India with MSCIEM and expected return. It is clear from the analysis as of now that India has been performing in line with MSCI index in all the three phases of analysis. Yet it has been observed that if a well- diversified portfolio is formed with the help of portfolio optimization technique, risk reward can be improvised significantly. But first it would be advisable to go through correlation matrix, whether this structural shift has caused any upward movement in correlation coefficient as in pre-crisis period markets were weakly correlated. Table 9 presents correlation matrix for post- crisis period, indicates that economic shocks do increase level of co-movement among the markets as correlation have shown dramatic upward trend. Also, found significant increase in the mean of correlation co-efficient between the markets in the crisis period compared to pre-crisis period correlation coefficient of emerging markets is increasing slowly over a time though it varies over time. Markets are highly correlated in this duration of study because every economy is facing one of deepest recession around the world and cannot isolate them. Out of eleven emerging markets, only five markets have outperformed their expectations namely Indonesia, S. Korea, Malaysia, Mexico and Turkey. These markets have shown tremendous growth in respective economies and still exist with greater possibilities to explore more. The study has assumed markets to be available in free float condition with no pre-defined hurdles.

Table 9: Correlation Matrix: 2017-2021(Post-crisis)

	Brazil	China	Greece	India	Indonesia	S. Korea	Malaysia	Mexico	Russia	Taiwan	Turkey	MSCI EM

	Brazil	China	Greece	India	Indonesia	S. Korea	Malaysia	Mexico	Russia	Taiwan	Turkey	MSCI EM
Brazil	1.000											0.975
China	0.599	1.000										0.653
Greece	0.707	0.467	1.000									0.743
India	0.772	0.563	0.639	1.000								0.849
Indonesia	0.755	0.523	0.582	0.746	1.000							0.820
S. Korea	0.788	0.551	0.682	0.769	0.768	1.000						0.850
Malaysia	0.721	0.648	0.588	0.669	0.784	0.682	1.000					0.770
Mexico	0.715	0.388	0.539	0.650	0.727	0.671	0.583	1.000				0.787
Russia	0.822	0.454	0.711	0.674	0.753	0.722	0.613	0.714	1.000			0.851
Taiwan	0.737	0.465	0.594	0.751	0.651	0.737	0.596	0.610	0.772	1.000		0.806
Turkey	0.564	0.492	0.662	0.753	0.648	0.696	0.612	0.447	0.541	0.569	1.000	0.680
MSCI EM	0.975	0.653	0.743	0.849	0.820	0.850	0.770	0.787	0.851	0.806	0.680	1.000

Table 10: Optimum Number of Countries to Invest in

Three Phase Analysis		Proportion Of investment	Risk	Return
Whole Sample		0.10	11.86%	68.02%
		0.50	9.87%	39.23%
		0.90	**7.88%**	**20.53%**
		1.00	7.38%	21.21%
Pre-Crisis		0.10	18.61%	69.25%
		0.50	14.80%	39.24%

	0.90	**11.00%**	**15.93%**
	1.00	10.05%	16.01%
	0.10	1.99%	26.32%
	0.60	**1.78%**	**17.54%**
Post-Crisis	0.70	1.74%	17.62%
	1.00	1.6%	21.8%

As per table 10, four portfolios have been chosen for each phase of analysis where risk and return combination is optimized. For whole sample period, optimum combination award an investor 7.88% return with 20.53% risk. Optimum size of portfolio is 3 scrip's to reach out this combination of asset. Similarly, in pre-crisis period optimum portfolio with 4 scrip's gives a return of 11.00% with 15.93% risk. Post-crisis scenario with optimally 3 scrip's is generating 1.78% reward with 17.54% risk. To summarize 3-4 scrip's are creating portfolios with optimization of investor satisfaction. The results are with a random selection of stocks, employing a relatively small number of assets achieves high levels of diversification. Long-hold investor can choose to invest for long in emerging market with thorough analysis of countries perspectives and present scenario.

CONCLUSION

The findings of the study suggests that risk premium in emerging market is significantly higher than in developed market. However, the extent of risk premium varies with time variation and structural breaks like crisis and financial developments. Also distribution of equity risk premium in emerging market is not symmetric hence, investor should focus more on downside risk instead of standard deviation. It is clear from the above analysis that global diversification benefit still exist and India investor can improve the performance of their portfolio's by investing on international ground. At time of crisis investment return can be improved by investing abroad and domestic loss can be offset by gain from any other market. Talking about adding MPT with co-integration technique results suggest that this econometric analysis can further increase the satisfaction level of investor either by adding return in the portfolio and shifting of efficient curve on higher level or by helping in reducing the number of countries for investment. Currency hedging in the long run does not provide fruitful result to the portfolio for emerging market, against to this currency hedging for developed market can significantly improve the result of portfolio. International portfolio diversification can be suggested for Indian investor in the wake of its performance during structural breaks.

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