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**International Portfolio diversification between  
US and Emerging Markets**

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**Abstract**

**This study examines strategic objectives behind international diversification in emerging market, from the side of US investors. It is present the whether diversification gives a risk reduction chance to US investors or not. This study also examines about the correlations levels between the Emerging Countries, and aim to figure out, whether international diversification gives an opportunity to emerging markets portfolio manager or not during the last 10 years.**

**After all, to be much more focused, we analysed the yearly Base Correlations for between Turkey and US; Middle East and US and East Europe and US. We have aimed to see the opportunity and the trend line during the last ten years.**

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## **1. Introduction**

International diversification of investment portfolios is high interest to both academics and practitioners since it allows for reduced risk without the sacrifice of expected return. In other words, it helps improve the risk-adjusted performance of a purely domestic portfolio by diversifying away the national market risk. **A prerequisite for this argument to hold is the relative price behaviour independence of the various capital markets. It is often stated however that the progressive removal of impediments to international investment, as well as the growing political, economical and financial integration affect market linkages.** A progressive increase in the international co-movement of international financial markets could significantly reduce the benefits of international diversification. Another worrying fact is that it has been observed that co-movement of international financial markets, as measured by correlation, increases in period of high turbulence. In other words volatility seems to be contagious. As international diversification is most useful in times of increased volatility this is indeed an unfortunate fact.

International equity managers are extremely interested in which factors drive international returns since this will determine their approach to portfolio selection. Managers who believe that domestic market factors are more important than industry factors will use two – stage approach to portfolio selection. They will first decide on country allocation and in the second stage they will select the most promising stocks from each country. An important issue in international economics the size of benefits from diversifying over securities in foreign countries, especially in emerging markets. However, the magnitude of the diversification benefits in general depends on various portfolio constraints.

### **1.1. Research Questions:**

This paper examines the international diversification benefits subject to risk return efficiency of emerging versus development markets against US market over the period 1991 – 2001 and two of its sub-periods: 1991 – 1997 and 1998 – 2001. With this paper we are going to investigate whether US investors have opportunities to reduce their risk by investing to emerging market (East Asia, South Asia, East Europe and South America). The results of this study will aim be useful when considered the implementation of a portfolio management strategy on a globally diversified level.

### **1.2. What is an Emerging Markets ?**

Broadly defined, an emerging market is a country making an effort to change and improve it of raising its performance to that of the world's more advanced nations. The World Bank classified Gross National income (GNI) per capita of \$9,386 and above as high income countries. The **World Bank** classifies economies as low – income (GNI \$755 or less), middle-income (GNI \$756-9,386). Low income and middle income economies are sometimes referred to as developing countries. (Reference Global Economic prospects and the developing countries, World Bank. 2002)

There is another criterion for emerging stocks markets is whether the stock markets have begun a process of change, growing size, turnover and sophistication. The International Finance Corporation (IFC – a World Bank Subsidiary) has decided to follow these two criteria for including in its emerging market database. It uses the World Bank classification and also defines as emerging a country with a low or middle income. The IFC rejected using the solely a GNP per capita criterion for several reasons. First, this measure is highly volatile; second, many countries develop rapidly based on GNP per capita basis, but the development of their stock markets can be lagged. Areas such as market efficiency, regulation, supervision and enforcement, accounting standards, transparency and disclosures are all important in defining a emerging market.

The term 'emerging market' was originally coined by International Finance Corporation (IFC – a subsidiary of the World Bank) is commonly used. According to IFC definition, the characteristics of the emerging markets are:

- Countries with Gross National Domestic Products (GDP) per capita lower than \$9,266 per year.
- There is no local government barrier and discriminatory regulations are imposed on foreign investors.
- Undeveloped capital markets with the market capitalisation representing a small portion of their Gross National Products (GNP)
- Countries are not industrialised.

And again according to the IFC factbook, (1999) there were 32 emerging markets to invest in the world. All these markets have been grouped into four geographical regions.

Firstly; Latin America (Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela) ,  
Secondly; East Asia (China, Korea, Philippines, Taiwan) – South Asia (India, Indonesia, Malaysia, Pakistan, Sri Lanka, Thailand),  
Thirdly; Europe, (Czech Republic, Greece, Hungary, Poland, Portugal, Russia, Slovakia),

And the fourth ones, Middle East and Africa; (Egypt, Israel, Jordan, Morocco, Nigeria, South Africa, Turkey, Zimbabwe).

The IFC has started to publish monthly emerging stock market indexes which allowed money managers to measure the performance of their portfolios invested in developing countries. Recently, they cover over fifty emerging markets. It also proposes IFC Global (IFCG) and IFC investable (IFCI) indexes on a daily basis. As of 1999, the IFC Global index covered thirty-two countries and published as well as regional indexes. At the start of 1999 the IFCG composite index included more than 2000 stocks. IFC investable indexes attempt to measure the market for shares available to foreign investors and it also published on a daily basis. At the start of 1999, the IFCI composite index included over 1400 stocks from thirty-one countries. While IFCG composite index have been since 1984, the IFCI indexes have been available since 1988. The IFC also publishes monthly IFCG and IFCI industry indexes across all emerging markets. There are nine sector indexes and twenty-three industry indexes. Other index providers such as Morgan Stanley Capital Indexes (MSCI) or ING Barings have also started to publish indexes for major emerging stock markets.

Recent studies shed more light on the historical experience of investing in emerging equity markets. Based on prior research there are main differences between returns in emerging markets and developed stock markets. In subject to main differences, Emerging markets have had;

- Higher average returns,
- Lower correlations with developed markets,
- Greater serial correlation,
- Greater Volatility.

The capitalisation of emerging markets represents 9% (or \$2.2 trillion) of the global market capitalisation in 1997. In the last decade, the capitalisation of all emerging markets has increased by 1,007% compared with an increase 253% developed markets. The trading volume has also increased by 2,189% compared to 564% for the developed markets. Surprisingly, That unexpected returns surprised the global investor and create highest motivation to invest in emerging markets.

## 2. Literature Review

### 2.1. Modern Portfolio Theory

During the 1950's *Harry Markowitz* first developed the theories that form the basis of Modern Portfolio theory, and many other scholars and investment experts have contributed to it since. *Modern portfolio theory (MPT)* utilizes several basic statistical measures to develop a portfolio plan. Included are expected returns and standard deviations of returns for both securities and portfolios and the correlation between returns. According to MPT, diversification is achieving by combining securities in a portfolio so that individual securities have negative (or low positive) correlations between each other's rates of return. Thus the statistical diversification is the deciding factor in choosing securities for an MPT portfolio. Two important aspects of MPT are the *efficient frontier* and *beta*.

### 2.2. The advantages of the multinational portfolios;

To answer that question, first we should argue about the benefits of International diversification. As we've seen, the advantages of International investing are several. The primary motivation in holding a diversified portfolio of stocks is to reduce risk. The risk of a portfolio in term of variability of return will be less than the risk of separate parts. An international focus offers far more opportunity than a domestic focus. More than half of the World's stock market capitalisation is in non U.S companies increased over time.

Diversification minimizes risk because of balancing effort that tend to cause the poor return of one vehicle to be offset by the good return on another. Minimizing diversifiable risk through careful selection of investment vehicles requires that the vehicles chosen for the portfolio come a cross the world. The most important points of investing overseas are **wider opportunity set, greater diversification, return improvement, and the effect of exchange rate**. There are some other factors that appearance for in case of investing developing markets. Which are;

- Less efficient markets provide to investor, greater reward for security selection,
- All these markets will benefit from the entry of increased foreign capital.
- Developing countries have much bigger economic growth than developed countries.
- The structure of Emerging markets changes, including privatisation and deregulation is continuing, allowing capitalism to strengthen.
- Company valuations are reasonable while comparing price and growth ratio and equity market capitalisation to GDP ratios lower than in developed markets.
- Decrease World tension provide higher opportunity for a cross World trading.

### **2.3 How effective can International Diversification be?**

According to the recent studies, an even greater reduction of risk can be attained by a portfolio internationally. And several have shown that movement in stock prices in different countries are almost unrelated. Changes in price on the Paris Bourse appear independent of stock price fluctuations on the London exchange, and so on. When securities of one country are doing worse than expected, another market is likely doing better, consequently offsetting the losses.

The gains from international diversification are substantial. In terms of variability of return an internationally well-diversified portfolio would be one – tenth as risky as a typical security and half as risky as a well-diversified portfolio of U.S. stocks. The benefits of international diversification for a German or a Swiss investor would be even larger relative to a highly diversified domestic portfolio. While increasing the size of a domestic portfolio beyond 20 stocks seems to achieve only a relatively small incremental reduction in risk, a substantial reduction can still be achieved for an international portfolio of the same size.

Some practical selection rules are needed for obtaining good diversification with reasonable portfolio size. A simple selection procedure would be to insure a good geographical diversification by picking stock across countries. Stocks from all countries can also be classified by industry, in this selection by industry will automatically provide some diversification across countries. A third selection method would be a combination of either of two: The international reduction of risk would be attained by consciously selecting stocks across both countries and industries. Clearly, inter-industry diversification is inferior to inter-country diversification. Except for very large portfolios, the risk of a portfolio diversified across countries is lower than the risk of one diversified across industries. As expected, the combined procedure with both industrial and geographical diversification gives slightly better results.

### **2.4 The effect of Exchange Risk**

One influence that affects the attractiveness of international diversification is changes in exchange rates. It is possible to partially protect against exchange rate fluctuations. An investor can enter into a contract for future delivery of a currency. If the investor (say an American investor invests in Germany) knew exactly what the security would be worth at the end of the period, the investor would be completely protected against exchange rate fluctuations by agreeing to switch amount of marks exactly equal to the value of the investment. However, given that in general, the outcome of investment is random, the best the investor can do is to protect against a particular outcome. Exchange rate fluctuations are not necessarily bad for the investor.

If exchange rate fluctuations are independent, then they can be diversified away and have negligible impact on the risk of the portfolio. Similarly, if exchange rate fluctuations tend to move opposite to domestic conditions, then they favorably impact the risk of an international diversified portfolio relative to a domestic portfolio. As hypothetical example, assume that when the domestic economy is doing well the currency is moving up relative to foreign currencies and vice versa. This movement reduce the correlation of foreign portfolios with domestic portfolios.

Exchange rate fluctuations introduce an unfavorable element into international diversification insofar as one currency tends to fluctuate uniformly compared to all other currencies. For example if the dollar is doing poorly relative to all currencies, then exchange fluctuations increase the risk because they lead to all foreign investments doing more poorly and lower risk reduction aspects of holding multiple foreign investments.

To show the effect of exchange risk, international portfolios have been constructed, with their returns at each point of time computed in dollars assuming no protection against exchange risk. As can be expected, the risk of a portfolio unprotected against exchange risk larger than for a covered portfolio. However its total risk is still much smaller than for a comparable domestic portfolio. And again it is obvious, for example that holders of foreign stocks have greatly benefited from the dollar devaluation. An uncovered international portfolio is certainly a good hedge against devaluations of the dollar.

## **2.5 The Empirical Review**

It has been well documented on how diversification into emerging markets has potential benefits for an investor and papers on this topic focused back to the early 1988 and most of them included all emerging markets.

**Errunza and Padmanabham (1988)** asked the question whether diversification into emerging markets was still feasible as the world moved towards greater synchronisation and integration. They took annual returns and monthly standard deviation from 10 emerging markets over period from 1976 – 84. They have reached that the performance of emerging markets over the 1976 – 84 period was consistent with that the correlation between emerging markets and developed ones in 1976-84 was still low despite the substantial economic problems these economies encountered during the early 1980s.

**Madura and Soenen (1992)** measured intertemporal shifts in the risk characteristic of eight country indices for period 1974 – 1988. They have found no conclusive evidence that the gains from international diversification are decreasing over time, regardless of the country perspective in aggregate increased.

**Harvey (1994)**, analysed the returns of twenty developed markets and twenty-one emerging markets. Based in the regressions on global and country specific information variables, he forecasted the future returns in emerging markets. The results of that study showed that forecasting regressions are significant in twelve out of the twenty one emerging markets, implying that their returns are indeed predictable.

**Campbell (1995)** examines whether adding emerging market assets to an investor's portfolio significantly affects the portfolio set. Data from 800 equities in emerging markets from Latin America, Asia, Europe, Middle East and Africa were used. It was found that the low correlation with developed markets returns suggested that the emerging markets returns are not spanned by the developed market returns. Therefore, inclusion of emerging market assets in a mean variance efficient portfolio will significantly reduce portfolio volatility and increase expected returns.

**Solnik 1995**, evaluated the advantages of building an internationally diversified portfolio. A study on the relation between the riskiness of a portfolio assembled on the American Market and the number of securities included was carried out from 1966 – 1971. Solnik (1995) wanted to prove that substantial advantages in risk reduction could be attained through portfolio diversification in foreign securities as well as in domestic common stocks. The paper also focused the question how effective diversification was in reducing the risk of portfolio. Solnik has found that adequate

channels and structures for international stock investments could be found during those times if international monetary uncertainty. It was also found that the benefits from international diversification were large and would lead to the rapid developed of mutual funds in the US.

**Defusco, Gebbert and Tsetsekos (1996)**, tested the long run diversification benefits of various emerging capital markets. They argued that previous studies that used weekly or monthly data to estimate correlations among various equity markets might have over estimated the long run diversification potential of international investing. Weekly price index levels for 13 emerging markets were collected for 228 weeks from January 1989 to May 1993. Cointegration tests were then applied to three mutually exclusive groupings included the US. They concluded that none of the regions examined possessed cointegrated markets. They have reached that the correlation between counties on average was quite low which suggest us diversification across countries within these regions should be quite effective.

**Defusco, R.A. , Gebbert J.M., and Tsetsekos G.P, (1996), Long run diversification potential in emerging stock markets, The Financial Review 31, May pp 343 – 363.**

**Solnik, Boucrelle, and Le Fur (1996)**, use the monthly stock returns from December 1958 to November 1995 for France, Germany, Japan, Switzerland , UK, US and EAFE (East and Far Asia) as a region to test the relationship between volatility and correlation. They have found that as the volatility rises, so too does the correlation between markets. That points to the diminishing benefit of international diversification. European countries showed significant correlation between them, a natural outcome as they are members of the European Union. Their findings also reveal that the correlation of the EAFE index with the US. Market has not increased over the long run because Asian markets are less correlated with the US market than the European and emerging markets. This leads them to conclude that in spite of the increased correlation in times of high volatility, there is still a benefit from international diversification.

**(Solnik, B., Boucrelle C., and Le Fur Y., (1996) international market correlation volatility – Financial Analysts Journal, 52 (5), 17-34.**

**Toque (1997)**, have used monthly index return data of fifteen emerging and developed countries to determine the costs and benefits of diversifying into emerging markets for the time period 1992-1994. Country specific information variables and investor risk preference are used within the GARCH – M model along with the Markowitz mean variance quadratic programming. The finding of that study, indicate us that there are benefits of diversifying into emerging markets for the sample periods.

**Meric and Meric (1998)**, investigated whether the changes in the co – movements of international stock markets after the crash are long term changes or not. Their study covered the national stock markets of two North American countries (Canada and US) and four European countries (France, Germany, Switzerland, UK) , and four Far East Countries ( Australia, Hong Kong, Japan, Singapore) monthly observations for the post crash period (November 1987-February 1994) were used to test the correlations between the markets. The study finding show that the co movements of the World's developed stock markets had become more harmonised and correlations between the markets had increased substantially after the crash in 1987. The results indicated that the benefits of international portfolio diversification with the world's major developed stock markets decreased considerably after the crash.

### 3.1 Four Crises in Emerging Market

A large number of developing countries have been hit by financial crisis since the early 1970s, with a sharply increased frequency since early 1980. We could consider four major ones: those of Latin America (1982-1983), Mexico (1994-1995), East Asia (1997-1998), and Russia (1998). We have several reasons to focus those crisis. One is that the size and nature of crisis raised concerns about their potential systemic implications and the recognition of this led to large scale rescue operations. At the same time because of their origins and the way they unfolded, all four were part of the process financial globalisation.

First one was **Latin America** debt crisis (1982 – 83), erupted during the summer of 1982 in Mexico, spread to most of the Latin American countries during the following year and affected a large number of other developing countries as well. It led during the subsequent years to the rescheduling of the external bank debt of twenty – five developing countries, that is two – thirds of the outstanding bank debt of the whole of developing world.

There is one striking and quite real similarity between the Latin American experience in 1982-83 and 1994-95 **Mexican Crisis**. Both were preceded by large-scale and persistent current account deficits. The visible crisis began in the last months of 1994, with an accelerating capital flight that could no longer be financed by the further issuance of Tesobonos and led therefore to the spectacular depletion of gross foreign-exchange reserves. By December, it had become clear that the exchange rate could no longer be supported and the Mexican authorities decided to let it float. Its collapse was accompanied by that of the Mexican stock exchange.

Just as in 1982, this second Mexican crisis spread to other countries. Net spontaneous private capital flows to other Latin American countries dried up and some of the currencies, notably that of Brazil came under pressure. As with the international banks' imprudent over-lending before 1982 crisis, portfolio investors and banks during the years 1990-93 and to lesser extent, foreign purchasers of Tesobonos in 1994 did have some excuses for their behaviour. And all the foreign holders of Mexican equities suffered sharp losses; but holders of Tesobonos did not lose a penny.

**East Asian Crisis (1997 – 98)**; the origin and nature of the crisis are clear, but its outcome, both for the countries directly concerned and in its wider implications are uncertain – despite the recovery which started in early 1999. Moreover, understanding through hindsight does not mean that the violence and depth of the crisis was foreseeable, - in fact it is hard to find publicly available explicit warning, either by private forecasters or by official institutions, that the financial melt down experienced by Indonesia, Thailand, Korea was imminent. All these countries enjoyed throughout the late 1980s and 1990 exceptionally high saving and investment ratios, strong

growth, fiscal balance, subdued inflation and in case of Korea and Indonesia (not Thailand) relatively modest current account deficit. This was a situation completely different from that of the Latin American countries before 1982 – 83 and although to a somewhat lesser extent, from that of Mexico in early 1990s.

**The Russian crisis (1998)**, broke out in August 1998, when the authorities decided to unpeg the rouble, declared a unilateral moratorium on their rouble-denominated internal debt and prohibited banks from complying with their foreign exchange commitments.

Russia's crisis bears two strong resemblances to the three other crisis episodes: It had been preceded by the build up of a large external debt, the economy had operated under a system of pegged exchange rates and Russia's basic economic institutional and structural weaknesses.

The 34% decline in the emerging markets index from 1997 through 1998 has forced investors to reexamine their views regarding these markets. In that case, it is important to remember that crises are nothing new in these markets. The International Monetary Fund has typically had to intervene in some twenty or thirty developing countries each year. And crises are frequent in emerging markets, large market declines are far more common than in developed markets. While most investors are aware of some of the notable crashes in Emerging Markets, it often comes as a shock to observe just how often these bear markets occur and how very bad they can be. Declines of 50% or more are not uncommon, and a number of these bear markets have lasted for five years or longer. The one piece of good news is that these downturns have tended to be local in nature, rather than cutting across emerging markets as a group.

Recoveries are also bigger in emerging markets. Extreme volatility of emerging markets can cause the performance of the asset class to look very different over different periods. This makes standard practice of looking at five-year trailing returns especially unreliable in emerging markets. For example, by looking backward from 1994 would have indicated 36% annual gains for previous five years. But performance for the next five year period turned out to be dismal with annualised losses of 9.3%. To now extrapolate these most recent results would be as misguided as extending the earlier outsized returns proved to be.

The right question is whether emerging markets ought to grow over the long run or not? Given that their economies grow, fueling corporate profits, it makes sense that over time the stocks should also grow in value like other equities. And emerging markets have in fact, shown a distinct tendency to grow over the long run at least since 1985, when reliable indexes were introduced.

**After all these, if we evaluate the emerging markets subject to the benefits of diversification:**

The time of period sensitive nature of emerging market performance is by no means unique. Leadership among all equity asset classes tends to come and go. When we consider the relative performance patterns over the past fifteen years for US equities, EAFE (representing the developed markets outside the US) and the emerging markets. EAFE was the star performer between 1984-1987 so investors with their eye on the rearview mirror window would have put a lot of their assets in developed markets outside the US. In the late 1980s. Such investors would have done poorly, as EAFE was the worst performer between 1987 – 1994, while emerging markets performed the best. Investors who then concluded that emerging markets would continue to lead the pack would have again been disappointed. Since 1994, emerging markets have of course been the worst performing asset class and the US has been the best.

We are going to focused the international Crash of October 1987 which all major markets declined substantially in October 1987 – an exceptional occurrence given the usual modest correlations of returns across countries. The US market had the fifth smallest decline in local currency units, came in only 11<sup>th</sup> out of 23 when returns are restated in a common currency.

The US was not the first to decline sharply. Non-Japanese Asian markets began a severe decline on October 19. This decline was echoed first by a number of European markets, then by North America and finally by Japan.

There historical shifts in relative performance provide two important lessons for the present.

First, we should probably be more worried about the US than emerging markets right now. In the past whenever one asset class pulled this far ahead of the pack, it often ended up being the worst performer in the subsequent period.

Second, in the absence of perfect foresight, it is wise not to have too many eggs in any one basket. Spreading a portfolio across multiple assets classes gives a portion of benefits of what ever does well, while limiting the damage should some class do particularly poorly.

## **INTERNATIONAL PORTFOLIO DIVERSIFICATION BETWEEN US AND EMERGING MARKETS**

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Some might wonder whether emerging markets still provide diversification benefits since the monthly correlations between emerging and developed markets have risen sharply over the past two years. In fact, these high short – term correlations belie the rather extreme divergence in performance between US and the emerging markets.

In fact in two have moved in opposite directions over the two years, with the S&P 500 gaining 71% and the Emerging markets Free index plunging 34% during 1997 and 1998.

Focusing on short-term correlations can obscure more meaningful long term trends that are quite different. This happens because short – term correlations are very sensitive to the level of volatility. Whenever a crisis causes a jump in emerging markets volatility – be it the 1987 crash, the Gulf War, the peso Crisis of 1995 or recent Asian Crisis – correlations tend to go up as well. But for all the talk of increasing globalisation, emerging markets remain essentially local in character. Only 15% of emerging markets' equity capitalization and just 10% of their trading volume – comes from developed –market investors. Over time, when crises pass the fundamantels reassert themselves, and as the markets once again chart own pathsi correlations revert to the long term average.

#### **4.1 Emerging Market's role in Asset Allocation**

On an asset allocation level, the diversification benefit that emerging markets provide is probably their most attractive feature. Emerging markets will likely continue to be much more volatile than developed markets, but holding both in combination can actually improve an overall portfolio's risk return balance. Because developed and emerging market returns often come at different times. The effect is to lesson the overall stock portfolio's year to year fluctuations, thereby allowing returns to compound more steadily.

It may seem odd that adding an asset with higher volatility can actually reduce a portfolio's risk and add to its returns, but this is exactly the magic of diversification. We believe this diversification benefit, rather than any inherent return advantage, is the most compelling argument for investing in emerging markets.

According to recent research into asset allocation indicates that, for portfolios with at least 10% in stocks, adding a modest amount of emerging markets equities can be beneficial. Generally, the optimum in terms of return enhancement and volatility reduction occurs when between 5% and 10% of the equity portion of portfolio is committed to emerging markets. For this strategic allocation to perform its role, however, it is necessary to rebalance: to trim back emerging markets after periods of out-performance, and to add to them at times like the present when poor performance has reduced the emerging market portfolio weight to below the long term target.

##### **4.1.1 How effective Emerging Market?**

It is admittedly paradoxical to recommend committing resources to this asset class at this time. Yet precisely, Emerging markets have performed so poorly over the recent past years, their valuations become compellingly cheap. By the year end of 1998, we could buy Brazilian stocks at half of book value, Chinese stock at 60% of book, and the overall emerging markets index for 1.2 times book value. All this when the EAFE index of developed countries in Europe, Australia and the Far East was trading at 2.6 times and the US market at close to five times book value.

This was a very significant valuation distortion. As of December 31, 1998 the market capitalization of all 959 stocks in the MSCI Emerging Markets Global index was only 80% of the combined value of just five leading US growth companies – which were, American Online, Coca Cola, Merck, Microsoft and Pfizer. Now all these five are very successful enterprises, but can be worth more than the entire emerging markets universe? After all, even though emerging markets earnings had been very depressed while the American companies were enjoyed record profitability, the emerging markets companies generated 2.5 times the earnings. And the emerging markets represent 12.6 times the book value of these US companies.

## **INTERNATIONAL PORTFOLIO DIVERSIFICATION BETWEEN US AND EMERGING MARKETS**

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Clearly, we could get a lot more for your money in emerging markets (prices in emerging markets did rise somewhat in the first half of 1999, but not nearly enough to close this valuation gap)

So, while some may read the recent rumbles in emerging markets as a signal to get out, a look below the surface should suggest quite the opposite. Our research indicates that the diversification benefits that have made emerging markets an important part of long term asset allocation have in no way been compromised by recent events. And even after the strong performance in the first half of 1999, prices have rarely been more attractive in the short – history of this asset class.

The long – term case for emerging markets remains strong and now may actually be a better time than most to gain exposure to the asset class.

## **5. DATA AND METHODOLOGY**

### **DATA**

This paper concentrates on the stock exchanges in nineteen emerging markets at around the world, which are Argentina, Brazil, China, Chile, Czech Republic, Egypt, Hong Kong, Hungary, India, Indonesia, Israel, Mexico, Poland, Russia, Singapore, Taiwan, Thailand, Turkey and the one developed country America. Data period includes, last ten years plus eight months and starts from December 1990, and finishes at August 2002. We have used weekly data while calculate the return of stock markets. We also used primary domestic index for each stock exchange.

**We have aimed to answer three questions, which are,**

1. What was the correlation between US (Return of Dow Jones) stock market and emerging market during the period and also focused the correlation before 1997 crisis and after.
2. Secondly, we have tried to answer; what was the correlation between the emerging markets at the same period.
3. What was correlations on the yearly base for Turkey/Us, Middle East / US, East Europe and US?

The samples consist of 610 observations for the period. However, for the Egypt and Check Republic stock market data were only available since 1993. As substantial parts of this study is devoted by observing relationships before and after the Asian crisis. The data has been separated into 2 sets. The pre-crisis data set consists of data from December 1990 to July 1997, and the port-crisis data consist of data from July 1997 to September 2002

**METHODOLOGY**

In all two part of the study, serial correlation is used to test the various relationships. This is used to determine if two data sets move in tandem together to determine if there is positive relationship, a negative relationship or whether values in both sets are unrelated (correlation near 0). Microsoft excel was used to test the serial correlation between the two data sets divided by the product of their standard deviations.

$$\rho_{x,y} = \text{cov}(x, y) \div \sigma_x \sigma_y$$

where;

$$\sigma_x^2 = \frac{1}{n} \sum (X_i - \mu_x)^2$$

and

$$\sigma_y^2 = \frac{1}{n} \sum (Y_i - \mu_y)^2$$

In the first part of the analysis, the log returns of the US market are tested against the various emerging markets to determine the degree of correlation between the US market and the other markets, for last ten years, and before and after Asian Crisis. Secondly, the log returns of the emerging markets are run against to each other to determine the correlation between the various emerging markets for last ten years.

5.1 ANALYSIS

We would like to focus to emerging market region by region, as an East Asia, South Asian, East Europe, South America and Middle East. As shown at table 1 below, while choosing the emerging market, we also took account their market performance, and some economic indicators.

SUMMARY INFORMATION by the end 2001						
Country	Global Ranking by Market Value US\$,	Mcap end-2001 US\$ billion	Market Liquidity Ratio	Growth in Market Value US\$ (1997-2001)	Inflation Rate 2001	Exchange Rate Per US\$
<b>East Asian</b>						
Hong Kong	10	499.5	46.90%	21.30%	-3.60%	HK\$7.779
Singapore	16	224.63	26.95%	0.72%	1.00%	S\$1.853
Taiwan	13	292	179%	6%	-0.01%	NT\$34.95
<b>South Asian</b>						
India	23	111.09	89.30%	5.70%	5.25%	Rs47.92
Indonesia	40	23.3	40.80%	49.60%	11.30%	Rp10.254
Thailand	34	36.34	98.20%	41.80%	1.60%	Bt44.48
<b>South America</b>						
Argentina	35	33.4	7.05%	-43.60%		
Brazil	18	185.4			7.67%	R\$2.3204
Chile	30	56.74	7.32%	-21.13%	2.60%	P656.20
Mexico	21	26.62	293%	-8.30%	4.40%	M\$9.16
<b>East Europe</b>						
Czech Republic	47	8.14	41.80%	-27.30%	4.70%	Kc36.47
Hungary	45	10.21	97.30%	-6.80%	6.80%	Ft279.03
Poland	36	25.93	77.90%	94%	5.50%	
Romania	65	1.23	10.66%	94.40%	30%	L31.428
Russia	27	77.7	5.80%	-39.80%	18.60%	R30.14
<b>Middle East</b>						
Egypt	38	24	21.97%	57.10%	3.90%	E£4.635
Israel	29	57.6	26.10%	55.30%	1.40%	Shk4.4160
Turkey	31	47.7	136%	442%	68.50%	1,446.638

Table 1

While trying to figure out some emerging markets correlations against the US market, it is important to see their market size/performance and economical information.

And also important to answer these three questions, which are:

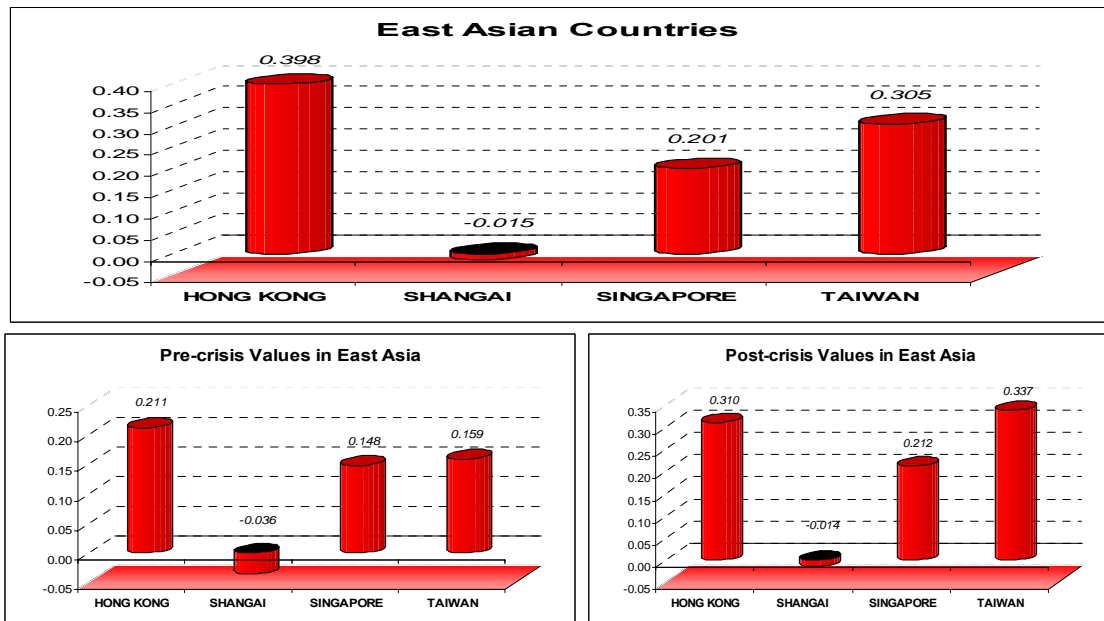
What were the correlations, between US markets and emerging market during the last ten years?

What were the correlations, between US markets and emerging market, before Asian crises?

What were the correlations, between US markets and emerging market after Asian crises?

All these questions have answered at below by supplying the charts.

**5.1.1 - Correlation between the US market and East Asian emerging markets**

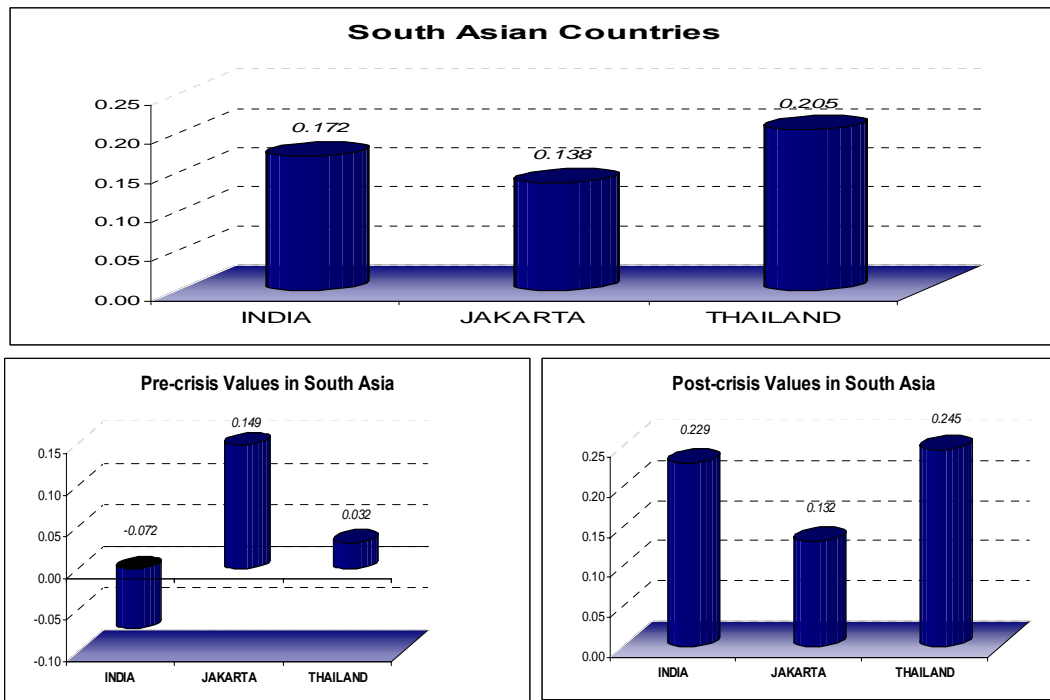


**Chart 1 (group A)**

As seen from chart group A, during the last ten years, Hong Kong has higher correlation with US market, especially after Asian crises, the correlations has got bigger as compared pre – crises value. That means, there was no logic to invest to Hong Kong for US investors.

Singapore and Taiwan has lower correlations compared to Hong Kong, but after Asian crisis, the both react like Honk Kong and the correlations have increased. The correlations of Taiwan have increased by %112, while Hong Kong and Singapore have increased by 46%, 43% respectively. Despite to Chinese markets correlation, we could say, there were a good opportunity for US investor to invest there. Especially, pre- crisis period was reducing the US investor risk. The Chinese markets have shown an increase but still it is negative.

**5.1.2 - Correlation between the US market and South Asian emerging markets**

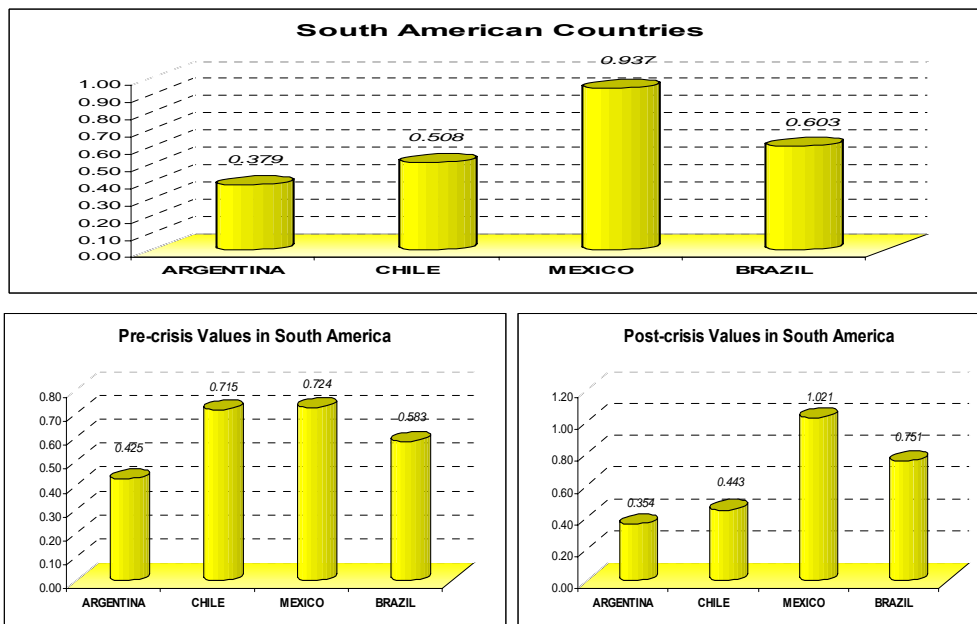


**Chart 2 (charts group- B)**

If we look at the between 1991- 2001 years, South Asian Markets has given reaction almost the same against to US markets. But when we focus to pre- Asian crisis period, we could have catch a risk reduction opportunity for Indian market, from side of US investors. While using the above data from the chart group B, it is fair to say, after Asian crisis, Indian markets dynamics have been changed a lot compared to Jakarta and Thailand. And the correlation came up the 0.229 levels from negative side (-0.072).

After crisis, Indonesian market has been moving less sensitive than pre – crisis period against to US market. Even Thailand been at the same region, it has shown reaction different than Jakarta, and it has been started to move more sensitive against to US markets after Asian crisis period, and the correlation have came up to 0.245 from 0.032.

**5.1.3 Correlation between the US market and South American emerging markets**



**Charts 3 (charts group C)**

As an South American Countries, where we have already focus, Argentina, Brazil, Chile and, Mexico, and calculated their correlations for hole last ten years, pre-crisis and after crisis period. From the above charts, Mexico and US stock markets, they were almost moving together during the last ten years. The Mexican stock market haven't exhibit any strong reaction to US stock Markets even after the Asian crisis, while Chile and Argentina has became less sensitive. At the same time, Brazil has started to move more sensitive to US stock markets.

So, from the side of US investors, they had limited potential to diversify their portfolio while investing to Argentina and Chile since the Asian crisis. But before Asian crisis, those countries were Argentina, Brazil.

5.1.4 - Correlation between the US market and East Europe Emerging markets

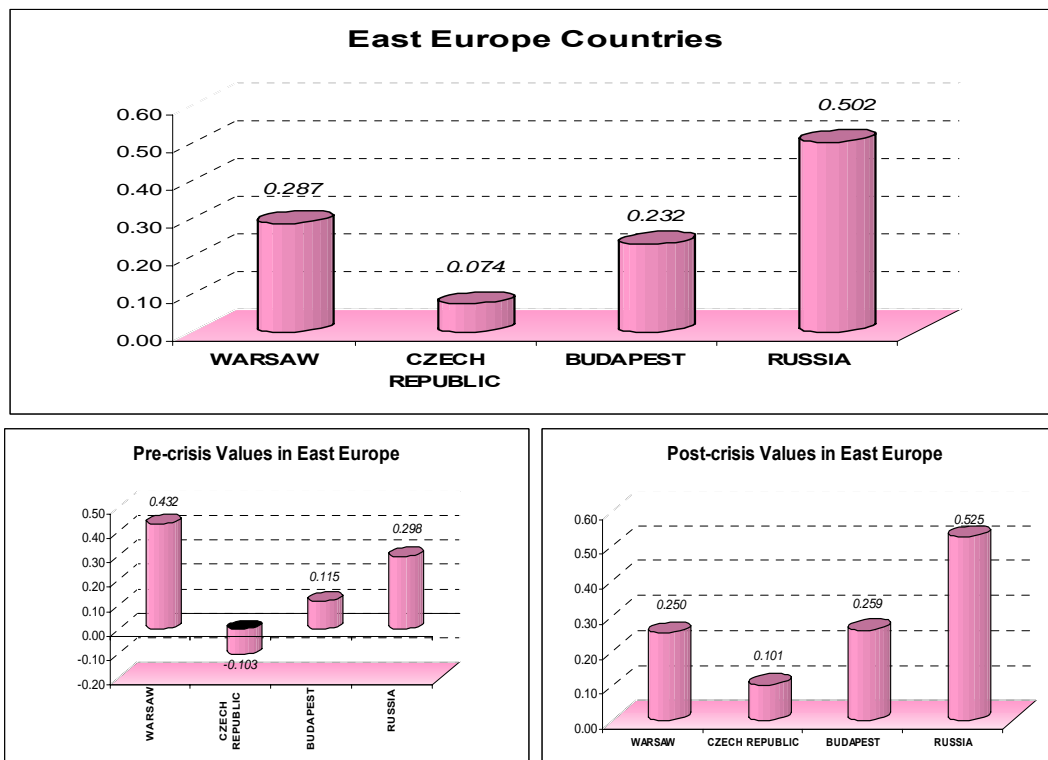
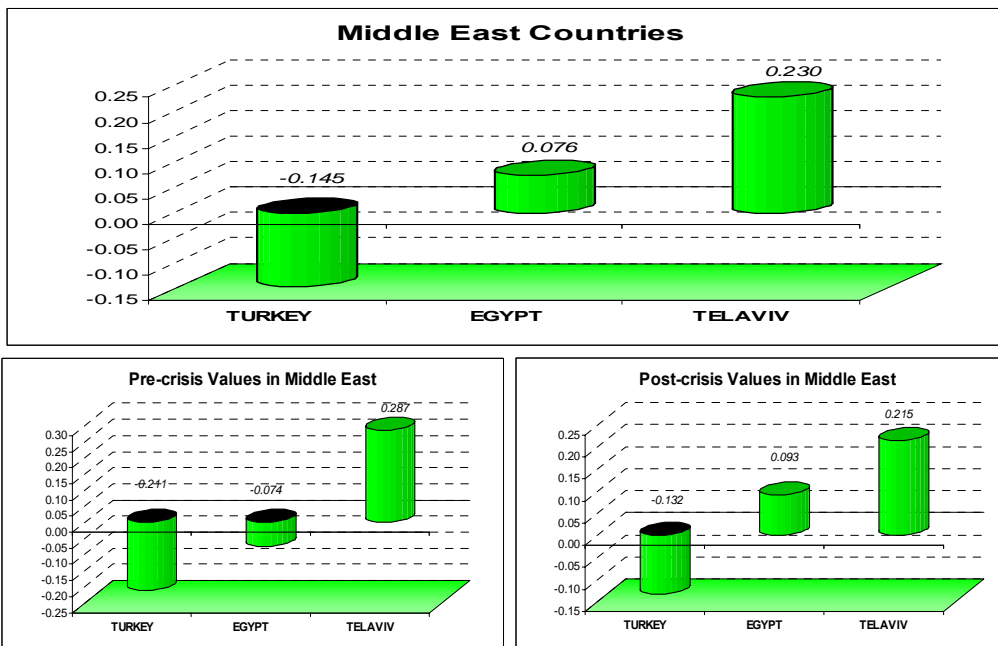


Chart 4 (charts group D)

The East Europe Countries which we focus just Warsaw, Czech Republic, Budapest and Russia, during the last ten years, Warsaw and Budapest were almost reacting the same against to US markets. But if we calculate more sensitive correlations by using pre and post crisis data, it is fair to say Warsaw and Budapest were moved at the same direction but the percentage was not too close each other, for the pre-crisis period. During the pre-crisis period, Czech Republic has given risk reduction opportunity for the US investors.

The thing is Warsaw and Russia has exhibited opposite reaction against to US market, while comparing to pre and post crisis correlations. After crisis, Russia has been started to move more sensitive than Warsaw market, which was visa versa for pre crisis period. For post crisis period, Czech Republic period has not given a good opportunity to US investors any more.

**5.1.5 - Correlation between the US market and Middle East Emerging markets**



**Chart 5 (charts group E)**

As seen from the table, during the last ten years, even at pre and post crisis period, Israel markets have exhibited more sensitive reaction to US markets, and did not give option to reduce the US' investors risk as Turkey and Egypt market. Israel Markets has not been change too much regarding to their correlations and seems to us the Asian crisis have not impact strongly to their market.

As shown at the chart, Egypt stock market has been exhibited opposite direction to the US investors after crisis, and came up to nearly 1 Beta. That's made sense to leave the Egypt stock market for US investors.

It is interesting to say that, during the last ten years (even pre and post crisis period), Turkey stock markets have negative Beta who has allowed the US investors to reduce their risks. However, after Asian crisis, Turkey stock markets have been taken the place with the Egypt stock market and gave ability to the US investors to diverge their portfolio.

As a result of above analyse, at pre-crisis period we could easily say that, there were 5 stock market out of 18 countries, which were Czech Republic, China, Egypt, India and Turkey, to give ability to diverge American investors portfolio. But after Asian crisis, the ability of Us investors have lots its ability and the count of markets came down to just two out of 18 countries, which were China and Turkey. From the Us investors side, Turkey (-0.132) has given much higher risk reduction potential to Us investors than China (0.014) market regarding to their correlations.

5.1.6 – On yearly Base Correlations for Turkey / US; Middle East / US; East Europe/US

According to this result, we would like to show yearly correlations for Turkey who would be more sensitive, and we also want to figure out, what was happening with Turkey conditions while having negative correlations between US and Turkey stock markets.

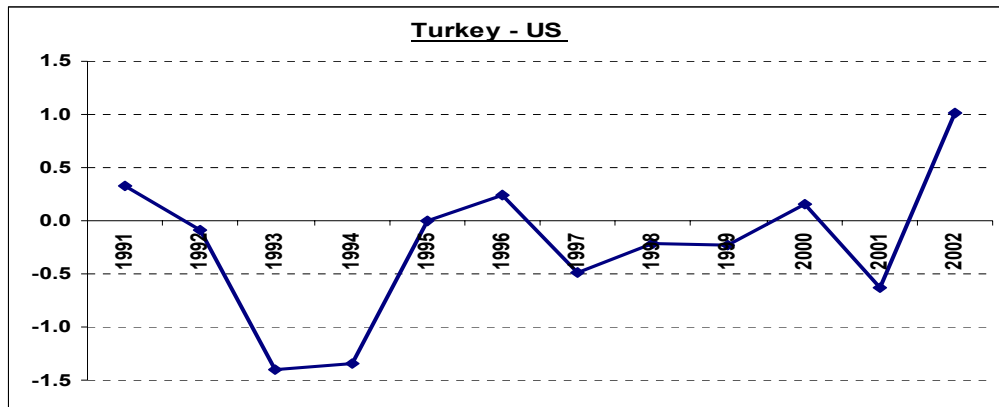


Chart 6

As seen from the chart above, between 1992 – 2001 years, the correlation had moved between +0.40 and –1.48. After 2001, the correlation of US and Turkey, have come up to 1.0. That's results shows us that US investor had a chance to reduce their investment risk by investing Turkey (Istanbul Securities Exchange) during these years.

Turkey is at the Middle East region, and it is also close to East Europe countries, what the correlations were for both region on yearly base, and could we get any result from that data. So, we have calculated the correlations for US / East Europe and US/ Middle East since 1991 up to 2002.

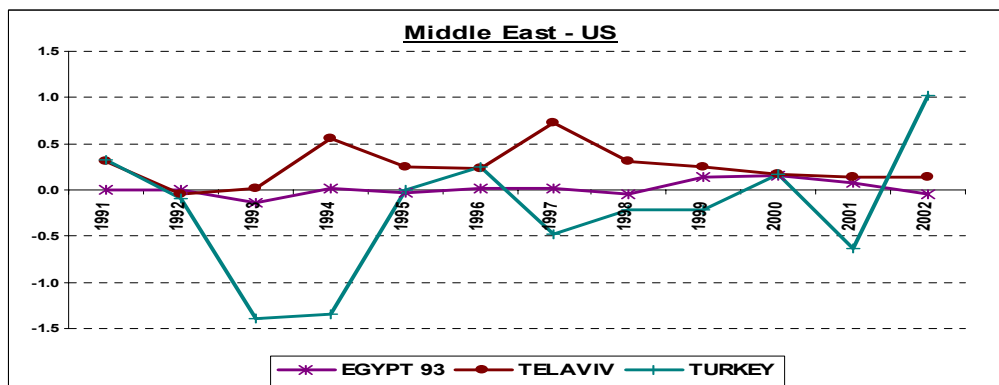


Chart 7

## INTERNATIONAL PORTFOLIO DIVERSIFICATION BETWEEN US AND EMERGING MARKETS

As shown from the chart..., Turkey's volatility is so high, while compared to Egypt and Israel but its also has negative correlation with US. During the last ten years, Israel and Egypt were almost moving together without given any chance to diversify Us portfolios.

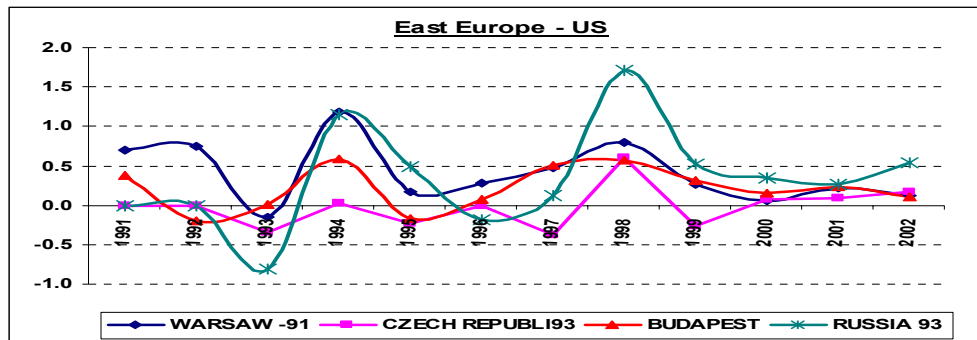


Chart 8

From the chart 8, the Correlation of the between US and East European countries have been moving together, between 1993 and 2001 period. As seen, there are different correlations for each country meanwhile they are moving together from the one side to other. That's could give us a clue as an American while invest the East-Europe. After Asian crisis, especially Russia has moved out of its band and came up to +1.6 correlation level, with in next two years, has moved down to its line. After 2001, Russia has been moving separately from the others.

During the last ten years, East European Countries did not give any chance to US investor for diversifying their portfolio except Czech Republic.

## INTERNATIONAL PORTFOLIO DIVERSIFICATION BETWEEN US AND EMERGING MARKETS

### 5.1.7 - The Correlations between the Emerging Markets during the last ten years:

	ARGENTINA	BRAZIL	CHILE	CHINE	CZECH REP.	EGYPT	HONK KONG	HNGRY	INDIA	INDONESIA	ISRAEL	MEXICO	POLAND	RUSSIA	SINGAPORE	TAIWAN	THAIL.	TURKEY	
ARGENTINA	1																		
BRAZIL	0.2461	1																	
CHILE	0.0850	0.128	1																
CHINE	-0.0134	-0.036	-0.072	1															
CZECH REP.	0.0268	0.039	0.134	0.023	1														
EGYPT	0.0366	0.027	0.194	-0.021	0.059	1													
HONK KONG	0.0763	0.119	0.403	0.025	0.206	0.098	1												
HUNGARY	0.0356	0.144	0.351	0.007	0.527	0.180	0.345	1											
INDIA	0.0576	0.078	0.242	-0.015	0.174	0.133	0.098	0.139	1										
INDONESIA	0.0514	0.086	0.432	0.035	0.376	0.147	0.721	0.416	0.134	1									
ISRAEL	0.0430	0.104	0.286	-0.001	0.101	0.146	0.229	0.172	0.125	0.075	1								
MEXICO	0.3123	0.181	0.433	-0.006	0.015	0.051	0.213	0.129	0.066	0.041	0.180	1							
POLAND	0.1071	0.199	0.320	-0.037	0.416	0.203	0.413	0.456	0.048	0.163	0.254	0.200	1						
RUSSIA	0.2446	0.299	0.834	0.146	0.452	0.235	0.375	0.471	0.256	0.200	0.485	0.369	0.246	1					
SINGAPORE	0.0519	0.090	0.280	0.021	0.207	0.116	0.533	0.246	0.083	0.269	0.251	0.127	0.155	0.099	1				
TAIWAN	0.0796	0.040	0.276	0.014	0.119	0.229	0.307	0.132	0.168	0.081	0.204	0.162	0.087	0.118	0.375	1			
THAILAND	0.0417	0.116	0.532	0.049	0.211	0.011	0.769	0.309	0.145	0.463	0.259	0.132	0.190	0.148	1.116	0.267	1		
TURKEY	-0.0294	0.036	0.103	0.016	-0.309	0.083	0.081	-0.188	0.036	-0.008	0.077	0.039	-0.001	0.009	0.118	0.076	0.066	1	

Table2

We have also calculated the correlations between the Emerging Markets, and as if portfolio manager of Emerging Markets wanted to figure out which emerging markets have allowed us to reduce the investment risk.

First of all, it is important to highlight the correlations with negative value. From the table above, if manager have position at South American Markets, he/she should have invest to Chine to reduce the risk. And also if there were any stocks in portfolio from Middle Eastern Countries (Egypt, Israel, Turkey) and India and Poland or one of them, to reduce the investment risk; Managers have must to invest to Chinese (Shangai) stock market (**dark red ones in table**).

Another, highest diversifying tool came up from Turkey stock markets, and gave the portfolio which consist of emerging markets, highest ability for risk reduction. Especially, if there were any stock from Argentina, Czech Republic, Hungary, Indonesia or one of them, to reduce the Portfolio risk, it was better to invest to the Istanbul Stock Exchange (**purple ones in table**)

Secondly, we have focus to which countries also have highest correlations, in Emerging Markets. As seen from the table, (**blue ones in table**), even those correlation were not equal 1 or bigger than 1, but, we have 3 values which closer to 1 in our table. During the last ten years Chile and Russia; Hong Kong and Indonesia; Honk Kong and Thailand have produced the values of 0.83; 0.72; 0.77 Beta respectively. These values have showed us, which market shouldn't have to be invested while aiming to reduce the portfolio risk.

The remains values have moved between the values of 0.00 - 0.55 Beta, which gave the Portfolio Manager limited risk reduction chance. **But still there was a chance!**

## **Conclusion**

This study examines whether international diversification reduce the risk of US investors while investing the emerging markets and also test the correlation between the emerging markets. By classifying the sample markets into regions which are East Asian, South Asian, East Europe, Middle East and South American emerging markets we have reached the different results during the last ten years whose are;

### **From the side of the US investors;**

There was no a big risk reduction ability while investing to **Hong Kong** stock markets. **China** (Shanghai) was one of the **East Asian countries** that gave the US investors risk reduction chance.

**South Asian Countries** have not indicate any important ability subject to risk reduction. The correlation of them were close the zero but still were not enough to support any investment decision.

**South American Countries** have limited potential to diversify their portfolio while investing to Argentina and Chile since the Asian crisis. But before Asian crisis, those countries were Argentina and Brazil.

As an **East European markets** whose are Warsaw, Czech Republic, Budapest and Russia; Especially, after Asian crisis, Czech Republic markets has given much more the risk reduction prospect to US investors than Warsaw and Budapest.

From **the Middle East Countries**, Turkey has been taken the place of Egypt after Asian crisis. Until Asian crisis, Egypt and Turkey were set to highest risk reduction ability to US investors.

When we have focused to **emerging markets separately**, it was so clear that international diversification indicate a risk reduction option. For example, if the investors would have been invested to China and South American Markets he/she could have lower risk than others. And again, if there were any stock from Argentina, Czech Republic, Hungary, Indonesia or one of them, to reduce the Portfolio risk, it was better to invest to Turkey (the Istanbul Stock Exchange).

**From the study, we except that the international diversification gave the investor risk reduce ability.**

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