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International Portfolio Diversification: United States and South Asian Equity Markets

Summary: This paper explores the dynamic liaison between US and three developing South Asian equity markets in short and long term. To gauge the long-term relationship, we applied Johansen co-integration procedure as all the representative indices are found to be non-stationary at level. The findings illustrate that the US equity market index exhibits a reasonably different movement over time in contrast to the three developing equity markets under consideration. However, the Granger-causality test divulge that the direction of causality scamper from US equity market to the three South Asian markets. It further indicates that within the three developing equity markets the direction of causality emanates from Bombay stock market to Karachi and Colombo. Overall, the results of the study suggest that the American investors can get higher returns through international diversification into developing equity markets, while the US stock market would also be a gainful upshot for South Asian investors.

Key words: International portfolio diversification, South Asian stock markets, Co-integration and causality.

JEL: C32, G11, G15.

It is generally supposed that gains from international portfolio diversification are larger compared to the gains of investment in domestic assets. The emergence of apparently new international portfolio diversification notion in 1960 has led the investors all around the globe including the United States to instigate exploring the potentially unexploited and lucrative equity markets. Global diversification offers investors greater benefits and opportunities to hedge against possible risks associated to an individual country and market. The empirical research established that benefits for investing in the developed equity markets carries greater benefits for the investors in developing countries. However, in small economies, equity market investors are faced with locally imposed precincts which prevent them from investing abroad (see for instance, Kenneth R. French and James M. Poterba 1991; Marianne Baxter and Urban J. Jermann 1997; Karen K. Lewis 1999; Kai Li 2004). These restrictions prove costly for investors and impede the way of international portfolio diversification. Moreover, in spite of the benefits of international portfolio diversification, investors typically invest large portion of their investment in domestic security markets because of "home bias" phenomenon. This home-bias trend is further strengthen by the extra transaction cost and process complexity of investing abroad besides unfavor-

able international relations dynamics between countries, thereby negatively affecting the motivation for international diversification. Although the phenomenon seems to be dwindled now, Abdullah M. Alam, Usman M. Arshad, and Syed Zulfiqar Ali Shah (2012), yet "home bias puzzle" continues to attract more attention in the contemporary literature on the issue, and presented being the most potent justification of low diversification practices on the face of knowingly higher advantages of portfolio diversification. Present day, the financial markets of developed and developing economies became more integrated due to increasing trends of financial liberalization and deregulation. While the escalating integration trends between equity markets witnessed less diversification opportunities.

1. Theoretical Background

Harry Markowitz (1952) and James Tobin (1959) agreed that the expected returns and risk of a portfolio largely depends upon the correlation among stock returns. If correlation doesn't exist among stock returns, portfolio diversification can reduce risk. Stock market investment is risky but investors can minimize that risk up to a certain extent. Instead of investing in a single security, investors can reduce risks associated to the individual security (unsystematic risk) by making diversified portfolio leaving the un-diversifiable risk (systematic risk) unchanged. Widely cited theories in this context are the Capital Asset Pricing Model (CAPM) and the Modern Portfolio Theory (MPT). These theories explicitly admonished to invest in single security though advocates addition of foreign securities to construct a well-diversified portfolio to reduce risk. Since differences exist in level of economic development and timings of business cycles all over the world, purportedly international diversification an alluring option to reduce risk. Typically, the returns of foreign stocks are closely correlated with the global beta rather with the domestic stock returns. As a consequence, the market risk of a fully diversified domestic portfolio ostensibly is higher than the market risk of internationally diversified portfolio. In fact, international and domestic portfolio shave identical principle as the investor attempt to add less than perfectly correlated assets which reduces the total risk and are averaged into the expected returns and risk of the portfolio. Classical portfolio theory assumes that the typical investor is risk averse and can only tolerate nominal risk but not willing to accept unnecessary risk. Therefore, priority of a typical investor is a portfolio having minimum risk and maximum returns. Moreover, the investor can find lower expected risk for each level of expected returns at any point on the efficient frontier of the opportunity set of internationally diversified portfolio.

2. Literature Review

The issue of international diversification has been a key research area for the researchers. Herbert G. Grubel (1968) investigated the possible gains and capital flows from international portfolio diversification. The author confirmed significant benefits of diversification for American investors. Following the work of Grubel (1968), many other researchers have reported the benefits for investors arising from internationally diversified portfolios. Haim Levy and Marshall Sarnat (1970) examined the

linkages of twenty eight developed and emerging equity markets around the world and unearthed the benefits of diversification for American investors. It further argues to discourage the concentration of investor's portfolios to local equity markets. Bruno H. Solnik (1973) conducted a study of nine European equity markets while Tarmo Haavisto and Björn Hansson (1992) studied Nordic stock markets. Both studies signified and supported the empirical evidence of prior researches in favor of international portfolio diversification. Numerous studies have investigated the international diversification opportunities from the perspective of US investors and confirmed the existence of substantial benefits of diversification. However, research regarding international diversification opportunities for the investors of the developing countries is rarely addressed in detail.

According to Modern Portfolio Theory, gains from international diversification are inversely related to the correlations of security returns. Relatively low correlations among different national stock markets advocates a stronger evidence for international diversification. Warren Bailey and Rene M. Stulz (1990), Arjun B. Divecha, Jaime Drach, and Dan Stefek (1992), Richard A. DeFusco, John M. Geppert, and George P. Tsetsekos (1996), Richard O. Michaud et al. (1996), and the like, acquiesced on low correlations between the stock markets of developed and emerging countries. These studies proved that more the difference is in the behavior of stock markets; higher are the benefits of diversification. On the contrary, probability of getting higher profits strikingly declines, in case of higher correlations among stock markets.

Some studies have also shown significant increase in correlations between the stock markets, noteworthy during and after the1987 international market crash (see, for example, Sie Ting Lau and Thomas H. McInish 1993; Ilhan Meric and Gulser Meric 1997). It was argued that the correlation between equity markets only shows the short term horizons and is unable to capture the long run relationship. Resultantly, co-integration analysis was supposedly suggested to measure the long-term relationship between equity markets. Therefore, it is evident from recent studies that are widely based on the framework of co-integration and Granger causality. A common feature of the prior research was to measure correlation for short span of time between equity markets of developed and emerging markets. Kenneth Kasa (1992) highlighted that benefits of international diversification declared on the basis of low correlation might be overstated for long run investments. Consequently, different researchers applied co-integration technique to investigate the long run relationship between the stock markets of developed and emerging countries. Interestingly, studies based on the technique of co-integration produced mixed evidence regarding the gains from international diversification for American investors. It shows that the benefits of international diversification are limited when stock markets are co-integrated.

Bang N. Jeon and Thomas C. Chiang (1991) conducted a study by utilizing univariate and multivariate co-integration approaches and elaborated that the equity markets of New York, London, Tokyo and Frankfurt exhibit a uniform trend. They credited increasing deregulation and intensive electronic coordination for the greater interdependence among stock markets. Bala Arshanapalli and Johan Doukas (1993)

tried to examine the long run linkages between the US and European equity markets. The authors found evidence of the existence of bivariate co-integration between these markets. In contrast, multiple studies found no vivid evidence in support of indication of long run linkages. It can be observed from the studies of (David J. Byers and David A. Peel 1993; DeFusco, Geppert, and Tsetsekos 1996; Felix O. Ayadi, Uric B. Dufrene, and Amitava Chatterjee 1998; Angelos Kanas 1998).

The earlier researchers mainly focused to examine the existence of long run interdependence of equity market indices of developed and emerging markets, ignoring the regional diversification. Abul M. M. Masih and Rumi Masih (1999) examined the short- and long-term dynamic linkages among international equity markets. Daily stock price indices were used to study eight stock markets by applying the error correction and level Vector autoregression (VAR) models containing integrated and co-integrated processes. They confirmed the existence of both short- and long-term relationships among these markets. Baekin Cha and Sekyung Oh (2000) investigated the relationship between stock markets of developed and developing countries. For this purpose, the two largest equity markets of the world i.e. US and Japan were taken as representatives of developed stock markets while the equity markets of developing countries was represented by Singapore, Taiwan, Hong Kong and Korea. They posed the link between developed and Asian emerging markets after the stock markets' crash of 1987 and also labeled that the impact of the US equity market on Singapore and Hong Kong has increased after the 1987 while the influence of the US equity market on Taiwan and Korea remains unchanged.

Gong-Meng Chen, Michael Firth, and Oliver M. Rui (2002) examined the associations of stock markets of Latin American countries covering the time period of 1995-2000. They applied co-integration and error correction VAR models and concluded limited diversification benefits. Svitlana Voronkova (2004) concluded that the Central European markets (Czech Republic, Hungary and Poland) displayed equilibrium relation with the mature stock markets of Europe (Germany, France and the UK); therefore implying lower diversification benefits for the investors of both sides. Claire G. Gilmore, Ginette M. McManus, and Ahmet Tezel (2005) and Abdulnasser Hatemi and Eduardo Roca (2006) wrought similar conclusions. Theodore Syriopoulos (2007) and Zeynel A. Ozdemir, Hasan Olgunb, and Bedriye Saracoglu (2009) signify the integration between the US and Central European markets. José Soares da Fonseca (2008) estimated the co-integration of European stock markets (after the introduction of Euro) and concluded that various international factors explain the integration of national European stock markets. Cristiana Tudor (2011) investigated short-term interactions and causal relationships among six Central and Eastern European stock markets with the USA's stock exchange mainly focusing the global financial crises period of 2007-2009. The study suggested that the potential risk of the market diversification in different CEE markets is limited during financial turmoil. Only turmoil in US equity market can negatively affect the equity market of emerging countries while the response of US equity markets and adverse changes in these economies remains negligible.

The literature seems more concentrated on investigating the diversification opportunities within developed equity markets, while little attention has been paid to

the diversification within developing equity markets and their possible venture in developed equity markets. The integration of South Asian stock markets with the developed markets also attracted less attention of researchers. In this study, we make an attempt to fill this gap by considering diversification benefits for the United States' investors towards South Asian equity markets and the benefits of local investors by investing in neighboring markets.

3. Data and Methodology

3.1 Data

The data consists of weekly adjusted closing prices of indices of the Karachi, Bombay, Colombo and US stock markets, covering the time frame of (1st of July 1997 to 1st of August 2011), a total of 723 observations of 14 years (168 months). To represent the US equity market, S&P index is used since it serves as a benchmark for well diversified US investors. KSE-100 index is used to represent the Karachi Stock Exchange, the largest and oldest stock market of Pakistan with many local and foreign listings. Karachi Stock Exchange was founded in 1947 and it has 651 companies, four indices and had a market capitalization of US $26.48 billion on June 5, 2009. Bombay Stock Exchange (BSE) was established as "The Native Share & Stock Brokers' Association" in 1875. In terms of number of listed companies, it is the world's number one stock market having over 4900 listings with total market capitalization of US $1.28 trillion as of February 2010. We used the BSE Index, SENSEX, the most popular Stock Market benchmark index of India. Colombo Stock Exchange (CSE) was established in 1982 and is licensed by the Securities & Exchange Commission of Sri Lanka (SEC). The Colombo Stock Exchange (CSE) has 241 companies representing 20 business sectors, with market capitalization of Rs. 2,210.45 Billion as of 31st of December 2010.

Our aim is to explore the international portfolio diversification opportunities from the US and South Asian investor's perspectives. To precisely investigate this phenomenon, the data set has been divided into three subsets on the basis of time varying factors for the developed and developing equity markets under consideration. First subset is witness of the war between Pakistan and India and nuclear tests by these arch rivals. It also represent the era of post Asian financial crises and before 9/11 incidence. Second subset characterized by the aftermath of 9/11 while third subset demonstrates the period of global financial turmoil. It is also victim of increasing integration between financial markets and large scale deregulations.

3.2 Methodology

We use the co-integration analysis to estimate the opportunities for American investors and the possible benefits of regional diversification in South Asian equity markets. Augmented Dickey-Fuller test was applied on each index as a first step of data analysis. To test the co-integration of time series, two methods are normally used i.e. Robert F. Engle and Clive W. J. Granger (1987) co-integration method and the Søren Johansen (1988) co-integration procedure. Engle and Granger method is useful for two variables but in this particular study we have more than two variables.

Johansen's co-integration procedure is therefore applied, instead of Engle and Granger three-step methodology to measure the long-term dynamic linkages among equity markets.

3.3 Descriptive Statistics

Table 1 reports the descriptive statistics including mean and standard deviation for whole and each sub period. As expected with the behavior of emerging markets, all the index returns series are negatively skewed and leptokurtic. Descriptive statistics show that all the three stock markets of South Asia have higher level of risks than the US stock market. For the whole sample period, S&P shows lower risks while Colombo stock exchange performed well in terms of risk as compared to Karachi and Bombay stock markets. Karachi and Bombay stock exchanges shows higher levels of risk in Post Asian financial crises period (the first sub-period of the study covering the time frame of three years, starting from the 7th of July 1997 to 10th of September 2001), also negative mean returns estimated from Karachi stock market index and Colombo stock market index for this period. However after 2000, all three stock markets of the South Asia performed well in terms of risk and return. Karachi stock exchange performed better in the second sub-period from 17th of September 2001 to 27th of June 2005, and exposed declining trends in mean returns in third sub-period from 5th of July 2005 to 1st of August 2011.

Table 1 Summary Statistics of Weekly Index Returns

Panel A: Entire period (July 7, 1997 to August 1, 2011)				
	Pakistan	**India**	**Sri Lanka**	**US**
Mean	0.0026	0.0019	0.0029	0.0003
Standard deviation	0.0401	0.0371	0.0331	0.0270
Skewness	-0.9447	-0.4145	-0.0331	-0.7507
Kurtosis	6.1426	4.9378	22.6660	8.7528
Jarque-Bera	404.5071	133.65	11635.01	1063.43
Panel B: First sub-period (July 7, 1997 to September 10, 2001)				
Mean	-0.0017	-0.0019	-0.0032	0.0007
Standard deviation	0.0473	0.0433	0.0241	0.0271
Panel C: Second sub-period (September 17, 2001 to June 27, 2005)				
Mean	0.0096	0.0047	0.0078	0.0004
Standard deviation	0.0357	0.0272	0.0337	0.0233
Panel D: Third sub-period (July 5, 2005 to August 1, 2011)				
Mean	0.0013	0.0027	0.0040	0.0000
Standard deviation	0.0367	0.0378	0.0373	0.0291

Note: Index returns are calculated using the log-relative of weekly prices from July 7, 1997 to August 1, 2011. KSE-100 index for Pakistan, BSE index SENSEX for India, CSE for Sri Lanka.

Source: Authors' estimations.

4. Empirical Results

Firstly, correlation analysis was used to measure the short run co-movement among US and emerging stock markets of South Asia. As a pre-condition of co-integration, we tested the data for stationarity using Augmented Dickey-Fuller test, and move towards co-integration. Finally we estimated granger causality between US, Pakistan, India and Sri Lankan stock markets.

Table 2 shows the correlation coefficients among the returns of four stock markets for whole sample period and separately for each sub period. Correlation between US and three stock markets of South Asia increased over three sub periods except post 9/11 subset. Correlation between US and Indian stock markets also shows increasing trends; whereas, the correlation between US and Sri Lankan stock markets decreased in second sub period, however, an increase in correlation was estimated in third sample period. While, all other correlations present weak form of relationship between US and three emerging markets of South Asia.

Table 2 Contemporaneous Correlation Coefficients of Weekly Stock Returns

Panel A: Entire period (July 7, 1997 to August 1, 2011)				
Market	Pakistan	India	Sri Lanka	US
Pakistan	1			
India	0.14	1		
Sri Lanka	0.09	0.13	1	
US	0.10	0.39	0.11	1
Panel B: First sub-period (July 7, 1997 to September 10, 2001)				
Pakistan	1			
India	0.12	1		
Sri Lanka	0.25	0.05	1	
US	0.08	0.21	0.09	1
Panel C: Second sub-period (September 17, 2001 to June 27, 2005)				
Pakistan	1			
India	0.12	1		
Sri Lanka	-0.00	0.03	1	
US	0.07	0.34	-0.01	1
Panel D: Third sub-period (July 5, 2005 to August 1, 2011)				
Pakistan	1			
India	0.15	1		
Sri Lanka	0.03	0.21	1	
US	0.13	0.55	0.17	1

Source: Results compiled by the authors.

Table 3 depicts results of Augmented Dickey-Fuller and Phillip-Perron tests. All indices at their levels fail to reject the null hypothesis of existence of unit root at 5% level of significance. While the first differenced series rejects the null hypothesis of non-stationarity, hence, the series are stationary at first difference. Consequently, it might be possible to say that all four series are I(1) integrated.

Table 3 Unit Root Tests Results for Weekly Stock Indices

Countries	Level		First differences	
	ADF	PP	ADF	PP
Pakistan	-0.7572	-0.6957	-23.8407*	-23.9739*
India	-0.6279	-0.5145	-16.1347*	-26.6576*
Sri Lanka	1.8949	1.7389	-15.6683*	-25.7347*
S&P 500	-2.4633	-2.3857	-28.6677*	-28.6414*

Notes: * Indicate significance at the 1 percent level. Unit root tests are conducted using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests.

Source: Authors' estimations.

After testing the data for stationarity, in the next step we applied Johansen (1988) co-integration procedure, to determine if any of these three South Asian equity markets co-integrated with US equity market. We used two versions of co-integration; the procedure proposed by Johansen (1988) was based on the intercept in co-integration equation while the second type does not involve intercept in co-integrating equation (CE). Pairwise bilateral co-integration was applied on each of underlying South Asian stock markets with US equity market. Table 4 indicates that none of the South Asian stock markets is co-integrated with S&P 500 stock index. We were fiasco to reject the null hypothesis in all cases, and found no co-integrating vector. No evidence favored the bilateral co-integration between equity markets of US and emerging stock markets of South Asia. Gilmore and McMannus (2002), Syriopoulos (2007), and Ozdemir, Olgun, and Saracoglu (2009) among others reported similar results. Although we found no evidence of bilateral co-integration, to confirm our findings we checked the indices for multivariate co-integration.

The results of multivariate co-integration are given in Table 5. We again found extinct clues of co-integration and are unable to reject the null hypothesis for all cases. Therefore, the under investigation markets are not co-integrated and hence no long-run relationship might be concluded for this particular dataset. Since the markets are not co-integrated, the benefits of diversification for investors are admirable. Pompously, investors of these countries may actively invest in the US and neighboring foreign markets to diversify the portfolios which are not co-integrated with their home stock markets.

Non rejection of null hypothesis implies that there is no co-integrating vector, and concluded with no long-term co-movements between US and other three emerging stock markets of South Asian economies, Pakistan, India and Sri Lanka. Granger-causality test can be used without estimating an error correction model. Table 6 indicate the results of Granger causality, it tells us whether variable X_t Granger-cause Y_t or *vice versa* and whether the previous values of X_t have some information to predict Y_t. The Granger-causality test was applied to the first differenced index series of S&P 500 pairwise with each of three indices of South Asian stock markets.

Table 4   Bivariate Co-integration Test Results

Panel A: No intercept in CE, no deterministic trend in data

Hypotheses		0.05	US-	US-	US-
H_0	H_A	Critical values	Pakistan	India	Sri Lanka
		Maximum eigenvalue test			
$r = 0$	$r = 1$	11.22	1.56	1.08	6.83
$r \leq 0$	$r = 2$	4.12	0.02	0.01	0.17
		Trace test			
$r = 0$	$r \geq 1$	12.32	1.58	1.09	7.00
$r \leq 0$	$r \geq 2$	4.12	0.02	0.01	0.17
Conclusion			***r = 0***	***r = 0***	***r = 0***

Panel B: Intercept in CE, no deterministic trend in data

		Maximum eigenvalue test			
$r = 0$	$r = 1$	15.89	5.33	5.439227	12.96217
$r \leq 0$	$r = 2$	9.16	1.55	1.025999	2.250920
		Trace test			
$r = 0$	$r \geq 1$	20.26	6.88	6.465227	15.21309
$r \leq 0$	$r \geq 2$	9.16	1.55	1.025999	2.250920
Conclusion			***r = 0***	***r = 0***	***r = 0***

Source: Authors' estimations.

Table 5   Multivariate Co-integration Test Results

Panel A: No intercept in co-integration, no deterministic trend in data

Hypothesis			
H_0	H_A	Maximum eigenvalue test	Trace test
$r = 0$	$r = 1$	20.26	27.91
$r \leq 1$	$r = 2$	5.11	7.65
$r \leq 2$	$r = 3$	1.54	2.54
$r \leq 3$	$r = 4$	0.99	0.99
	Conclusion	***r = 0***	***r = 0***

Panel B: Intercept in co-integration, no deterministic trend in data

$r = 0$	$r = 1$	21.99	36.34
$r \leq 1$	$r = 2$	8.36	14.35
$r \leq 2$	$r = 3$	4.71	5.98
$r \leq 3$	$r = 4$	1.27	1.27
	Conclusion	***r = 0***	***r = 0***

Source: Results obtained by the authors.

Here, it is important to discuss that S&P 500 index significantly Granger causes all South Asian markets at 1% significant level except Karachi stock exchange where it causes at 10% significant level. However, in response no South Asian equity market significantly Granger causes S&P 500. Bombay stock exchange significantly Granger causes Karachi and Colombo stock exchanges at 1% significant level. While

a uni-directional relationship was found at 10% significant level between Karachi and Colombo stock markets from the direction of Karachi Stock Market. The result of this study supports the findings of Syriopoulos (2007), and Ozdemir, Olgun, and Saracoglu (2009) among others. It is enigmatic to find out a study which stated the effect of an emerging stock market on their large counterparts e.g. US, Japan or big European markets.

Table 6 Pairwise Granger-Causality

Country	Null hypothesis	Test values	
		F-statistic	*P*-value
Pakistan	(SP) ≠ > (SAM)	2.5131†	0.0817
	(SAM) ≠ > (SP)	0.1486	0.8619
India	(SP) ≠ > (SAM)	16.956**	0.0021
	(SAM) ≠ > (SP)	0.7409	0.4770
Sri Lanka	(SP) ≠ > (SAM)	5.8184**	0.0031
	(SAM) ≠ > (SP)	1.2872	0.2766
Granger-causality tests among the South Asian markets			
Pakistan- India	(KSE) ≠ > (BSE)	1.5597	0.2109
	(BSE) ≠ > (KSE)	9.2581**	0.0001
Pakistan-Sri Lanka	(KSE) ≠ > (CSE)	2.5334†	0.0801
	(CSE) ≠ > (KSE)	0.7128	0.4906
Sri Lanka-India	(CSE) ≠ > (BSE)	5.4391**	0.0045
	(BSE) ≠ > (CSE)	5.4909**	0.0043

Notes: †, *, ** Denote rejections of the null hypothesis at 10, 5, and 1 percent significance levels, respectively; and the symbol "≠>" means does not Granger-cause. South Asian Markets (SAM) and S&P 500 (SP).

Source: Results obtained by the authors.

5. Conclusions

This study has examined the possible benefits of diversification from the perspective of US and South Asian investors. To precisely investigate this phenomenon, the data set is divided into three subsets on the basis of time varying factors. Our results suggest that the American investors can get benefits of diversification by investing into South Asian stock markets as these markets exhibits marginally different behavior than US equity market. The relative low correlations of index returns between the US and South Asian equity markets for all the three time periods indicates the benefits of diversification for short-term investment. It is important to mention an interesting outcome that the relation of US equity market with the equity market indices of three selected emerging economies shows an integrating trend over time. Our findings also suggest that the investors of these emerging countries may also get benefits of diversifications into neighboring and US equity markets. Granger causality portray that only turmoil in US equity market can negatively affect the three emerging equity markets under consideration while the response of US equity market to adverse changes in these equity markets remain negligible.

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