EFFECT OF FINANCIAL MARKET INTEGRATION ON FOREIGN PORTFOLIO INVESTMENT DIVERSIFICATION IN DEVELOPING STOCK MARKETS

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ABSTRACT

The purpose of this study was to analyze the effect of financial market development level on foreign portfolio investment diversification in developing stock markets. The study sought to affirm or reject the alternative hypotheses that financial market integration level has a negative effect on international portfolio investment diversification. From a sampling frame of 43 developing stock markets, the study constituted a sample of 20 markets through non-probability multi-stage procedures. Using a data capture sheet, equity time series data was collected and summarized into Roy's Safety-First Ratio (RSFR) excess returns on a benchmark of FTSE 100. Data analysis techniques involved were simple pairwise correlation and Johansen cointegration to respectively measure short run and long run integration levels. The study found financial market integration partly critical to international portfolio investment diversification.

Keywords: Integration, Diversification, Developing markets.

INTRODUCTION

Analyzing stock market dependencies in frontier and emerging markets is critical to investment diversification, more so with regard to financial downturns. This importance is attached to the fact that in highly comovement markets, shock transmission from a market can have significant effects on others, from different proximity and size dimensions. Diverse historical evidence affirms this: - The 2007/8 sub-prime mortgage crisis caused a 53% dip in developing markets composite index performance, a 20-year low, against a 19% fall in the All-Country World Index over the same time. This dip was echoed by markets in different regions. While Pakistan's Karachi stock market index gained over 10,000 basis points (or 100%) in the 3rd Quarter of 2008 (Crisis date was July 17, 2008), the rest of the markets lost-Egypt (36%), Hungary and Russia (34%), Argentina (32%), India (24%); South Africa (22%), MSCI (2016).

A similar situation occurred in 1997 when the Thai Baht was devalued, resulting in a currency crisis. The turmoil spread to East Asia and Russia (which defaulted in 1998) and subsequently to Brazil. This was named the Asian flu (Forbes & Ringobon, 2002). Other relevant spillovers across markets were the Debt crises in 1982, the Russian Cold in August 1998 (including the LTCM crisis), the Brazilian Sneeze in January of 1999, the NASDAQ Rash in April of 2000 and the European debt crisis of 2007/8 (2009, Krugman et al., 2013).
In October 1987, the Hong Kong market cratered and the crash spread west to Europe, hitting the United States after other markets had already declined by a significant margin. The Dow Jones Industrial Average (DJIA) for example, dropped 508 points to 1738.74 (a

22.61% dip), and the crash quickly affected major stock markets around the globe (Zwaniecki, 2007).

Understanding the dynamics of volatility or shock transmission is hence central to financial research and hence this study. Although stock market shock transmission is associated with different preconditions, empirical literature (for instance Beine and Candleon 2006; Eun &Shim, 1989; Nathaniel et al., 2008) delineates a tripod of factors: Industrialization (economic development) differences, the degree of financial market synchronization (financial market integration) and the filtration of material information to the markets under study (financial market contagion).

From empirical literature on stock market linkages and investment diversification, 2 classes of studies emerge. The first class consists of Crisis contingent studies-those that investigate diversification possibilities across a crisis breakpoint date (for example Esin, 2004, Murshid, 2004, Nathaniel et al., 2008, Forbes & Ringobon, 2002; Connolly & Wang, 2003). The second is the non-crisis-contingent studies, which simply investigate stock market comovements over an undivided time horizon (studies like: Corhay & Urbain, 1993, Erb et al., 1994, Roll, 1992, King et al., 1994; Beine & Candleon, 2006).

The grey area of the foregoing studies is that none of them used a benchmark portfolio. At the core sound financial investment decision making is benchmarking, an analyst must consider the investment's suitability (to investor objectives, investment characteristics and benchmarks), communicating them in plain language (Eaton, 2014) and failure to do this is a violation of Global Investment Professional standard III (C). The researches lack both a market benchmark and a measure of excess risk. Consequently, to advise investors on risk diversification based on the findings of the foregoing studies is professionally imprudent, and may lead to sub-optimal portfolio construction. In order to address the gap, this study incorporates the FTSE 100 benchmark to the workings of excess returns and Roy's Safety-First Ratio (RSFR) for measurement excess risk based on the benchmark.

LITERATURE REVIEW

Esin (2004) examined the effect of economic integration among Turkish and European stock exchanges, seeking to establish the suitability of international portfolio diversification. Using correlation and cointegration tests on a sample of fifteen EU member-countries and Turkey on continental market index series over the 1990-2003 sample period, the author found the series to be integrated of the same order and hence it was possible to conduct cointegration tests on them. The markets' correlations were more synchronized during the post-Euro sub-period than the time period before. Johansen cointegration test yielded results to the effect that countries in the same economic bloc had no pair-wise cointegration with regard to customs union but there was intra-country long-term market relationship.

An earlier study on stock mart comovement was conducted by Christofi & Christofi (1983). On a sample of common stock monthly market price averages of 1959 to 1978, they examined fourteen industrial countries for annual and biennial correlation coefficients of the US with each of the countries. The study used Box-Jenkins tests and non-parametric tests for annual correlations, then examined the coefficients by dividing the twenty years into two sub-periods, as fixed exchange rate environment and flexible exchange rate environments. The results revealed that the inter-country correlation coefficients remained the same over the sub-period years examined. Through Principal components analysis for the same period and

two equal sub-periods Christofi & Christofi's research concluded that the national stock market indices of the 14 sample countries were interrelated through a common factor whose effect appeared to be consistent over time. It was therefore not possible to benefit from international investment diversification.

Mathur and Subrahmanyam (1990), studied the Nordic and US market for index interdependencies. They analyzed the index time series via correlations and Vector Autoregression (VAR). While the correlations yielded the results that there were high interdependencies among countries which had high economic interdependency, the VAR analysis results indicated that the US market was only influential on Denmark and not any other market hence each market was responsible for own its behaviour.

Roll (1992) examined the equity prices of 24 countries over the 1988-1991 sample period. The research involved correlation analysis computed from daily dollar-denominated returns. The results gave correlation levels of below 0.5 (low) for most (276) of the 326 coefficients obtained. Roll also calculated correlations from the industry perspective and found them to be different (generally higher) from those computed using raw stock price indices. One conclusion of the study was that countries with similar industrial structures had highly correlated markets yet the importance of regional characteristics should not be overlooked. The study also concluded that stock indices in different countries generally exhibited disparate behaviour, principally due to differences in index construction procedures, industry composition of individual nations and the effect of exchange rates.

In a study of weekly stock price indices from France, Germany, Italy, Netherlands and the UK for the period March 1975 to September 1991, Corhay & Urbain (1993) used cointegration technique. Faulting the use of correlation on the grounds that it may harbour some long run components due to the trended characteristic of its constituent data, they opted to use common stochastic trends when the series were stationary, in order to examine whether stock prices of two or more countries moved together. The authors concluded that cointegration analysis could be used for finding the links between stock markets and the results were the same for all the other European stock markets.

Erb et al. (1994) used correlation analysis to determine whether the G-7 nations had market dependencies. They found that correlations among the G-7 countries were affected by the business cycle, whereby the correlation was high during recession and low during recovery. They further noted that these correlations were not symmetric in up and down markets. The study concluded that integration initiative was not significantly responsible for market coupling or comovement trending.

The foregoing empirical literature can be summarized to conclude that the different studies conducted did not have generalizable findings on the effect of financial market integration and investment diversification. Besides, the studies used indexes at level autoregressive or differenced form but no benchmark was applied, rendering their application infeasible to decision making on active returns. The market development contexts are also disparate, hence the necessity of a research to address these gaps.

METHODOLOGY

Population

This study targeted all developing markets, both emerging and frontier markets as documented in different sources of the sampling frame.

Sampling frame

The sampling frame at the time of this study was the MSCI database of developing markets. According to MSCI (2016), the markets were 43 (including 23 emerging and 20 frontier). The sampling frame is justified by the fact that MSCI has not only summarized the clusters but has gone ahead and prepared indexes, stratified by different regions: - EMEA, Asia-pacific, Europe; Latin America (Emerging markets) and a global frontier markets index, while other indexes disregard these frontier markets on the claim of small size and illiquidity. Besides, MSCI uses a common currency-the US dollar and index returns other than the indexes themselves, contrary to the rest. Table 3.1 shows the sampling plan, in which the countries in brackets contribute the main regional index constituents).

Table 3.1: Cluster samples

Stratum	Size	Main Countries
Frontier	23	(Kuwait, Argentina, Nigeria, Pakistan, Morocco), Bahrain, Bangladesh, Bulgaria, Croatia, Estonia, Jordan, Kenya, Lebanon, Luthania, Kazakhstan, Mauritius, Oman, , Romania, Serbia, Sri-Lanka, Tunisia, Vietnam, Slovenia.
Emerging	20	(Brazil, Chile, China, Colombia, Czech Republic), Egypt, (Hungary, India), Indonesia, (South Korea, Malaysia, Mexico, Peru,) Philippines, (Poland, Russia, South Africa, Taiwan), Thailand; Turkey.

Source: MSCI Developing Markets Databases by Region (2016)

Sampling and Sampling Techniques

Out of the sampling frame of 43 countries, a total of 20 were selected in a multi-stage sampling procedure. The 43 markets were clustered as either "Frontier" or "Emerging". From the countries that fit the definition of either frontier or emerging, the index constituents were selected judgmentally according to the rules of constructing the Global Investable Market Index (GIMI) methodology. From the MSCI (2016) database, the GIMI methodology classifies index constituents on the basis of different parameters. These can be summarized as in Table 3.2.

Table 3.2 Index constituents' selection benchmarks

CLASS/MARKET	Frontier markets	Emerging Markets
Equity Universe Minimum Size Requirement (UMSR)	U$ 120million	U$ 150 million
Equity Universe free float-adjusted market capitalization	0.25 of UMSR	0.5 of UMSR
Minimum length of trading	≥ 3 months before implementation date, except IPOs with company and float Market Capitalization ≥1.8x of the Interim Standard Index Cutoffs post sizable offering	
Global minimum foreign inclusion factor (FIF)	Larger FM: ≥ 0.15; If < 0.15, full Market capitalization ≥Interim Size-Segment cutoff; float Market Capitalization must be ≥ 1.8x ½ UMSR.	
Maximum stock price	U$ 10,000	
Minimum liquidity requirement	Less: GIMI attached	More: GIMI attached
Minimum foreign room requirement	≥ 15%; if ≤25%, included with a 0.5 FIF adjustment	

Source: MSCI (2016) GIMI parameters

Guided by the criteria in Table 3.2, the research from Table 3.3 judgmentally selected the 20 countries with the GIMI-compliant corporations making up the developing market indexes (Frontier and emerging), and with the greatest contribution to the composite index market capitalization. These market host countries were: Frontier-5 (Kuwait, Argentina, Nigeria, Pakistan, Morocco, and emerging- 15 (Poland, Russia, South Africa, Taiwan, Hungary, India, South Korea, Malaysia, Mexico, Peru, Brazil, Chile, China, Colombia, Czech Republic. These countries (in Table 3.3) are the domiciles of the GIMI-compliant corporations making up the developing market indexes.

Table 3.3 Market sampling procedure

Emerging Market constituents and (main countries represented, Name of Stock market)		**Frontier market constituents and (main countries represented)**
Africa	92 (1): South Africa (Johannesburg)	**121 (5):** Kuwait(Kuwait-KWSEIDX), Argentina(Merval), Nigeria (Nigeria), Pakistan (KSE 100); Egypt (CASE 30).
Europe	171 (4): Russia (RTS index), Poland (WIG), Hungary (BUX); Czech Republic (PX 50).	
Latin America	119(5): Brazil (Sao Paulo Bovespa), Mexico(IPC All-Share), Chile (Santiago), Colombia (Bogota); Peru (Lima)	
Asia-Pacific	554 (5): China (Shanghai Composite), Korea (Kospi), Taiwan (Taiex Weigted), India (S&P BSE Sensex); Malaysia (Kuala Lumpur).	
All from 20 countries		

Data Collection and processing

Using 17th July 2007 as the sub-prime mortgage crisis breakpoint date, the research used historical data on two 50-day sub-periods: -the pre-crisis and crisis periods. The secondary data was obtained from Wall Street Journal via its online market database.

The analysis of the data was based on index returns instead of actual prices for two reasons: - First, return is a complete and scale-free summary of the investment opportunity. Second, returns are easier to handle than price series because the former have more attractive statistical properties (Campbell, Lo, & MacKinlay, 1997). Continuously compounded returns enjoy advantages over simple net returns. In a multi-period, setup, for example, the continuously compounded return is simply the sum of continuously compounded one-period returns involved. The statistical properties of log returns are also more pliable (Tsay, 2005, Poon and Taylor, 1992; Nikkinen et al., 2008). Allowing for a passive investment management strategy, let the index of an inter-market free float- adjusted market cap-weighted portfolio at time i= (t−1, t), be Pi and the periodic returns be Rt. Following this, the periodic absolute and log returns on the portfolio index will respectively be:

$$R_t = (P_t - P_{(t-1)}) / P_{t-1} \quad 3.1$$

Hence,

$$R(t) = ln\left(\frac{P_t}{P_{(t-1)}}\right) \quad 3.2$$

Equations (3.1) and (3.2) were the inputs of the data to be used on the time series data re-organization.

Data summary involved computation of excess returns per unit of risk, using Roy's Safety First (RSF) ratio on the FTSE 100 index benchmark. Roy's Safety-First Ratio is in the equation (3.3).

$$SR = \frac{R_p - R_B}{\delta_p} \qquad 3.3$$

Where R_p, R_{B_r} and δ_p are respectively the expected returns on the portfolio(to be) held, the expected return of a benchmark portfolio (FTSE 100 index in this study) and the standard deviation of the returns of the portfolio invested in.

Market integration Analysis

Market integration level was analyzed in two time dimensions. For the short run, the analysis used was simple correlation of the market pairs while for the long run market integration was measured using Johansen co integration tests.

RESULTS

Short run analysis of financial market integration

This section analyzed excess stock market index returns, benchmarked on Financial Times Stock Exchange (FTSE) 100 world indexes. The correlation coefficients (short run dynamics) and their significance are presented in Table 4.1.

Table 4.1 Benchmark return correlations

	ARG	BRAZIL	CHILE	CHINA	CZECH	EGX	HUNG	INDIA	JOHANN	MALAY	MEX	RUSS	PAKIST	POL	SKOR	TAI
ARG	1.00															
BRAZIL	0.56	1.00														
CHILE	0.46	0.62	1.00													
CHINA	0.34	0.42	0.19	1.00												
CZECH	0.57	0.65	0.48	0.31	1.00											
EGYPT	0.67	0.69	0.58	0.25	0.66	1.00										
HUNGAR	0.54	0.65	0.62	0.28	0.74	0.53	1.00									
INDIA	0.47	0.62	0.51	0.53	0.64	0.66	0.60	1.00								
JOHANN	0.20	0.12	0.16	0.14	0.18	0.14	0.18	0.18	1.00							
MALAYS	0.54	0.71	0.66	0.34	0.73	0.65	0.74	0.79	0.27	1.00						
MEXICO	0.62	0.69	0.60	0.24	0.73	0.61	0.67	0.55	0.25	0.71	1.00					
RUSSIA	0.30	0.46	0.21	0.17	0.55	0.42	0.50	0.41	0.14	0.48	0.27	1.00				
PAKIST	**-0.22**	**-0.16**	**-0.19**	**-0.14**	**-0.29**	**-0.28**	-0.34	**-0.29**	**-0.05**	**-0.21**	**-0.10**	-0.39	1.00			
POLAND	0.09	0.27	0.17	0.26	**-0.05**	**0.00**	**0.00**	-0.03	0.01	0.05	-0.15	0.30	-0.12	1.00		
SKOREA	0.66	0.81	0.66	0.50	0.81	0.67	0.76	0.65	0.22	0.74	0.67	0.54	-0.34	0.30	1.00	
TAIWAN	0.56	0.78	0.70	0.47	0.68	0.69	0.64	0.61	0.20	0.71	0.61	0.58	**-0.21**	0.34	0.80	1.00

In Yellow Fill:significant correlations
Not filled; not bold insignificant positive correlations

Bold only: insignificant negative or zero correlations.

From Table 4.1, Pakistan stock returns were negatively correlated with all the other markets. These correlations were significant, except for South Korea. This means that there was benefit of international investment diversification benefit for portfolio pairs involving Pakistan. Investors should however be cautious in incorporating South Korea. Poland had 4 significant negative correlations (with Czech Republic, India, Malaysia and Pakistan), no

correlation with 2 markets (Hungary and Egypt) and significant positive correlations with the rest of the markets. The other market combinations had positive correlations of benchmark returns, implying no diversification benefit.

Long run Integration analysis

Following the finding that investment diversification was only beneficial between Poland and Czech Republic, India; Malaysia and between Pakistan and all other markets in the short run investment period, this study further sought to find out which market pairs were (are) integrated in the long run for analysis of investment diversification gains for an extended investment horizon. This was the essence of cointegration testing. Table 4.2 presents the results.

Table 4.2 Pairwise cointegration results

	ARG	BRAZIL	CHILE	CHINA	CZECH	EGX	HUNG	INDIA	JOHANN	MALAY	MEX	RUSS	PAKIST	POL	SKOR	TAI
ARG	1	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
BRAZIL	0.56	1	NO	NO	NO	**X**	NO	NO	NO	NO	NO	NO	**X**	NO	NO	NO
CHILE	0.46	0.62	1	NO	NO	NO	NO	NO	NO	NO	NO	NO	**X**	NO	NO	NO
CHINA	0.34	0.42	0.19	1	NO	NO	NO	NO	NO	NO	NO	NO	**X**	NO	NO	NO
CZECH	0.57	0.65	0.48	0.31	1	NO	**X**	NO	NO	NO	NO	**X**	NO	NO	NO	NO
EGYPT	0.67	0.69	0.58	0.25	0.66	1	**X**	NO	NO	NO	NO	**X**	**X**	NO	NO	NO
HUNGAR	0.54	0.65	0.62	0.28	0.74	0.53	1	**X**	**X**	**X**	NO	**X**	**X**	NO	NO	NO
INDIA	0.47	0.62	0.51	0.53	0.64	0.66	0.6	1	**X**	**X**	NO	**X**	NO	NO	NO	NO
JOHANN	0.2	0.12	0.16	0.14	0.18	0.14	0.18	0.18	1	**X**	NO	**X**	**X**	NO	NO	NO
MALAYS	0.54	0.71	0.66	0.34	0.73	0.65	0.74	0.79	0.27	1	X	**X**	NO	NO	NO	**X**
MEXICO	0.62	0.69	0.6	0.24	0.73	0.61	0.67	0.55	0.25	0.71	1	NO	NO	**X**	NO	NO
RUSSIA	0.3	0.46	0.21	0.17	0.55	0.42	0.5	0.41	0.14	0.48	0.27	1	**X**	**X**	NO	**X**
PAKIST	**-0.22**	**-0.16**	**-0.19**	**-0.14**	**-0.29**	**-0.28**	-0.34	**-0.29**	**-0.05**	**-0.21**	**-0.1**	-0.39	1	NO	NO	NO
POLAND	0.09	0.27	0.17	0.26	**-0.05**	**0**	**0**	0.03	0.01	0.05	-0.15	0.3	-0.12	1	NO	NO
SKOREA	0.66	0.81	0.66	0.5	0.81	0.67	0.76	0.65	0.22	0.74	0.67	0.54	-0.34	0.3	1	NO
TAIWAN	0.56	0.78	0.7	0.47	0.68	0.69	0.64	0.61	0.2	0.71	0.61	0.58	**-0.21**	0.34	0.8	1

In Yellow Fill: significant correlations
Not filled; not bold insignificant positive correlations

Bold only: insignificant negative or zero correlations.

The findings in this table present the long run investment diversification opportunities depending on the market integration levels. Of the 120 market pairs tested for integration, only 25 are integrated in the long run. In the rest of the pairs, an investor can try out diversification on a case-wise basis, though the results are not guaranteed. Notably, All markets had short term investment diversification benefit (with Pakistan) though the diversification gain vanishes into time (in the short run, both market pairs have significant negative correlation of benchmark returns and in the long run, the market pairs are co-movement). Table 4.2 shows that only South Korea-Pakistan portfolio investment diversification is beneficial across time (since initial returns are significantly negative and the markets are not co integrated).Moreover, Argentina and South Korea are not co integrated with each other or any other market. The two portfolios can thus be adapted to any foreign investment portfolio as a hedge against investment risk. Also (feebly) feasible for short run and long run diversification are portfolio combinations involving Poland (with India, Pakistan and Czech republic) and Pakistan (with Malaysia, India, Mexico and Czech republic), since

these markets have (insignificant) negative correlations of benchmark returns and are all not I(1).

CONCLUSION

Both in the short run and long run investment horizons, only two market sets are disintegrated: Poland and Egypt; Pakistan with any of Taiwan, South Korea, Poland, Argentina, Czech Republic, India, Malaysia; Mexico. For the rest of stock market pairs, there investment diversification would be infeasible.

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