DETERMINANTS OF INTERNATIONAL PORTFOLIO INVESTMENT RISK DIVERSIFICATION IN DEVELOPING STOCK MARKETS

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Determinants of International Portfolio Investment Risk Diversification in Developing Stock Markets

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

To all those who work hard towards making the world a better and humane place. May this particular category of people live to full enjoyment of its academic and related endeavors.

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ACRONYMS

ADV	Average Daily Volatility
AFR	Africa
AIMS	Alternative Market Investment Segment
ANOVA	Analysis of Variance
ARG	Argentina
ASEAN	Association of South-East Asian Nations
BOVESPA	BOlsa de Valores do Estado de São Paulo
BRA	Brazil
CAPM	Capital Asset Pricing Model
CFD	Contract for Difference
CFI	Corporate Finance Institute
CHI	Chile
CPI	Consumer Price Index
CZE	Czech Republic
DJIA	Dow Jones Industrial Average
ECM	Error Correction Model
EGX	Egypt
EMH	Efficient Markets Hypothesis
ETF	Exchange-Traded Funds
EU	European Union
FIF	Foreign Inclusion Factor
FTSE	Financial Times Stock Exchange
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GIMI	Global Investable Indexes Methodology
HAR-RV	Heterogeneous Autoregressive Realized Volatility
HARX-RV	Heterogeneous Autoregressive Extended Realized Volatility

HUN	Hungary
ICB	Industry Classification Benchmarks
IFC	International Finance Corporation
IMF	International Monetary Fund
IND	India
IPI	International Portfolio Investment
IPO	Initial Public Offer
IT	Information Technology
JOH	Johannesburg
JSE	Johannesburg Stock Exchange
LTCM	Long Term Capital Management
MAL	Malaysia
MDH	Mixture-of-Distribution Hypothesis
MENA	Middle East and North Africa
MEX	Mexico
MIMS	Main Market Investment Segment
MPT	Modern Portfolio Theory
MSCI	Morgan Stanley Capital Incorporated
NASDAQ	National Association of Securities Dealers Automated Quotation
NXR	Nominal Exchange Rate
OECD	Organization of Economic Corporation and Development
OMX	Open Market Exchange
OTC	Over-the-counter
PAK	Pakistan
PIV	Pooled Investment Vehicle
POL	Poland
PPP	Purchasing Power Parity
RSFR	Roy's Safety-First Ratio
RUS	Russia

RXR	Real Exchange Rate
S&P	Standard and Poor's
SD	Standard Deviation
SIAH	Sequential Information Arrival Hypothesis
SKO	South Korea
TAI	Taiwan
UK	United Kingdom
UMSR	Universe Minimum Size Requirement
US	United States (see also USA)
VAR	Vector Auto regression
WFE	World Federation of Exchanges

DEFINITION OF TERMS

Cointegration: The existence of a statistically significant connection between two-time series which have the same order of integration (Roll, 1992).

Developing Stock market: A stock market whose host-country is economically classified as Emerging or Frontier according to macroeconomic variables. It is generally a low-income country (Carl, 2006).

Financial market Contagion: Transmission of economic shocks from one financial system to another, shortly (Aguilar & Ringenberg, 2011; Dornbusch et al., 2000).

Financial market integration: Regionalization, economic and/or political grouping or merger of trading systems (Chaudhuri, 1997)).

Financial market segmentation: Stratification of financial markets according to geopolitical orientation (Heaney, 2001).

Financial sector development: Industrial structure that defines financial market linkages explaining the correlations among international stock markets according to the host country level of economic development (Yarde, 2006).

International Portfolio Investment: Buying or acquiring of assets in stock markets in different countries or regions so as to take advantage of the possibility of abnormal returns due to market segmentation, the participation in

	the growth of other foreign markets, hedging of the financier's consumption basket and diversification effect (Bartram & Dufey, 2001).
Investment Diversification:	Putting investment in different risk-return financial assets or markets (Eaton, 2014).
Passive investment:	Putting investable funds in stock market indexes rather than in portfolios constructed by other means, since only a few fund managers can consistently beat the market over extended periods of time (Lewis, 2019).

ABSTRACT

Frustrated by inconsistent returns, the time requirements to effectively implement strategies and inability of even the most seasoned managers to consistently beat the market, securities traders have in recent years turned to professional portfolio management through index investing. Evidence affirms that market index investing fully diversifies unsystematic risk so that the only concern is systematic risk reduction, to which object, developing stock markets have gained preference in recent years. To diversify this type of risk, empirical studies have not presented generalizable patterns of index comovement. This study sought to analyze the determinants of international portfolio investment risk diversification in developing stock markets. To achieve this, the study postulated the following questions: - What is the effect of financial market development level on international portfolio investment risk diversification in developing stock markets? What is the effect of financial market integration level on international portfolio investment risk diversification in developing stock markets? What is the effect of financial market contagion level on international portfolio investment risk diversification in developing stock markets? What is the effect of financial market segmentation level on foreign portfolio diversification in developing stock markets? From a sampling frame of 43 developing stock markets, the study constituted a sample of 20 markets obtained through non-probability multi-stage sampling. Using a data capture sheet, the study collected Time Series index sourced from Wall Street Journal. All the sample market index time series were benchmarked on Financial Times Stock Exchange Index 100 (FTSE 100) for computation of passive risk, based on Roy's Safety-First Ratio (RSFR). The main analysis technique of this study was the classical linear regression model to judge the predictive significance of the regression coefficients to test the corresponding null hypotheses that: Financial market development level has no significant effect on international portfolio investment risk diversification in developing stock markets, Financial market integration level has no significant effect on international portfolio investment risk diversification in developing stock markets, Financial market contagion level has no significant effect on international portfolio investment risk diversification in developing stock markets; Financial market segmentation level has significant effect on international portfolio investment risk diversification in developing stock markets. In order to ready the data for the hypothesis tests, the benchmark returns were visually inspected through computation of descriptive and diagnostic statistical tests. so that for the first objective, market development rankings were summarized into frontier and emerging, then the Mean and Standard deviation of returns computed, followed by One-Way ANOVA test of return differences and correlation ratio, pre-analysis for objective two used correlation analysis to capture short run dynamics and cointegration analysis for the long run, objective three employed Volume-Volatility Granger causality tests across July 7th 2007 crisis date to determine the spillover patterns, then for the fourth objective, One-Way ANOVA and Kruskal-Wallis test of independent samples were the pre-analyses. The methodology for data presentation included exploratory tables, and the final analysis was done using Ordinary Least Squares (OLS) regression analysis of International Investment Portfolio risk diversification level, first on each independent variable and overall on all of them, with hypotheses tested at 5% significance level. The study found financial market development level to be consequential, financial market integration level, financial market segmentation levels to have disparate effects and financial market integration level to be effective in the short run but, with mixed long run dynamics. The study recommends conservative use of the determinants in combination with further research focused on investor behavioral characteristics.

CHAPTER ONE

INTRODUCTION

1.1 Background

Today's investment environment presents a multitude of challenges to advisers that necessitate embracing a new approach to portfolio construction. Since the markets are more complex, fast moving and unpredictable and investors' general objectives are to increase the value of portfolios and reduce the risk of losses, diversification is the buzz word (Murphey, 2016). In diversification, when one asset declines in value, other assets increase protecting against overall losses. The backing of study on diversification is mainly because a specific stock market will reflect the economic conditions of an economy. According to Pettinger (2018), If an economy is growing, then output will be increasing and most firms should be experiencing increased profitability. This higher profit makes the company shares more attractive – because they can give bigger dividends to shareholders. A long period of economic growth will tend to benefit shares. Conversely, if the stock market predicts a recession, then share prices will generally fall – in anticipation of lower profits. If the economy is forecast to enter into a recession, then stock markets will generally fall. This is because a recession means lower profits, fewer dividends and even the prospect of firms going bankrupt, which would be bad news for shareholders and in a period of uncertainty, investors may prefer to buy bonds for the greater security, avoid shares, because of the greater risk involved. Moreover, stock market study is important since in this investment cluster, most of the significant asset classes (Stocks of companies dealing in commodities, cash/currency, fixed income securities, real property and alternative investments are represented, through securitization. The construction of stock market indices takes to account those classes that historically reflect economic performance, so that index performance is a proxy of economic performance.

1.1.1 Justification for studying stock markets

Evidence in history suggests that there are three reasons in support of investing in stock markets, all founded on stock market-economic growth causality. These include corporate profits, anticipation effects and interest rates.

Regarding anticipation effects, Pettinger (2018) terms stock markets as forward-looking. The stock market may already have priced-in the effect of the recession and now the stock market is anticipating a recovery.

World stock markets for instance performed badly in 2007 and 2008 in anticipation of a US recession, but during a long period of economic stagnation, stock markets might do better than expected because they are recovering former losses.

Secondly, since the 2008 credit crunch, company profit become a bigger share of national income such that despite low economic growth, firms have been able to increase profitability. This has been attributed to factors, such as the monopoly power of large IT firms, such as Apple, Google and Microsoft. Therefore, despite relatively weak economic growth, publicly listed companies, are still attractive to shareholders because they have retained their profitability, and even increased it faster than GDP growth (Oltheten & Waspi, 2012).

A third factor that enhances evidence of relationship between stock market and economic performances is interest rate according to Tomasz (2018). Due to ultra-low interest rates in Europe in 2016 for instance, there was increased investment in government bonds with negative yields. This means investors were buying bonds – even though, they lose money because of negative interest rates. This is because, in that climate, investors were pessimistic about the fortunes of the economy. With great uncertainty in the economy, investors are happy to buy bonds for the security they offer – even though they have very poor returns. Because of ultra-low interest rates, shares became relatively more attractive. Investors are willing to buy shares,

despite the threat of recession, because they at least have a good yield compared to bonds (Miziolek, 2018). Stock market index construction also considers economy-wide view of constituents and hence the suitability of the indexes as a barometer for economic performance.

Stock market index is key to investing, as the index performance is representing economic growth due to the number and diversity of its constituents. This aspect justifies the use of stock market indices as the baseline for inter-market economic wellness comparison for two reasons-index construction process and the scope (composition of the index). The first reason that makes stock market study critical to investing is that stock market index constitution is an important pointer to critical information about inter-country development differences, meaning that using a market index, one has a vantage view of the home-country economic activity.

According to Tomasz (2018) the index construction process considers nation-wide factors: - First is the dynamic development of various forms and methods of investing in the financial market, especially collective investment institutions (including investment funds), which generally use financial indexes to construct their benchmarks (except for hedge funds and some traditional and alternative investment funds).

Secondly, the providers consider the emergence (or dissemination) of new financial instruments based on index derivatives and the development of exchange-traded and over-the-counter (OTC) derivatives (including mainly index futures, index options and index swaps). Market indexes are used as reference rates embedded in structured products and index-based derivatives (Novick et al., 2016).

Thirdly, there has been a growing interest in new classes of assets – both financial (like currency) and non-financial (like commodities; real estates) – and the emergence of completely new areas of investment in exchange and OTC markets (like emotional investments), which imposes the creation of the indexes designed to

reflect the situation in these markets. Fourth, the development of electronic trading platforms that enable, inter alia, "index trading" (through such financial instruments as contracts for difference-CFD). Fifthly, there is a growing specialization in financial markets, which necessitates the creation of indexes for new, often niche, financial market segments and investment strategies. Secondly, index composition is done according to economic subsectors: Good investable sectors in a national stock mart index are also represented by stable constituents so that national shocks are not significant to investor gains, given the effects of portfolio reconstitution by the regulators.

Two benchmark index providers stand prominent in the stock index construction industry-the Morgan-Stanly-held MSCI (Morgan-Stanley Capital International) and the UK-based FTSE (Financial Times Stock Exchange) indexes. Description of most of the index characteristics can give vital ground in support of their use as target investments or investment benchmarks.

Morgan Stanley Capital International (MSCI) benchmark provider: - Founded in 1968 (by Morgan Stanley Holdings) as a main investment segment markets benchmark provider, Morgan Stanley Capital International (MSCI), constructs its indexes following Global Investable Index Methodology (GIMI). Accordingly, it is now possible to have indexes constructed by an index provider such as MSCI, according to the predictive sector weights, based on economic performance of the host country.

The MSCI Global Investable Indexes (GIMI) Methodology is a comprehensive and consistent approach to index construction that allows for meaningful global views and cross regional comparisons across all market capitalization size, sector and style segments and combinations (MSCI, 2019). This methodology aims to provide exhaustive coverage of the relevant investment opportunity set with a strong emphasis on index liquidity, investability and replicability.

The index is reviewed quarterly-in February, May, August and November—with the objective of reflecting change in the underlying equity markets in a timely manner, while limiting undue index turnover. During the May and November semi-annual index reviews, the index is rebalanced and the large and mid-capitalization cutoff points are recalculated. In re-evaluating the index providers use Factor Box methodology, a standard method for evaluating and reporting the Factor characteristics of equity portfolios. The methodology consists of Factor Groups (such as Value, Size, Momentum, Quality, Yield, and Volatility) that have been extensively documented in academic literature and validated by MSCI research as key drivers of risk and return in equity portfolios.

These Factor Groups are constructed by aggregating 16 factors (such as Book-to-Price, Earnings/Dividend Yields, Long term (LT) Reversal, Leverage, Earnings Variability/Quality, Beta) from the latest Barra global equity factor risk model, designed to make fund comparisons transparent and intuitive for use. The MSCI Factor Box provides visualization designed to easily compare absolute exposures of funds/indexes and their benchmarks along 6 Factor Groups that have historically demonstrated excess market returns over the long run. MSCI covers 11 different sectors- that move the economies of different countries, with quarterly rebalancing and reconstitution of the index portfolios according to universal indicator checklists.

The sectors normally include Financials, Information technology, Communication services, Consumer discretionary, Energy, Materials, Consumer staples, Industrials, Real estate, Health care and Utilities. The subsectors have variable weights at different construction times, concordant with the economic environment indicators. The following excerpt shows a MSCI sample of subsector weightings in January 2019.

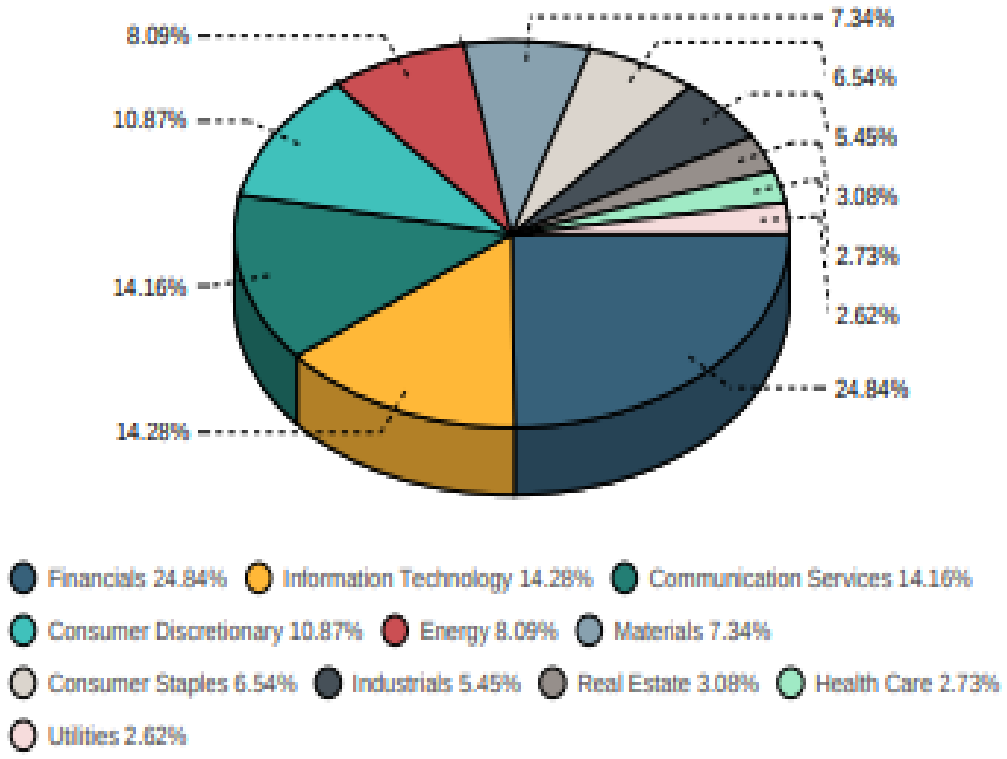

Figure 1.1: MSCI Index subsector breakdown

Source: MSCI (2019)

Financial Times Stock Exchange (FTSE): - The FTSE index, considers similar factors and applies the loadings to its indexes. Dissimilar to MSCI, it has 19 sub-sectors spread across specific-country economic segments following FTSE Industry Classification Benchmarks (ICB).

These are Oil and Gas, Chemicals, Basic resources, Construction and materials, Industrial goods and services, Automobile and parts, Foods and beverages, Personal and household, Healthcare, Retail, Media, Travel and Leisure, Telecommunication, Utilities, Banks, Insurance, Real Estate, Financial services; Technology, with 101 constituents with subsector weights coinciding with the subsectors' representation in the economy. This covers over 1.760 of the 2.180 trillion British Pound-market

capitalization as of 2019, a staggering 81 percent of the total market capitalization as the ensuing table presents.

Table 1.1: FTSE – ICB Subsector Breakdown

		FTSE 100			FTSE All-Share		
ICB Code	ICB Supersector	No. of Cons	Net MCap (GBPm)	Wgt %	No. of Cons	Net MCap (GBPm)	Wgt %
0500	Oil & Gas	4	300,905	17.14	16	309,167	14.18
1300	Chemicals	2	11,894	0.68	8	17,136	0.79
1700	Basic Resources	8	150,925	8.60	19	158,405	7.27
2300	Construction & Materials	2	26,048	1.48	15	34,317	1.57
2700	Industrial Goods & Services	14	123,193	7.02	88	207,312	9.51
3300	Automobiles & Parts	-	-	-	2	1,150	0.05
3500	Food & Beverage	3	83,344	4.75	17	95,368	4.37
3700	Personal & Household Goods	9	195,483	11.13	24	208,714	9.57
4500	Health Care	5	158,993	9.06	20	173,751	7.97
5300	Retail	7	51,628	2.94	33	74,414	3.41
5500	Media	7	71,567	4.08	19	79,006	3.62
5700	Travel & Leisure	9	76,776	4.37	39	104,180	4.78
6500	Telecommunications	2	56,332	3.21	6	59,931	2.75
7500	Utilities	5	58,041	3.31	8	63,139	2.90
8300	Banks	5	223,794	12.75	10	230,237	10.56
8500	Insurance	8	92,926	5.29	16	105,023	4.82
8600	Real Estate	3	18,221	1.04	57	58,777	2.70
8700	Financial Services	6	42,861	2.44	223	178,488	8.19
9500	Technology	2	12,840	0.73	17	21,854	1.00
Totals		**101**	**1,755,773**	**100.00**	**637**	**2,180,369**	**100.00**

Source: FTSE (2019)

1.1.2 Market Index investing as a core strategy

Contrary to past perceptions about investment in individual stocks, index investing is now common, as it is passive. Lewis (2019) opines that frustrated by inconsistent returns and the time requirements to effectively implement either a fundamentalist or speculator strategy, many securities buyers have in recent years turned to professional portfolio management through mutual funds.

According to the Investment Company Institute's Profile of Mutual Fund Shareholders, (2015), almost 91 million individuals owned one or more mutual funds by mid-2015, representing one-fifth of households' financial assets. According to the institute, only a few fund managers can consistently beat the market over extended periods of time and "…very few professional investors have actually managed to outperform the rising market over those years [2010-2015]" Somer (2015).

Quoting Bogle (1949), Lewis (2019) emphasizes the preference of market index investing because of four reasons:- Investors as a group cannot outperform the market because they are the market, Investors as a group must under-perform the market, because the costs of participation – largely operating expenses, advisory fees, and portfolio transaction costs – constitute a direct deduction from the market's return; Most professional managers fail to outpace appropriate market indexes, and those who do so rarely repeat in the future their success in the past.

According to Hilbert (2008), there was once a small number of fund managers with genuine market-beating abilities, as judged by having past performance so good that their records could not be attributed to luck alone. But virtually none remain today. Accordingly, Index funds are the only rational alternative for almost all investors, according to the findings.

Lewis (2019) gives a list of investment experts vouching for passive investment as follows: - Warren Buffett (1996)-The Sage of Omaha, in his 1996 Berkshire Hathaway shareholder letter, wrote, "Most institutional and individual investors will find the best way to own common stock is through an index fund that charges minimal fees." , Charles Ellis (2014)- Writing in the Financial Analysts' Journal in 2014, Ellis said, "The long-term data repeatedly document that investors would benefit by switching from active performance investing to low-cost indexing.", Peter

Lynch (1990)-Described as a “legend” by financial media for his performance while running the Magellan Fund at Fidelity Investments between 1977 and 1980, Lynch advised in a Barron’s April 2, 1990 article that “most investors would be better off in an index fund.”; Charles Schwab -The founder of one of the world’s largest discount brokers, Schwab recommends that investors should “buy index funds. It might not seem like much action, but it’s the smartest thing to do.”

The foregoing accounts establish that stock market profits can be elusive, especially in the short term. As a consequence, those seeking to maximize their returns without incurring undue risk constantly search for the perfect strategy to guide their activity. Thus far (Somer, 2015), no one has discovered or developed an investment philosophy or strategy that is valid 100% of the time. Investment gurus come and go, praised for their acumen until the inevitable happens and they join the roster of previously humbled experts. Nevertheless, the search for a perfect investment philosophy will continue (Hilbert, 2008).

1.1.3 In-country investment diversification

Success in investing is contingent upon diversification, since investment diversification is one of the basic building blocks of a solid portfolio. Diversification is the fancy name for the advice: Don't put all of your eggs in one basket. This is the basic principle behind asset allocation, a key element of portfolio diversification. Wohlner (2013) defines investment diversification as "a portfolio strategy combining a variety of assets to reduce the overall risk of an investment portfolio”.

According to The Cooperate Finance Institute-CFI (2019), this variety (classes) of assets has five components which are equities, cash or cash equivalents, fixed income securities, Real estates and Derivative contracts as in the forgoing explanation.

The purpose of in-country investment diversification is to reduce unsystematic risk. It is an effort toward ratifying the argument against putting all eggs in one basket. If one invests in only one asset category, or one individual stock, the investment will be exposed to the full extent of a possible loss. According to Faulkenberry (2019), investments in a country's environment face unsystematic risk, which is diversifiable and can be nearly eliminated through investment diversification. It follows that, unsystematic risk is specific to an individual investment or industry and is not correlated with the market, therefore failure to participate in diversification means taking unnecessary risk that will not be compensated for.

Investor expectations are important cursor to diversification benefits. If the prior expectations of the returns on all assets in the portfolio are identical, the expected return on a diversified portfolio will be identical to that on an undiversified portfolio. Some assets will do better than others; but since one does not know in advance which assets will perform better, this fact cannot be exploited in advance (Goetzmann, 2019).

The return on a diversified portfolio can never exceed that of the top-performing investment, and indeed will always be lower than the highest return (unless all returns are identical). Conversely, the diversified portfolio's return will always be higher than that of the worst-performing investment. So, by diversifying, one loses the chance of having invested solely in the single asset that comes out best, but one also avoids having invested solely in the asset that comes out worst (as in Somer, 2015). That is the role of diversification: it narrows the range of possible outcomes. Diversification need not either help or hurt expected returns, unless the alternative non-diversified portfolio has a higher expected return.

Regarding portfolio size and diversification efficiency, John and Stephen (2019) say: “The essence of investment diversification is to achieve a return and risk level that is plausible to the investor and there is no magic number of stocks that is diversified versus not. Sometimes quoted is 30, although it can be as low as 10, provided they are carefully chosen”. Similarly, Lorie et al. (1985) reported that most value from diversification comes from the first 15 or 20 different stocks in a portfolio; more stocks give lower price volatility. Statman (1987) and Ross (1999) recommended maximum diversification, also known as "buying the market portfolio" but cautioned that identifying that portfolio is not straightforward.

Anecdotal evidence suggests that diversification has no maximum so long as more assets are available (Statman, 1987). The earliest definition comes from the capital asset pricing model which argues the maximum diversification comes from buying a *pro rata* share of all available assets. This is the idea underlying index funds. Every equally weighted, uncorrelated asset added to a portfolio can add to that portfolio's measured diversification. When assets are not uniformly uncorrelated, a weighting approach that puts assets in proportion to their relative correlation can maximize the available diversification (Lioudis, 2018).

Following Markowitz’s Modern Portfolio Theory (MPT), Elton and Gruber (1977) worked out an empirical example of the gains from diversification. Their approach was to consider a population of 3,290 securities available for possible inclusion in a portfolio, and to consider the average risk over all possible randomly chosen n-asset portfolios with equal amounts held in each included asset, for various values of n. Their results are summarized in the following table. The result for n=30 was close to n =1,000, and even four stocks provide most of the reduction in risk compared with one stock. The findings follow in Table 1.2.

Table 1.2: Portfolio Size versus Standard Deviation

Number of stocks in portfolio	Average S.D. of portfolio returns%	Ratio of portfolio S.D. to S.D. of a single stock.
1.	49.24	1.00
2.	37.36	0.76
30	20.87	0.42
400	19.29	0.39
500	19.27	0.39
1,000	19.21	0.39

Source: Adopted from Elton and Gruber (1977)

From Table 1.2, it is plausible to conclude that, although it does not guarantee against loss, diversification is the most important component of reaching long-range financial goals while minimizing risk. This is the main reason why country stock markets have indexes constructed using professionally-scrutinized methodology, one could say that they achieve maximum diversification of synchratic (unsystematic) risk.

Lioudis (2018) identifies two types of risk on the basis of diversification. The first is Company-specific risk, which is diversifiable - This risk is also known as "unsystematic risk," and it is specific to a company, industry, market, economy, or country; it can be reduced through diversification. The most common sources of unsystematic risk are business risk and financial risk. The aim is thus to invest in various assets so that they will not all be affected the same way by market events. Conversely, there is systematic risk, which is undiversifiable. Similarly known as "systematic" or "market risk," undiversifiable risk is associated with every company. Common causes are things like inflation rates, exchange rates, political instability, war, and interest rates.

This type of risk is not specific to a particular company or industry, and it cannot be eliminated or reduced through diversification; it is just a risk that investors must accept (Beattie, 2011).

1.1.4 International Investment Diversification

Interest in analyzing the potential gains to investors through international portfolio diversification has gained much attention in recent years. This interest has been motivated by prevalence of international diversification benefits to differing extents, depending on investor characteristics.

The benefits of international portfolio diversification differ across countries from the perspective of a local investor where they are presumed to be the largest for investors in developing countries, when controlling for currency effects. Most of the benefits are obtained from investing outside the region of the home country.

There is extensive empirical evidence to support Markowitz's theory that investment across the globe reduces portfolio risk levels. According to Carl (2006), these global diversification benefits remain large when controlling for short-sales constraints in developing stock markets. International portfolio diversification benefits appear to be largest for countries with high country risk and vary over time as country risk changes. Cumby and Glen ((1990) cited in Aiello and Chieffe (1999) find superior returns are gained by internationally diversified investment funds.

Diversification is asset allocation and consideration of different industry sectors, where assets are organized into classes such as equities (shares), property, cash and fixed-income securities including bonds thus splitting investable funds split multiple asset classes to help balance risk and potential rewards. Industry perspective is also critical. In addition to balancing asset classes, different market experts recommend balancing investments across different industry sectors.

Typical sectors include resources (such as iron and gold), financials (such as commercial banks), and communications (Telecommunications), energy (such as oil and gas); technology. This helps balance the normal ups and downs these sectors may experience, and their impact on portfolio risk and return.

A principal determinant of foreign portfolio construction is home country bias, which accounts for different investment weights to total portfolio value for different countries. Countries reported to have great home country bias by the end of 2017 included the United States (with 79.1%), Australia (66.5%), Canada (59%), Japan (55.2%) and United Kingdom (26.3%), the percentages representing ratio of home country investment value to total value of stocks (Perry, 2017). This information is in Figure 1.2.

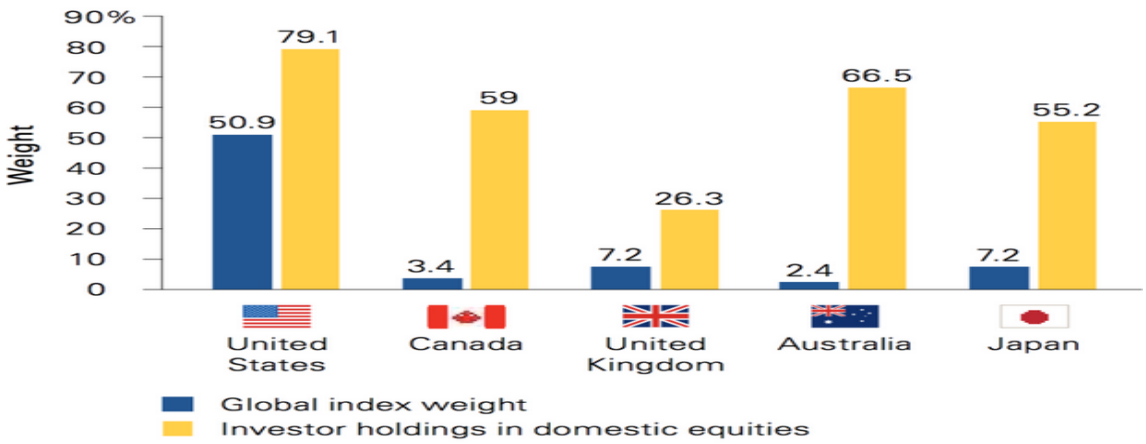

Figure 1.2: Global and Home-country Investments

Source: MSCI (2017)

Perry (2017) argues that despite home-country bias being dominant in some countries, it is not sustainable in the long run, that globally-diversified investment will make more sense. The reasoning is that due to country-specific factors, diversification benefit should be differential. A look at the global market performance for quarter 3 of 2017 will for instance attest to the lack of generality on

equity investment performance for various reasons. First, countries are in different points in the economic or business cycle**,** so that future market returns can vary depending upon where a country is in the economic or business cycle.

Secondly, countries are in different political environments, where elections, domestic politics, and foreign affairs can all influence stock market performance, and countries may be experiencing relative political calm or turmoil at any given time.

Thirdly, markets have different exposures to risk factors: external events affect countries differently, for instance, all else being equal, rising oil prices hurt the economy of an oil importer (like Japan) while helping the economy of an oil exporter (like Saudi Arabia.). Fourthly, Markets have different market sector concentrations: market performance is heavily influenced by which sectors are in or out of favor, and national markets have sector concentrations that vary widely, for instance, many Canadian and Australian companies focus on natural resources, while Taiwan and South Korea are dominated by information technology.

Fifthly, there exist different valuation and sentiment levels: at any given time, some countries will be in a bull market and others in a bear market. Future market performance can vary greatly, depending upon the starting point from the perspective of valuation and sentiment.

1.1.5 Investment Diversification in Emerging markets

From financial analysts' records, Emerging markets are a great investment destination. "They have been one of the hottest investment areas since the early 2000s, with new funds and new ways to invest popping up all the time" but, "while there is no doubt that huge gains await investors that can find the right emerging market investment at the right time, the risks involved are sometimes understated" (Beattie 2011). Litterman (2004) shows more specifically that investment in the

Emerging markets is likely to reduce a portfolios total risk. Moreover, Zimmerman et al. (2003) recommend allocation of at least 6 percent in the Emerging markets, to benefit from the rapid economic growth in the region. Speidell and Sappenfield ((1992) cited in Aiello (1999) maintain that developed countries, unlike emerging markets, move in close tandem with each other and therefore provide less diversification.

A study by Aiello and Chieffe (1999) also finds that diversification in the Americas Free Index provides the lowest standard deviation of returns. However, the authors also note that the emerging markets are characterized by high volatility due to asset and sector concentrations, small markets, insider trading and poor information.

Regardless of the performance factors a market is facing, evidence suggests that developed markets perform less preferably than developing ones in terms of index returns (but experience moderate risk), while developing market returns can be extreme, making them more volatile. This can be explained in Figure 1.3.

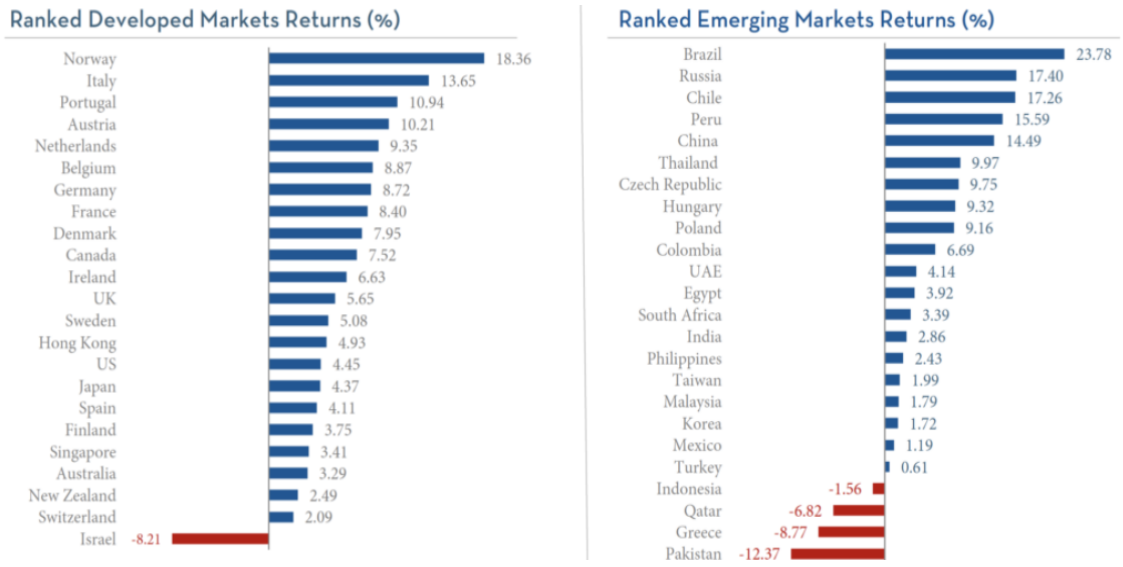

Figure 1.3: Equity Market Index Performance by Country

Source: MSCI (2017)

The evidence in Figure 1.3 points out that emerging markets have wide swings in average returns and so, following Modern Portfolio Theory (MPT), are the investment variances too. For an equally-weighted portfolio hence the same risk level has different rewards, with the best and the worst coming from emerging markets, like Brazil and Pakistan respectively. Since with great variances come higher chances of abnormal returns from developing markets than in developed ones, it is worthwhile to explore these chances while trying to minimize downside risk via international investment diversification.

1.1.6 Return correlations in international stock markets

On 19th October 1987, the Hong Kong market plummeted and then partially rebounded (Bordo & Morshid, 2000). These movements were mirrored in markets in North America, South America, Europe, and the rest of Asia. This was the day when stock markets around the world crashed, shedding a huge value in a very short time (Aguilar & Ringenberg, 2013). The crash began in Hong Kong and 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 by 508 points to 1738.74 (22.61%), and the crash quickly affected major stock markets around the globe (Zwaniecki, 2007).

In December 1994, the Mexican market cratered, and this plunge was quickly reflected in other major Latin American markets. This was the Mexican Tequila effect (De Gregorio & Rodrigo, 2001). In 1997, 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 contagious events on the 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 (Krugman et al., 2013).

From the MSCI (2016) statistics, the 2007/8 sub-prime mortgage crisis caused a 53% dip in the developing markets composite index performance, a 20-year low, against a 19% fall in the All-Country World Index over the same time. As further recorded in the market data series of Wall Street Journal (WSJ, 2016), developing markets were affected to different extents by the financial crisis under study. While Pakistan gained over 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%).

This evidence suggests that movements in one stock market can have a powerful impact on markets of very different sizes and structures throughout the world, in both the short and long run planning horizons. Moreover, the vulnerability of different countries to the effects can be diverse, occasioning spillover effects to other economic sector variables. This vulnerability is triggered by the level of international stock market comovement (Claesens & Forbes, 2009). International stock market comovement is in turn dependent on purchasing power disparity and international arbitrage on financial assets (Eaton, 2014; Field & Cobb, 2006), such that arbitrage activity-the search of riskless profit-eliminates diversification benefit in the short run.

Following Baumol (1997) and Krugman et al. (2013), international asset prices converge to long run equilibrium due to arbitraging thus obeying the law of one price. Financial literature also suggests that arbitrage and conformity to the law of one price do not eliminate the risk of international investments. The risk can be hedged (neutralized) or diversified away (Eaton, 2014; Collins & Biekpe, 2003), though hedging limits upside profit potential through derivative contracts.

Diversification (which is purely speculative) is therefore preferred by many passive investors. According to Markowitz (1952, 59), diversification among markets having imperfectly correlated returns is an effective way to reduce portfolio risk without impairing the portfolio's expected return.

1.1.7 Determinants of international Stock Market Comovement

Over the last score, International Portfolio Investment (IPI) diversification has gained such a level of popularity as to attract students both from the investment and scholarly worlds. The drawing power of international portfolio investment is based on (a) the possibility of abnormal returns due to market segmentation, (b) the participation in the growth of other foreign markets, (c) hedging of the financier's consumption basket and (d) diversification effect (Bartram & Dufey, 2001). At the centre of these IPI allure principles is the core determinant of whether to diversify and to what extent or not- correlation of returns, which is most desirable when negative. Since it is rare to find negatively-correlated returns, the investment decision will be made on the lowest possible correlation.

This is the drive towards international portfolio diversification. Following empirical evidence on stock market comovemnents and international portfolio diversification, four classes of studies emerge.

Those based on the possibility of return and risk differences because of market segmentation, others on the stages of economic development, the third on market integration and finally, those studies based on market contagion. The latter two are centered on diversification effect.

The first class of empirical studies centers market segmentation as critical determinant of risk diversification. Common findings in this study category point to the effect that market segmentation especially on geopolitical factors is useful to international investors due to factors like monetary policy dilemma.

Although different in their design, scope and study methods, studies such as Bekaert (2005), La Porta (1998) and Jorion and Schwartz (1986) concurrently arrive at the finding that market segmentation is a chief determinant of diversification effect. The studies cite institutional rigidities, law enforcement mechanisms and differential quality of financial services to have the capacity to absorb exogenous shocks. In the same line of findings are Caesar (2016), Heaney and Hooper (2001).

A contrary set of findings is postulated by Fischer (1995) with the assertion that market segmentation does not utterly promote or diminish international portfolio investment diversification and is therefore not a decision basis. Other studies (Mwega, 2009; Claesens & Forbes, 2006; Cobb, 2006) insist on no effect.

The second group of empirical studies on stock market dependency and international portfolio investment diversification is founded on economic development differences of the markets' host country. Despite their differences in sampling focus, time horizon and analyses, these studies are three-stranded on the basis of findings.

While some (for instance Corhay & Urbain, 1993) find no relationship between economic or financial market development level and international portfolio investment diversification, others (such as Mathur & Subrahmanyam, 1990) conjecture partial effect, others still (like Christofi & Christofi, 1983) find a negative relationship between the two variables while the rest (like Roll, 1992) find that markets' industrial structure influencing investment diversification disparately. The latter finding is supported in a study by MSCI (2017) in which developing markets post superior returns at higher risk compared to developed ones

The third foundation of empirical literature is financial market integration and international portfolio investment diversification, on which a host of researches emerge. Within this category are 3 divergent sets of study results, though again, derived from a diverse background of research settings. One group (for instance Elizaberta & Tung, 2015; Collins & Biekpe, 2003) have study results that do not find

evidence of market segmentation effect on international portfolio investment diversification, mainly due to effects of industry structure while the second, presented by Naiime (2001); Hellstrom et al. (2014); Suva (2014); Aviral (2014) find unpredictable evidence, with some relationships working partially- on the basis of investment time horizon. In these evidences, market integration is found to positively influence investment diversification in the short run only.

The last face of this study classification is presented in works such as Beine and Candelon (2006); Liu (2016), according to which financial market integration diminishes international investment diversification prospects due to reduced price jumps.Financial market contagion is also apparent in financial literature as another determinant of investment diversification. Forbes and Rigobon (2002) argued that "...if two markets show a high degree of comovement during periods of stability, even if the markets continue to be highly correlated after a shock to one market, this may not constitute contagion. According to this paper's definition, it is only contagion if cross-market comovement increases significantly after the shock. If the comovement does not increase significantly, then any continued high level of market correlation suggests strong linkages between the two economies that exist in all states of the world".

Past studies in this aspect of financial market contagion yield results which are cannot be generalized. While some researches (Longin & Solnik, 1995; Tse, 2000; Tse & Tsui, 2002) affirmatively associate financial market contagion with diminished risk/return prospect in international diversification, a partial counter-argument is posted by researches such as Zouheir and Faysal (2013); Calvo and Reinhart (1995); Esin (2004), who posit that financial market contagion is not the sole determinant of risk- return comovement in international portfolio investments- that there were others like economic grouping. The latter set of studies hence establishes a partial relationship. Niklas and Thong (2012), Modi and Patel concur with an influence relationship, a position disputed by Ng (2000); Lee and Rui

(2000); Yang and Hu (2000). A final group of researchers (King & Wadhwani, 1990; Mwega, 2009; Stewart & Kabundi, 2011) finds that financial market contagion situations have effects to differing extents on international portfolio investment diversification due to contextual factors. This last group therefor offers varying effects regardless of the market integration situations, so that investors cannot rely on one integration result to make decision on a separate investment.

1.1.8 Market return benchmarking-FTSE versus MSCI

The importance of benchmarking in investment management is indubitable, according to Global investment standard III (C). According to Eaton (2014) failure to benchmark returns makes it difficult to comparatively analyze market sets, since gross returns do not control for portfolio size and their variations are not standardized to make them comparable.

According to the author, a suitable measure would be one with tracking error component, such as Roy's Safety-First Ratio, Tracking Error and Treynor measure. Roy's Safety First (RSF) ratio on a benchmark is justifiable in that first, it is standard financial practice and second, it is a tracking measure (Dominique, 2019). If a portfolio of market indices has a higher RSF, then the risk per unit of return harvested is either unnecessary or too much. Accordingly, including that portfolio into the investor's investment basket will only serve to increase the risk level, for an equally-weighted basket (Dominique, 2019).

$$RSFR = \frac{R_p - R_B}{\delta_p}$$

Where R_p, R_{B_r} and δ_p were respectively the expected returns on the index portfolio in, the expected return of a benchmark portfolio and the standard deviation of the returns of the portfolio invested in.

Chris (2012) proposes the introduction of a benchmark according to its performance history and suitability to markets including portfolio characteristics.

Comparative studies (including Chris, 2012; Dominique, 2019; Norges Bank Investment Management-NIBM, 2014) between choice of FTSE and MSCI as benchmarks point at similarities such as comprehensiveness of construction methodology, asset class scope and maintenance of the indexes and insignificance of performance differences.

According to NIBM (2014), the indexes are the oldest and warrant choice, only based on trivial differences like publicity, costing and brand awareness.

Figure 1.4: MSCI versus FTSE performance excerpt

Source: Dominique (2019)

The studies concurrently document that ultimately, both returns-based and holdings-based performances convergence in the risk/reward relationship between the two global benchmarks, possibly driven by a market consensus on "best practice" for global equity benchmark construction (Chris, 2012).

Conversely, NIBM (2014) and Dominique (2019) fault the indifference between the two benchmarks. According to the former critic, the duration between June 2005 and March 2013 had some performance differences where FTSE outperformed MSCI from a return-risk perspective, due to dissimilar picking of benchmark constituents. NIBM (2014) also determine that MSCI had to address the anomaly in 2007 to emulate FTSE in process and this has hitherto synchronized their performance. FTSE has therefore been steadier. Besides, a comparative scrutiny of the ensuing table establishes that FTSE has a greater number of shares in its composition and hence more robust than MSCI.

Table 1.3: MSCI and FTSE: Number of Shares by Index

Region	MSCI	FTSE
All-World	2787	3211
Developed market	1636	2193
Emerging market	1151	1018
Europe	443	594
Japan	322	520

Source: Summary from MSCI; FTSE (2019)

1.2 Statement of the Problem

Internationally-diversified portfolios are attractive risk reduction investments since they are more likely to move somewhat independently from each other, as opposed to those in a domestic portfolio. Founded on the article by Grubel (1968) and furthered by Levy and Sarnat (1970); Solnik (1974), the theory determines that securities held in a domestic country portfolio will tend to move in a highly synchronized manner in which situation, with systematic risk largely undiversified.

This ratification of International Portfolio Investment (IPI) risk diversification is coupled with two questions-that of how (using which strategy) to invest, and where (in which markets to do so).

Regarding the question of how to diversify investment risk in international portfolios, one will face the choice of active or passive strategy, the former being manager-based portfolio construction and the latter, simply tracking the market portfolio (index investment). According to Somer (2015), most (active) professional managers fail to outpace appropriate market indexes, and those who do so rarely repeat in the future their success in the past. Hilbert (2008) says that there was once a small number of fund managers with genuine market-beating abilities, as judged by having past performance so good that their records could not be attributed to luck alone, but virtually none remain today. Accordingly, Index investing remains the only rational alternative for almost all investors, according to the findings.

Lewis (2019) gives a list of investment experts vouching for passive investment to include Warren Buffet, Peter Lynch, Charles Ellis and Charles Schwab. From this literature, index investment is thus the strategy to pursue. It is also supported by other two grounds: first, a national stock market index represents all material industries and their characteristics and so the market portfolio is diversified enough.

The second ground to back index investing is that stock market indices are constructed using methodologies that engulf all considerable volatility and weighting factors, such as the Global Investable Market Index (GIMI) methodology by and Industry Classification Benchmarks (ICB), which are used by all index providers. Since market indexes have low return and risk levels compared to actively constructed stocks, they are the ideal passive investment target. An investor can either take out index derivatives or indirectly buy traches in an index mutual fund, have passive returns for a given systematic risk level, avoiding the mostly fruitless active portfolio construction strategy (Lewis, 2019; Somer, 2015).

The second concern of an international portfolio investment risk diversifier is the markets in which to invest, Errunza (1970), Errunza and Losq (1971) all the way to Canover et al. (2002) present evidence that optimal IPI diversification should include securities from developing markets, as the markets offer superior returns and risk reduction benefits compared to their developed counterparts. This evidence has been countered in other works like McCormack and Perdue (1999) and Bekaert (1999). This divergence of findings has made the study of emerging markets particularly attractive to researchers and also the motivation behind this study.

According to Modern Portfolio Theory (MPT), the risk of an investment depends on the degree of asset return correlation (Markowitz, 1952, 59;99), where market coupling diminishes diversification benefit especially in crisis periods. Asset return correlations in addition determine the extent to which the shocks are transmitted (Dornbusch et al., 2000) and can be caused. Holding an international equity index portfolio would thus require the investor to determine equity index comovement patterns occasioned by different idiosyncrasies. Accordingly, the study of equity market difference determinants becomes critical. Empirical literature suggests there are at least 4 critical determinants of international investment diversification decision. These include the level of financial market integration as found in studies by Neaime (2001); Elizabeta and Tung (2015), the level of financial market development (as in Litterman 2004)-financial market contagion and financial market segmentation.

From the study past financial researches concerning the feasibility of international investment portfolio diversification, different conclusions on each of the 4 highlighted determinants emerge. The first category of studies concerns international portfolio diversification and market development level, part of whose findings present no evidence of influence (for example in studies by Corhay & Urbain, 1993), another subset (like Christofi & Christofi, 1983) presents partial causality relationship and the last group (such as Mathur & Subrahmanyam 1990; Roll, 1992)

have findings of disparate causal relationships, depending on country-contextual factors.

According to the literature, the level of financial market integration is critical to investment risk diversification, since diversification in two highly correlated markets offers no risk hedge during a financial downturn (Wong & Du, 2015) and investment in the Emerging markets is likely to reduce a portfolio's total risk (hence market integration diminishes risk reduction benefit in international investment diversification). In this regard again, some literature (as in Elizaberta & Tung, 2015; Collins & Biekpe, 2003) finds no evidence in support of this hypothesis, others find some evidence for some regions and not for others (for instance Naime, 2001), others such as Hellstrom (2014), Suva (2014); Aviral (2013) posit that risk diversification benefit-financial market integration relationship is partial, occurring only in the short run. The rest of researches in this category (such as Liu, 2016; Beine & Candelon, 2006) have findings to the effect of partial causality.

In researches concerning the third variable of Interest-Financial market contagion, three distinct sets of findings are manifest. According to the first of these (fronted by Ng, 2000; Mwega, 2009), financial market contagion accounts for an insignificant portion of potential IPI risk diversification, so it is feasible to gainfully diversify investment in international equity market portfolios. This view is contrasted in studies such as Bordo and Murshid (2000) and Nathaniel et al. (2008) who cite evidence of contagion effect on grounds of market decoupling and coupling respectively, across financial crisis periods. Meanwhile, studies like Calvo and Reinhart (1995), King and Wadhwani (1990), Esin (2004); Stewart and Kabundi (2011) table research results affirming mixed effect of financial market contagion on IPI risk diversification, so that effectively, contagion is not an outright constraint of feasible diversification as there is no particular pattern of effect in the study samples.

Regarding the 4th international portfolio investment diversification determinant highlighted in financial literature-Financial market segmentation; empirical literature has a dichotomy of findings.

While studies with Heaney and Hooper (2001), Jorion and Schwartz (1986) find the effect of IPI diversification attributable to financial market segmentation, others such as Fischer (1995) and Cesar (2016) discover that financial market segmentation does not affect international portfolio risk diversification.

Additionally, financial market segmentation proponents posit that markets in different countries face different country-contextual factors and policy and law enforcement structure differences, hence difference in portfolio characteristics (La Porta, 1998; Levine, 2002). Their position implies that market segmentation an important international investment diversification decision mix-country contextual factor rather is. The findings support those formerly advanced but disagree with the latter.

The problem of this study is two faceted. First, the studies do not end up with generalizable results that can be applied to market situations involving those variables. The studies use different market and study period and different research methodologies and get disparate findings. They only end up with a clear lack of generality. Secondly, none of the studies considers a benchmark portfolio, meaning that in the eyes of the investment fraternity, more has to be done to any imminent valid results to make them savvy. In making sound financial investment decisions, 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 safety measure of risk tolerance. Consequently, to advise investors on risk diversification based on the findings of the benchmark-free studies is professionally imprudent, leading 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.

1.3 Research Objectives

1.3.1 General objective

The overall objective of this study was to analyze the determinants of international portfolio investment risk diversification in developing stock markets. In order to fulfill this objective, the study sought to address the specific objectives in sub-section 1.3.2.

1.3.2 Specific objectives

1. To determine the effect of financial market development level on international portfolio investment risk diversification in developing stock markets.
2. To analyze the effect of financial market integration level on international portfolio investment risk diversification in developing stock markets.
3. To analyze the effect of financial market contagion level on international portfolio investment risk diversification in developing stock markets.
4. To determine the effect of financial market segmentation level on international portfolio investment risk diversification in developing stock markets.

1.4 Research Hypotheses

Corresponding to the specific objectives, this study postulated the following non-directional null hypotheses:

$H_0$1: Financial market development level has no significant effect on international portfolio investment risk diversification in developing stock markets.

$H_0$2: Financial market integration level has no significant effect on international portfolio investment risk diversification in developing stock markets.

$H_0$3: Financial market contagion level has no significant effect on international portfolio investment risk diversification in developing stock markets.

$H_0$4: Financial market segmentation level has significant effect on international portfolio investment risk diversification in developing stock markets.

1.5 Significance of the Study

This section of study addresses the tacit questions fundamental to scientific research: Why the chosen topic area (international portfolio investment risk diversification), who (benefits from the study) and how the study is beneficial to them.

The theoretical significance of this study is rooted on the importance of the topic area-IPI risk diversification. The study of international capital markets is essential for finance studies; no wonder its large following. According to Rua and Nunes (1999) for example, the study of the comovement of stock markets is crucial for risk assessment of portfolios. A higher comovement among the assets of a given portfolio implies lower gains, in terms of risk management, stemming from portfolio diversification. Hence, the evaluation of the comovement is of striking importance to the investor so that he can best assess the risk of a portfolio.

Moreover, Ali et al., (2011, cited in Celik and Baydan, 2015) assert that to study comovements among stock markets would be useful for policy makers in a sense if stock markets are found to be closely linked, then there is a danger that shocks in one market may spill over to other markets thus requiring closer cooperation among the authorities of these countries, whose equity markets are closely linked.

The second justification of this study is conceptual, engrained in the introduction of a form of tracking error, on the basis of benchmarking. Many a study in the area have used time series returns based on simple differencing and this does not reflect a standard measure of risk per unit of return. The results are therefore unreliable for cross-country comparisons. The studies have also lionized the use of econometric modeling and rarely engaged other useful statistical methods which are even more suited to different analyses. This study brings in difference in that it does not rely on only one modeling methodology, hence analyses and models differ by research objectives.

The empirical justification of this research is established in the finding that past studies as presented in the problem statement have addressed the issue of IPI risk diversification, some even with a focus on emerging market as a scope, but the findings are widely difficult to generalize to the sample under study, or others. The challenge to go for more studies thus keeps beckoning, and demands for more findings increasing.

This research targets to advantage 3 audiences. The first audience is that of foreign portfolio investors, interested in frontier and emerging stock markets. To these, the study will be a source of information useful for adequately diversified international portfolio construction. The second set of beneficiaries of this study is the non-investment fraternity, specifically financial and economic policy makers. The findings will be evidence on the dynamics of developing stock market linkages and their policy implications. Other researchers will also benefit from the use of the findings of the study to know which other areas of capital markets study to focus on.

1.6 Scope of the Study

The regional scope of this study included all developing world regions. The research majored on the frontier and emerging Bourses of Africa, Asia-pacific, Europe and Latin America. The time horizon scope is 2007 quarter 1 to 2016 quarter 4.

For the purpose of financial market contagion analysis, the study time horizon was divided into two 50-day sub-periods, one before and the other after July 17, 2007. This is because the cutoff date is when the sub-prime mortgage crisis is documented to have occurred according to literary evidence (Palamalai et al., 2013). The asset class scope covered the market index portfolios, since the research was focused on passive investment strategy.

This is supported by the concept that no active investment consistently beats the market (Lewis, 2019). Moreover, in passive investment strategy, one is dealing with the market and thus a fully-diversified unsystematic risk scenario. This contrasts active strategies where one has to build a country portfolio, diversify it as much as to attain the highest investment risk reduction across the constituents, then get to the next level of systematic risk consideration.

The study did not cover all the frontier stock exchanges, since most of them are small and illiquid, and only those which qualify for documentation in either the global or frontier categories are listed by data vendors.

1.7 Limitations of the study

Conceptually, this study envisaged the limitation of lack of authentic market data and choice of a suitable benchmark for reliability of the results. The first challenge was countered by pre-contacting Thomson Reuters for Wall Street Journal data, which is not only authoritative but also authentic and thematically organized.

Regarding choice of an investment performance benchmark, the study compared the oldest and most preferred data vendors- FTSE (100) and MSCI (developed) and found that comparatively, they have no significant differences, due to similarity of construction standards. The indexes are also stable over time. To counter this limitation, the study opted for FTSE 100. FTSE 100 was apparently more plausible for the reasons highlighted in section 1.1.8 of this study.

The empirical limitations of this study was in finding past studies which addressed exactly the same topic area using the same methodology or same sample of developing markets. With such a study at hand, it would be easy to compare the findings and secure better inferential insights.

To counter this limitation, the study assorted past researches with similarity of one or more specific objectives, focused on developing markets and across crisis periods. This would reduce divergence of the study results.

The theoretical limitations of this research included locating studies with a compressive list the determinants of IPI risk diversification. To counter this, the study centered on only studies related in scope, to cross-country investment risk diversification. The study merged all available literature, extracting the determinant (s) postulated in each.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the research identifies the theories relevant to the study of stock market dependencies and, discusses some of the pertinent dependency indicators and reviews empirical literature in line with the study objectives. From this, there is a critique of the literature and a research summary. At the end of the chapter is identification of the research gaps.

2.2 Theoretical Review

Interest in the study of international stock market linkages and IPI risk diversification intensified after the stock market crash of October 1987 (Palamalai et al., 2013). These linkages are categorized as short run (including just correlation and contagion) or longrun (where stock market returns are co integrated. There are three co movement scenarios: -Negative, positive (contagion and/or co integration) or no comovement-signifying zero correlation (as in Celik & Baydan, 2015, Mondi et al., 2010). Justification of the existence of market co movements or divergence (herein linkages) is a dominant theme in financial literature. While substantial concentration of study effort has been on the level of financial market integration as one of the promoters of stock market return convergence or divergence (Wong & Du, 2005, Scott, 2012; Hussein, Hess & Lu, 2015**)**, other scholarly work has taken more diverse views. These are presented under this theoretical review.

2.2.1 Financial market development (Industrialization) theory

This theory is associated with Roll (1992). He theorized that in comparing stock price indices across countries, it was common to find that despite the technical aspects of stock market index construction, each country's industrial structure played a major role in explaining stock price behavior. Other determinants include exchange rate differences; though industrial structure is by far-a significant determinant. According to the proponent of this theory, the unconditional correlation in stock returns depend negatively on difference in structure of production. It is hence expected that countries that are similar in their industrial structure will exhibit higher degree of comovements.

Considering a pair of countries that are similarly specialized in the production of a set of goods, global sector-specific shocks will lead to a movement of returns in both countries in the same direction and one should observe a high correlation in national stock market returns even if the stock markets are segmented. In financial literature, the theory is supported by several studies as is documented in the empirical literature review.

Comovement in stock market returns depends on reflections regarding: How open is a country's capital account? Can firms raise equity abroad? Can foreigners easily buy bonds and shares? Is it possible to repatriate investment capital? GDP growth, correlated changes in interest rates, and greater trade volumes all appear to play a role in driving up correlations. In this case, trade and greater cross-border equity positions are closely linked.

Industrialization theory is also common in other scholarly works. Hess and Lu (2015) also affirmed that similarity in industrial structure is the most important economic linkage explaining the correlations among international stock markets: -the more the similarity, the higher the comovement. Kollman and Malherbe (2011) further argue that the more developed an economy is, the less the equity return

volatility, so that both the index risk and return levels are lower than those of developing market indexes. According to Celik (2013), developed economies have higher pair-wise index return relationships than developing ones, in the short-run. In the long-run however, this may not be the case. Zimmerman (2003); Speidell and Sappenfield (1992); MSCI (2017) support that country development status has negative relationship with stock market return and risk and Aiello and Cliffe (1999) partly differ on the ground that the relationship is moderated by the sampled markets.

Industrialization theory can hence be considered important in IPI risk diversification in that it will enable the investor to target investment destinations in that if the markets are in the same development cluster, they may not be suitable, unless they are further evaluated.

2.2.2 Financial market contagion (Contagion) theory

Another form of co-movement in stock market time series is contagion. Despite its occurrence earlier (in 1829 and 1930s (during the Great Depression for the latter case), contagion theory gained widespread ovation following the October 1987 market crash. This theory was fronted in the seminal works of King and Wadhwani (1990). Synonymous to "Volatility spillovers" in financial literature, Contagion is taken by the proposer and hitherto assumed to mean cross-country shock transmissions than cannot be explained by market fundamentals, or simply, market co-movements that are viewed to be excessive. Dornbusch et al. (2000) and Scott (2012), describe financial contagion as the spread of market disturbances mostly on the downside from one country to the other, a process observed through co-movements in exchange rates, stock prices, sovereign spreads, and capital flows.

They argue that contagion explains an economic crisis extending across neighboring countries, or even regions. Forbes and Rigobon (2002) add that financial contagion happens at both domestic and international levels, regardless of industrial structure, hence it can be systemic or systematic.

Although widespread use of the term "contagion" as the spread of financial shock is dated to July 1997 with the collapse of the Thai Baht that spread spillover effects to Indonesia, the Philippines, Malaysia, South Korea and Hong Kong in less than 2 months (Claesens & Forbes, 2009), the phenomenon was there in other names way before. Examples include Wall Street Market Crash of 1929-33- this time named the great depression (which was foreshadowed by collapses in commodity prices in multiple emerging nations such as Uruguay, Australia, Argentina and Brazil), and the Wall Street market crash of 1987, which spread to Europe, Asia and Latin America within a day. Due to contagion, events in one national market are likely to have some effect in another market causing the valuation of stocks in that market to change (Darrat & Cheng, 2007).

In the study of International Portfolio Investment risk diversification, financial contagion relates to the relationship between trading volume and price volatility. Following Karpof (1987), the price-volume relation is important for event studies that use price and volume relation data to draw inferences. Two theoretical models are critical in analyzing the volume-volatility relationship (Celik, 2013): The Mixture of Distribution Hypothesis (Hereafter MDH) introduced by Clark (1973) and the Sequential Information Arrival Hypothesis (Hereafter SIAH) by Copeland 1976. MDH assumes that the volume-volatility relation is dependent on the rate of information flow into the market.

According to MDH there is contemporaneous positive relation between volume and volatility because all traders simultaneously receive the new information (Karpof, 1987). A new equilibrium is thus established and therefore no intermediate equilibrium. Since the variables contemporaneously change in response to new information as posit Aguilar and Ringgenberg (2011), it should be impossible to use past volatility data to forecast volume (and vice versa), diminishing speculative opportunities. Accordingly, it will not be possible to diversify investment to markets based on foreseeable benefit or debenefit.

Contrary to MDH, SIAH assumes that all traders receive new information in a sequence and change their positions when the new information arrives at the market. The traders do not however receive the new information at the same time. According to Darrat and Cheng (2007), the response of each trader to the new information therefore establishes an incomplete equilibrium. The final equilibrium is established when all traders finally receive and respond to the new information. SIAH thus suggests that there should be a lead-lag relation between volume and volatility. Stated otherwise (as in Giot & Patitjean, 2010), lagged values of volume may be used to forecast current volatility and vice versa. The diversification implication of SIAH is that an investor can take advantage of the lead-lag price-volume relationship and diversify away foreseeable or imminent risk, based on the knowledge of historical events or data.

The relevance of financial contagion theory to IPI risk diversification is the determination of the type of information transmission across the stock markets under study, whether SIAH or MDH. If SIAH, then IPI risk diversification will be beneficial to the investor, as contrasted by presence of MDH, here IPI is infeasible.

2.2.3 Financial market integration theory

This theory is founded on the Efficient Market Hypothesis (EMH) proposed by Eugene Fama (1960s), in which he defined an efficient market to be a market where

the actual prices at each point in time represent good estimates of the assets' intrinsic values given the information available (Fama, 1965). If this assumption is satisfied, it is not possible (except by pure luck or by taking on more risk) to 'beat the market' because the observed prices already reflect all the relevant information. Malkiel and Fama (1970) proposed three different levels of market efficiency: weak form, semi-strong and strong.

In its weak form, the EMH asserts that securities prices reflect all past, publicly-available information whereas a market is semi-strongly efficient if the set of information consists both of the previous prices plus all publicly-available information. Finally, a market is strongly efficient if the set of information consists of the previous prices plus all publicly-available information plus private (or insider) information. In a situation where financial integration is not full, cross-country investments yield capital gains or losses depending on their gross external positions (Lane & Milesi, 2003).

Following this theory, investors are assumed to be rational and given this condition, there are potential gains from international portfolio diversification if returns from investment in different national stock markets are not perfectly correlated and the correlation structures are stable (Palamalai et al., 2013). According to these authors, the presence of low price co movement levels offers investors the benefit of diversifying their holdings across the target stock markets, thereby affording them increased expected portfolio returns with no increase in risk. The popularity of this theory has evolved over the years, during which the degree of financial liberalization has increased globally, informed by developments in globalization and information technology (Palamalai et al., 2013).

As these developments continue to gain ground, financial systems have got more synchronized, facilitating financial market integration. This wave of globalization works inconsistently, since country economic development and other preconditions for regionalism are not on the same footing. If a uniformity position in this regard

would be achieved, then all financial systems including stock market asset prices would have perfect correlation across country borders, a scenario Karolyi and Stulz (1996) described as integration. According to the authors, markets are said to be integrated "if assets with perfectly correlated returns have the same price, regardless of the location in which they trade.

Financial market integration and co movements have different implications for both individual and institutional investors (Celik & Baydan, 2015). Jorion and Schwarts (1986) argued that in a fully integrated market, investors earn the same risk-adjusted expected return on similar financial instruments in different national markets meaning that gain from international arbitrage is not feasible. Other literature advanced determinants (and deterrents) of market efficiency to include: -geographic closeness (Chaudhuri, 1997), such that the more proximate the countries, the higher the market correlations, bilateral trade (so that the more the trade, the better the comovement), and exchange rate volatility (where increased volatility implies market divergence). These contribute to market synchronization to a greater extent than does inflation convergence (Diamandis, 2009). According to Hoque (2007); Wong and Du (2005), countries that have larger volumes of Foreign Direct investment (FDI) between each other do not show higher interdependence in their stock markets. According to the World Trade organization (2015), the foregoing integration theory can be summarized in economic theory as consisting of five major levels in Table 2.1.

Table 2.1: Economic Integration Indicators

Integration Level	Indicator (s)
1. Free Trade Area	No inter-country barriers to imports and exports of goods and services.
2. Customs Union	All countries adopt a common set of trade restrictions with non-members
3.Common market	Free movement of labour and capital goods
4. Economic Union	There are common institutions and common economic policy
5. Monetary union	Member countries adopt a common currency

To this study, Financial market integration theory is critical to determination of IPI risk diversification results in that across fully integrated (and therefore efficient) market pairs investment risk diversification will be an effort in futility. In contrast, where markets are not integrated at least in the short run, IPI risk diversification is gainful.

2.2.4 Financial market segmentation theory

Segmentation theory was put forward by Grubel (1968). In his 1968 article on the benefits of international diversification, he observed that a portfolio limited to a single country's securities had individual security returns that tended to move in a highly synchronized manner, making diversification difficult.For this reason, one can intuitively consider that the individual securities of an international portfolio will be more likely to move somewhat independently of each other than those in a domestic portfolio.

In furtherance of this theory, Cochinard (1995) suggested that on the basis of trade philosophy and international finance, it is optimal for nation states to negotiate treaties on a regional basis rather than multilaterally in order to eradicate cross-state trade frictions.

According to Heaney (2001), segmentation is not only driven by geographic separation of countries but similar cultural backgrounds and a complex interwoven mesh of trade, portfolio and foreign direct investment flows. As a result, there is a high degree of economic interdependency nurtured between entities within regions. This leads to the idea that firms within them are affected often by similar exogenous shocks, with idiosyncratic jolts often tending to deepen and widen regional integration and the commonality and sense of belonging that prevails within regions may be reflected in related stock price movements (Heaney, 2001).

In financial literature, market segmentation theory is countered by Behavioral Finance proponents. According to Liu (2016), the key assumption in the latter field is that people, under certain circumstances, take decisions which are not fully rational, motivated either by certain types of preference or because of cognitive limitations such as overconfidence, loss aversion, overreaction, mental accounting and herd behavior. One implication of these arguments is that financial markets do not always function well and price changes do not always accurately reflect the arrival of new information (Liu, 2016). This conclusion differs from the conclusion of market segmentation where it is assumed that prices are unpredictable though they behave similarly, converging with decreased segmentation level. The field of behavioral finance received much interest during the financial crisis in 2008 – 2009 because it made it possible to understand price movements that were not consistent with EMH (Barberis, 2011).

Regardless of the market segmentation levels therefore, it is not possible to identify investment behavior even if correlations of returns of the markets in question were clear. (Shefrin & Statman, 2011). Given the importance of market segmentation and interference of Behavioral Finance in the investor's decision mix, IPI risk diversification would need keen attention on the effects of both of the foregoing determinants.

2.2.5 Investment Diversification Theory

The formal proposition of investment diversification in Finance was postulated by Markowitz (1952, 59), in his foundry works titled "*Portfolio Selection",* and its sequel on Modern Portfolio Theory, MPT, hitherto used widely by portfolio managers in portfolio construction and in their seminal works on "*portfolio construction*. In Markowitz's standpoint, crucial to the application of investment diversification is the correlation of asset returns. If returns of n financial assets have positive correlation, diversification will not be beneficial, but when the correlation of asset returns is negative, risk diversification is beneficial. According to MPT, diversification can lower the variance (risk) of a portfolio's return to below what it would be if the whole portfolio were invested in the asset with the lowest variance, even if the assets' returns are uncorrelated (Markowitz, 1999).

Markowitz's MPT was a topic of focus by subsequent researches including himself. Elton and Gruber (1977) demonstrated that the risk of holding a portfolio of stocks decreased with increase in portfolio size to the extent that when the portfolio size, n, exceeded 30 stocks, the risk level did not decrease significantly. To other researchers, the essence of diversification is to minimize the diversifiable risk.

In Asset pricing models (such as the Capital Asset Pricing Model-founded by Treynor (1961; 2) and later modified by Sharpe (1964); Lintner (1965); Black (1972) and Behavioral Asset Pricing Theory by Merton (1973), the authors concur that only systematic (market) risk should be rewarded. For unsystematic risk, failure to

diversify will automatically attract failure to make capital gains or even lead to a capital loss.

Diversification theory can be taken to international level. As the number of assets in a country investment portfolio surpasses 30, unsystematic tends towards full diversification and ultimately, risk reduction benefit vanishes. Merton (1973) argued that failure to diversify a nationally-held portfolio will have adverse effects and is an automatic impetus for diversifying, hence, only systematic risk should be rewarded. According to Carl (2006), global diversification benefits remain large when controlling for short-sales constraints in developing stock markets. International portfolio diversification benefits appear to be largest for countries with high country risk and vary over time as country risk changes. Cumby and Glen ((1990) cited in Aiello and Chieffe (1999) find superior returns are gained by internationally diversified compared to in-country portfolios.

The focus of this study on International Portfolio Investment risk diversification is imperative since country risk can, according to MPT, be fully diversified away. Conversely, extra-county influences on investment portfolio risk remain a challenge to investing.

2.2.6 Passive investment (Index investing) theory

The foundations of passive investment theory date back to 1975, at the onset index investing which was pioneered by Bogle. Bogle insisted on the superiority of index investing over traditional actively managed mutual funds. He contended that it was folly to attempt to pick actively managed mutual funds and expect their performance to beat a low-cost index fund over a long period of time, after accounting for the fees that actively managed funds charge (Tim, 2017). In 1974, Bogle founded the Vanguard Company which is now one of the most respected and successful companies in the investment world.

In 1999, Fortune magazine named Bogle as "one of the four investment giants of the twentieth century" (Rostad, 2013).

This investment theory indirectly relies on the presumption of information and allocation efficiency in the markets. Rooted on Fama's (1965) Efficient market Hypothesis (EMH), the theory suggests that the market efficiency hypothesis is the simple statement that security prices fully reflect all available information." A precondition for this strong version of the hypothesis is that information and trading costs, the costs of getting prices to reflect information, are always 0. Moreover, a weaker and economically more sensible version of the efficiency hypothesis says that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed marginal costs (Rostad, 2013).

The theory implies that fund managers and stock analysts are constantly looking for securities that may out-perform the market; and that this competition is so effective that any new information about the fortune of a company will rapidly be incorporated into stock prices. It is postulated therefore that it is very difficult to tell ahead of time which stocks will out-perform the market. By creating an index fund that mirrors the whole market the inefficiencies of stock selection are avoided. In particular, it says that economic profits cannot be wrung from stock picking. This is not to say that a stock picker cannot achieve a superior return, just that the excess return will on average not exceed the costs of winning it (including salaries, information costs, and trading costs).

The conclusion is that most investors would be better off buying a cheap index fund (Tim, 2017). Index investing is a passive strategy that attempts to generate similar returns as a broad market index. Investors use index investing to replicate the performance of a specific index – generally an equity or fixed-income index – by purchasing exchange-traded funds (ETF) that closely track the underlying index.

Empirical research finds index investing tends to outperform active management over a long time frame and taking a hands off approach to investing eliminates many of the biases and uncertainties that arise in a stock picking strategy (James, 2017). According to the author, proponents of the strategy eschew active investing because modern financial theory claims it's impossible to "beat the market" once trading costs and taxes are taken into account. Since index investing takes a passive approach, index funds usually have lower management fees and expense ratios than actively managed funds.

The main activity in index investment is index tracking. Tracking can be achieved by trying to hold all of the securities in the index, in the same proportions as the index. Other methods include statistically sampling the market and holding "representative" securities. According to Arvedlund (2006), many index funds nowadays rely on a computer model with little or no human input in the decision as to which securities are purchased or sold and are thus subject to a form of passive management.

Passive investment theory is useful to this research in that it helps explain the idea that only market indices can be diversified in, given the difficulty of constructing fully efficient international portfolios.

2.2.7 Hedging (Risk neutralization) theory

An alternative to risk diversification-which is speculative, is hedging. According to hedging theory, an investor seeks to neutralize the return risks of an investment by holding short or long or both positions in (an) asset(s) (Eaton, 2014). In doing so, the investor enters forward commitments ((like forward contracts, futures contracts, swaps and credit derivatives) or contingent claims (usually options), in derivative markets. Financial derivatives are either traded across the counter or on organized exchanges, meaning some derivatives contracts are standardized and regulated (for exchange-trading) while others are not (Ibid, 2014). Hedging is the practice of taking a position in one market to offset and balance against the risk adopted by assuming a

position in a contrary or opposing market or investment. The use of the word as a verb in the sense of "dodge, evade" is first recorded in the 1590s; that of *insure oneself against loss,* as in a bet, is from the 1670s (Oltheten & Waspi, 2012).

In equity markets, hedging can take different fashions. Equity in an index portfolio can be hedged by taking an opposite position in futures. To protect stock picking against systematic market risk, futures are shorted when equity is purchased, or long futures when stock is shorted. Futures contracts and forward contracts are means of hedging against the risk of adverse market movements. These originally developed out of commodity markets in the 19th century, but over the last fifty years a large global market developed in products to hedge financial market risk. One can also take out index options, swaps or forwards, all these aimed at neutralizing the return risk imminent from investing in international stock markets. Despite its necessity, hedging is at the option of the investor (Morewedge, Tang & Larrick, 2016).

The relevance of the hedging theory in index investing is that an investor can hold contrasting positions in assets whose return and risk characteristics are not concurrent and shun concurrent ones. Alternatively, one can benefit from the hedge effect via diversifying investment in negatively correlated indexes, so that the effect of a down move in one is countered by an up move in the other.

2.3 Conceptual Framework

The conceptual framework of this study is drawn from the theoretical literature reviewed in the foregoing section. From the literature, Investment risk diversification takes center stage. Moreover, it is international diversification that investors seek to achieve in order to maximize on the benefit of risk reduction, as in-country diversification is already achievable through investing in the market paotfolio-the stock market index or its derivatives. According to the theoretical review, International Portfolio Investment (IPI) risk diversification level is primarily determined by financial market development level, Financial market contagion level,

Financial market integration level and Financial market segmentation level. Compared to active investment management, index investment which is passive is a general preference as the studies posit that passive returns are less strenuous and less costly. Further, the methodology of investing in different markets is to use one (set of) market(s) as a hedge of the other so long as the correlation of returns is not positive, hence the importance of the hedging concept.

Ultimately, the investor will make a decision to invest in at least one market pair. She will either do so on the basis of rationality or the decision will be affected by behavioral finance characteristics which are not necessarily pro-rationality. Behavioral characteristics therefore become an intervening set of variables. Figure 2.1 presents this summary of theories.

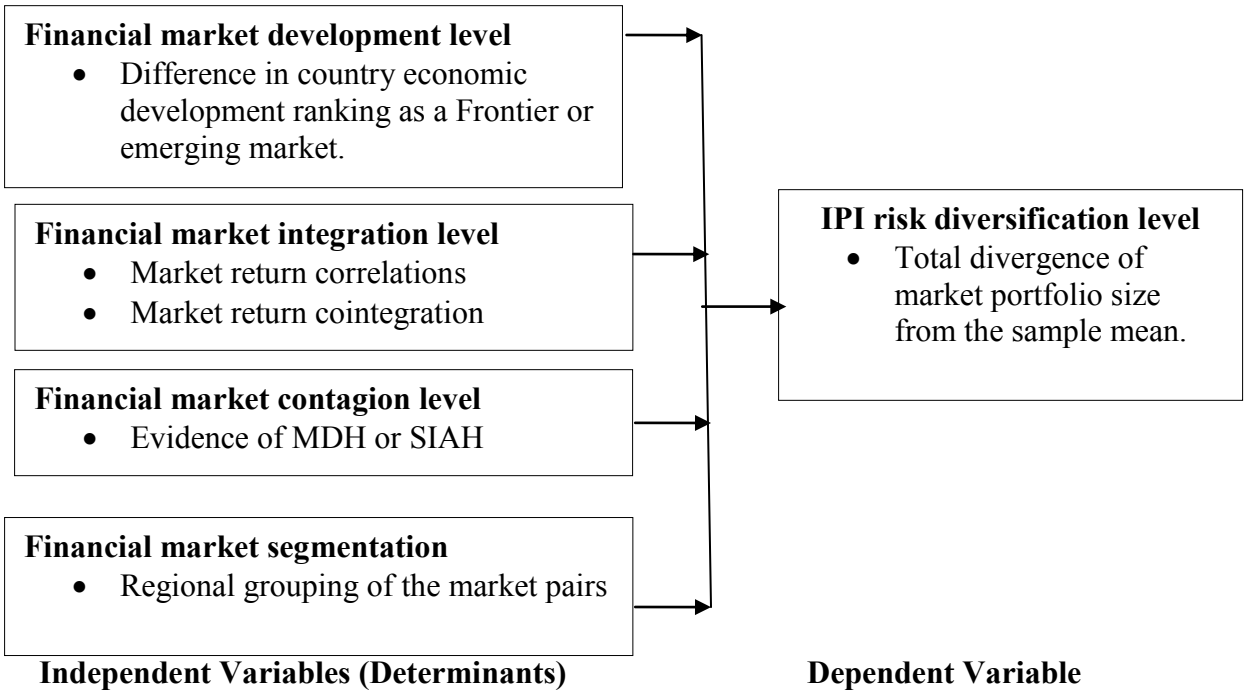

Figure 2.1: Conceptual framework

The conceptual framework was operationalized as follows: On the basis of financial market development level, the greater the difference in development, the more the perceived IPI risk diversification benefit between a market pair, as the conditional return means and variances would have low correlations. On the basis of market financial market integration level, higher return correlation and cointegration levels would render benchmarked conditional returns and variances (risks) to be convergent across market pairs, resulting in low IPI risk diversification level.

Regarding financial contagion level, evidence of Mixture of Distribution in information transmission across the sub-prime mortgage crisis (meaning no contagion and no comovement of benchmark returns in market pairs) would result in lower IPI risk diversification viability. Concerning Financial market segmentation, the regional cluster of a stock market's host country was deemed critical in determining its risk-reward characteristics to the investor.

In the study, two markets in the same regional cluster were deemed to negatively influence IPI risk diversification because of high comovement of risk and return. Conversely, a differently-clustered market pair would influence IPI risk diversification positively on account of lowly-comovement market characteristics.

2.4 Empirical Review of Variables

In this review, the first set of theorized variables is that of financial market development level and IPI risk diversification. The issue of stock market comovement involves short run and long run dynamics (namely correlation and cointegration), mostly with no breakpoint involved. This section combines empirical evidence on the two comovement perspectives, across different study scopes.

Concerning financial market development and IPI risk diversification, one of the earliest studies was conducted by Christofi and 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, respectively as fixed and flexible exchange rate environments. The results revealed that the inter-country correlation coefficients remained the same over the sub-period years examined. The study further used the principal components analysis for the same period and two equal sub-periods and 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 markets for interdependence on the basis of economic development level. Aiming at finding the nature of causality among the US, Sweden, Denmark, Norway and Finland, the researchers used Vector Autoregression (VAR) analysis and conducted Granger causality tests. The vector autoregressive model results indicated that the Swedish market index led the indices for Denmark, Finland and Norway. Norway also influenced the Swedish and Danish markets, while the Danish and Finnish markets did not show any influence on any other markets. Furthermore, the VAR analysis results indicated that the US market was only influential on Denmark and not any other market hence each of the other markets was responsible for own its behaviour. Economic variables, in general, did not hence appear to have much predictive power in explaining the indices. Only the consumer prices and expected consumer prices significantly affected the Finnish index and long-term interest rates affected the Swedish market.

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.

He 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. The results gave correlation levels of below 0.5 (low) for most (276) of the 326 coefficients obtained. Roll went on to calculate correlations from the industry perspective and found them to be different (generally higher) from those computed using raw stock price indices. The conclusion was that countries with similar industrial structures had highly correlated markets yet the importance of regional characteristics should not be overlooked.

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, Corhay and Urbain (1993) used cointegration technique to study the weekly stock price indices from France, Germany, Italy, Netherlands and the UK between March 1975 and September 1991. 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.

A research conducted by MSCI (2017) seeking to determine index performance differences due to economic development differences considered the returns of Standard and Poor's 500 and MSCI Emerging. The research found that over the previous 5 years to June 2017, developing market indexes rose an average of 23.8% annually compared to a minor 17.8% for the developed markets.

Suva (2014) examined the index returns in 26 stock exchanges of Africa, Latin America, Europe, Asia-pacific, Middle East; US and Canada, with the objective of determining common stochastic tendencies among the World Federation of Exchanges (WFE) index returns. Using simple correlation, correlation ratio (ETA), ANOVA and Yate's Chi-square of independence, the study concluded that index

returns were more decoupled with difference in industrial structure and intra-regional diversification was less beneficial than inter-regional one.

Hogan (2017) studied stock markets of the United States, Europe, Asia and Emerging markets on the basis of the host country economic development level. Using technical indicators of company performance of a five-year trailing performance, the study found that development ranking was a considerably important indicator of performance disparity. The United States, Europe, Asia and Emerging markets posted earnings performance of 14.6%, 6.5%, 6.9% and 1.4% respectively and the disparities appeared in Price-to-Earnings, Book, Sales and Cash flow ratios. The study concluded that economic development status had an unconditional bearing on stock market comovement or divergence. In addition to development level of the financial markets, the Hogan (2017) research concluded that investments in foreign markets could benefit (or suffer) from exposure to foreign exchange rates as currency fluctuations periodically enhanced or detracted from the returns of international equities for US investors.

Over time, currency movements helped to lower the correlation between non-US equities and US equities, thus contributing to the diversification benefits of holding foreign securities, since long-term purchasing power analysis found most non-US currencies to be overvalued relative to the dollar which should enhance future international returns.

Kei (2018) studied 37 advanced and emerging countries for stock market return comovements, over the period 1996-2015. The study found out that national stock markets converged more in advanced countries than in emerging ones, whilst the convergence happened more rapidly in emerging countries than in advanced ones. This was explained by the increased mobility of goods and capital as well as the rise in emerging countries' economic presence in the world. Conversely, this Degree of Global comvement can be affected by institutional opaqueness in terms of information transmission. Moreover, the study found that the driving forces behind

national DGCs were country fixed effects and country-specific time-varying factors. These factors worked in line with the global financial cycle hypothesis and the information-driven comovement theory. Factors contributing towards an upward trend in a national DGC were increasing openness of international trade and finance as well as a rise in a country's economic presence in the world.

Financial market integration and IPI risk diversification is the second set of variables in the study, of which empirical review ensues. Elizabeta and Tung (2015) investigate the level of financial market integration of the equity markets in China and Association of South-East Asian (ASEAN) 4 countries-Indonesia, Malaysia, Philippines, and Thailand. Using beta and sigma convergence, dynamic conditional correlation, and wavelet correlation, they found that financial integration across these markets fluctuated between a moderate level before and after the recent crisis and a higher level during the crisis.Investors thus achieved higher diversification benefits from a cross-industry than a cross-country investment strategy within the region. The diversification benefits and the length of the investment horizon were inversely related.

Neaime (2001) studied the properties and characteristics of the Middle East and North African (MENA) stock markets, and the prospects and implications of enhanced financial liberalization in the region. He also explored whether these markets could offer international investors unique risk and returns characteristics to diversify international and regional portfolios. Johansen co-integration tests revealed that the Gulf Cooperation Council (GCC) equity markets still offered international investors the portfolio diversification potentials mainly through mutual funds, while other emerging MENA stock markets like those of Turkey, Egypt, Morocco, and to a lesser extent Jordan offered less because of being integrated with the world financial markets. Granger causality tests and impulse response functions showed that shocks to the US and UK stock markets were transmitted to the MENA region but not to the GCC stock markets. Shocks to the French market insignificantly affected the MENA

stock markets. The empirical results confirmed that evidence of regional financial integration is still weak except among the GCC stock markets.

Collins and Biekpe (2003) used changes in correlations following the Asian crisis of 1997 to examine the interdependencies of African markets. They found that interdependencies in stock markets fell into regional blocks and that, with the exception of South Africa and Egypt, the evidence did not support integration with global emerging markets, meaning that integration efforts had a weaker or no effect on stock index comovements. Using dynamic components correlation ratios, Hellstrom et al. (2014) study the effects of OMX-nordic stock market mergers with the objective to provide empirical evidence on whether the integration of the Nordic stock exchanges (the OMX Nordic merger) affects the return comovements between stock markets. They conjecture that stocks on the merged market are possibly valued conditional on similar expectations by both domestic and foreign investors about, for example, the future global macroeconomic situation. The findings in their paper indicate that :- the creation of a common, crossborder stock trading platform increases long-run trends in return comovements for all of the markets considered so that market mergers is one of the determinants of cross-country return correlations; the dynamics of time-varying correlations are mixed, for example some pairs of correlations' short-run deviations approached the long-run trend in an oscillating manner while it is non-oscillating for others; the merger decreases the persistency of short-run deviations from the long-run trend so that return correlations adjust faster towards their long-run trend after markets were merged.

In an earlier study, King et al. (1994) assessed the impact of economic variables on the changes in co-movements among seventeen world stock markets and tested the contribution of allowable economic factors (real and monetary) to variation in conditional covariance. The study found that observable variables accounted for only a small proportion of co-movement between national stock exchanges and the markets moved closely as a result of globalization. The study was unable to find

material evidence to the effect that integration was an outright precondition for comovement (as in Esin, 2004), leaving investment diversification benefit a permissible guess.

Suva (2004) studied the stock market indices of Kenya, Uganda and Tanzania for common stochastic trends and cointegration, using both correlation and cointegration of the index series with 2002 as a structural breakpoint date. The study found there were low correlations of returns and disparate cointegration relations meaning it was viable to diversify profitably from some market pairs, despite the regional conditioning.

Beine and Candelon (2006) use a sample of 15 developing stock markets to determine the impact of trade and financial liberalization on the degree of stock market comovement. Over a 15-year sample period, they apply time-varying correlation analysis. The results offer support for a positive impact of trade and financial liberalization reforms on the degree of cross-country stock market linkages.

Liu (2016) also studies how jump-probabilities of Nordic stock prices were affected by the OMX mergers that took place in the period 2003-2006, against the alternative hypothesis that stock market merger effects are broadly characterized along two potentially important dimensions -A larger market attracts more buy/sell orders which affects the order books and stock market mergers may also change the composition of informed investors. The author uses time-varying correlation analysis and C-GARCH econometric model for stock market return time series.

One main finding of the study is that stock market mergers, on average, reduce the likelihood of observing price jumps. Another finding is that the effects are asymmetrically distributed in terms of that one only observes reduced probability of price jumps for large and medium size firms. Furthermore, the likelihood of observing negative price jumps decreases for an average firm after the mergers have

taken place whereas the likelihood of observing positive jumps increases. Finally, the market risk is reduced after stock market consolidations.

Aviral et al. (2013) examined the integration of nine Asian stock markets using the methodology of wavelet multiple correlation and multiple cross-correlation. They eliminated several limitations which are encountered when conventional pairwise wavelet correlation and cross-correlation are used to assess the comovement of a set of stock indices. Their results showed that Asian stock markets were highly integrated at lower frequencies and comparatively less integrated at higher frequencies. From the perspective of international investors, the Asian stock markets therefore offered little potential gains from international portfolio diversification especially for monthly, quarterly, and bi-annual time horizon investors, whereas, higher potential gains were expected at intraweek, weekly, and fortnightly time horizons. On the basis of stock market integration therefore, one cannot readily expect to get investment diversification disadvantage in these countries' stock markets.

In a study of Scandinavian countries (Denmark, Norway, Sweden and Finland), Martikainen et al. (1997) measure the volatility of market returns using the 1988-94 sample period. Vector Auto regression results disclosed independence of markets despite trade ties.

Studying Latin American markets for cointegration relationships, Lee and Rui (2000) find no evidence of cointegration over the 1995-2000 period. The no-cointegration findings are similar for Huang, Yang and Hu (2000) for the United States and Asian markets, though the sample period and methodology are different. Modi and Patel (2010) and Meric et al. (2006) examine different countries' stock markets over different time spans for dynamic linkages, using correlation analysis and respectively come up with a stable conditional comovement and low correlations among developing countries. The latter finding is contrasted by Ng (2000), who uses

the same methodology and finds the degree of integration to be inconsequential on correlations structure.

Financial market contagion and IPI risk diversification are also areas of focus in the specific objectives of this study. Empirical studies of contagion often find that economic fundamentals alone cannot explain the co-movement of stock market indexes, especially during a period containing one or more shocks to the financial markets (Connolly & Wong, 2003). According to Madhavan (2000), literary evidence indicates that social networks convey valuable information for financial decisions (Hirshleifer & Teoh, 2009). Individual and institutional investors are influenced by the statements they hear from their acquaintances and the news media.

Regardless of the terminology, research on financial market contagion to different stock markets centers around the Mixture-of –Distribution Hypothesis (herein MDH), the absence of which is termed as financial contagion (and its variants), or the proof of Sequential Information Arrival Hypothesis (herein SIAH). According to the foundry works of Forbes and Rigobon (2002), common-type contagion can be described as the propagation of shocks in excess to that which can be explained by fundamentals. According to these authors, the term has created controversy throughout the past years, with some experts arguing that strong linkages between countries are not necessarily financial contagion and that financial contagion should be defined as an increase in cross-market linkages after a shock to one country, which is very hard to figure out by both theoretical model and empirical work.

Aiming to examine how the dynamics of correlations between two emerging countries (Brazil and Mexico) and the US evolved from January 2003 to December 2013, Zouheir and Faysal explored whether the plunging stock market in the US, in the aftermath of global financial crisis (2007–2009), exerted contagion effects on emerging stock markets. They did a multivariate fractionally integrated asymmetric power autoregressive conditional heteroskedasticity dynamic conditional correlation framework, which accounted for long memory, power effects, leverage terms, and

time-varying correlations. The empirical analysis showed a contagion effect for Brazil and Mexico during the early stages of the global financial crisis, indicating signs of "recoupling." Nevertheless, linkages showed a general pattern of "decoupling" after the Lehman Brothers collapse. Furthermore, correlations between Brazil and the US are decreased from early 2009 onwards, implying that their dependence was larger in bearish than in bullish markets.

Bordo and Murshid (2000) track international financial crisis from 1825 when Britons were stashing capital to the newly liberalized Latin America, and to1997, when the currency crisis in Thailand quickly spread throughout East Asia and then on to Russia and Brazil. They find that even developed markets in North America and Europe were affected, as the relative prices of financial instruments shifted and in the latter case, caused the collapse of Long-Term Capital Management (LTCM). Starting from Thailand with the collapse of the Thai Baht, the crisis spread to Indonesia, Malaysia, Philippines, South Korea and China in less than 2 days.

Another study was conducted by Esin (2004) to examine the effect of economic integration among Turkish and European stock exchanges, seeking to establish the suitability of international portfolio diversification. The researcher used correlation and cointegration techniques, via unit root tests. On a sample of fifteen EU member-countries and Turkey, Esin (2004) collected both country and continental market index series over the 1990-2003 sample period and did the analysis at 1 percent significance level. The unit root test on the index series revealed non-stationarity in their level form, hence no basis of cointegration tests. Further, Esin applied the KPSS (1992) formula of first differencing and detected the presence of first difference stationarity for the sub-periods under the study. He found the series to be integrated of the same order and hence it was possible to conduct cointegration tests on them.

Using the introduction of the Euro as the breakpoint, market movements were more synchronized during the post-Euro sub-period than the time period before. The Johansen cointegration test yielded the results that countries in the same economic bloc had no pair-wise cointegration with regard to the customs union but there was intra-country long-term market relationship.

Further studies by Erb et al. (1994) found that correlations among the G-7 countries were affected by the business cycle, whereby market correlation was high during recession and low during recovery. They further noted that these correlations were not symmetric in up and down markets.

Using the October 1987 market crash as the crisis date, King and Wadhwani (1990), Lee and Kwang (1993); Baig and Goldfajn (1998) all examine US, UK, Latin American and Japanese cross market correlations. They use different sample sizes in their studies and arrive at conclusions to the effect that the crisis had inter-country spillovers of differing extents.

Following the 1994 collapse of the Mexican Peso, Calvo and Reinhart (1995) use the Peso crisis to determine change in market correlations of stock prices and Brady bonds. The results indicate that Asian and Latin American emerging markets were more decoupled in the period before than after the crisis.

Nathaniel et al. (2008) research on the linkages between markets and funding liquidity pressures as well as solvency during the 2007 subprime mortgage crisis. They use multivariate GARCH models to test for transmission of liquidity shocks across US financial markets and find market interactions to significantly decrease during the crisis period.

Mwega (2009) studied the impact of the 2007/8 global financial crisis on eight African stock markets-Tanzania, Mauritius, Zambia, Nigeria, Malawi, Ghana, Uganda and Kenya, with the object of determining the presence of spillovers of the

crisis from developed markets. The author examined a series of market returns using percentage aggregation of change in returns as on 26/2/2009. The research found the market returns were slowed down by the crisis except for Tanzania and Mauritius.

In their study on global financial crises and time-varying volatility comovement in world equity markets, Stuart and Kabundi (2011) examined the effect of the 2008 global financial crisis on 25 developed and 20 emerging stock markets. They applied a dynamic factor model based on two-year rolling window regressions and found emerging markets to be more decoupled than developed markets. The study further found a crisis-period re-coupling between emerging markets and world volatilities, identifying emerging market investments as a temporary hedge against volatility spillovers from the US subprime mortgage crisis.

Separately, Longin and Solnik (1995) used monthly index returns of major international markets for the period 1960–1990 and estimated a constant conditional correlation bivariate GARCH model pair-wise between all countries in their sample. They developed a test to measure correlation changes, and found that international correlations had increased over their sample and tended to increase during periods of high conditional volatility. They also found that macroeconomic fundamentals could explain little of the variation in correlations. Longin and Solnik's analysis of time-varying correlations, however, is severely limited by the fact that they estimate a constant conditional correlation model. In more recent studies using both the constant and dynamic conditional correlation MGARCH models, Tse (2000) and Tse and Tsui (2002) found evidence of statistically significant changes in the covariance structure between a limited sample of Asian markets during the 1990s.

Nicklas and Thong (2012) examined international equity markets correlation, integration and contagion. On 15 geographically diverse international markets, they employed a parsimonious dynamic latent factor model with time-varying loadings and stochastic volatility, over a 20-year sample period. The research documented that over the period, average global and regional correlations had risen steadily. Additionally, international equity returns had become increasingly exposed to common sources of variation, and that the entire low-frequency change in equity correlations was due to changing risk exposures rather than changing systematic risk, thus contagion was critical. The study also highlighted significant financial contagion eff ects during the 1994 Mexican and 1997 Asian crises.

The final empirical review of this study covers financial market segmentation and IPI risk diversification. One of the early studies in this area was conducted by Fischer in 1995. In his study of 17 emerging markets (Argentina, Brazil, Chile, Colombia, Jordan, India, Indonesia, Korea Republic, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Thailand, Turkey, Venezuela; Zimbabwe), the researcher noted that international stock market returns and risk were different due to different political governance, foreign investment policy (for example in China where non-citizen investors are only allowed to trade in stocks of category B), market information imperfections ad liquidity differences.

Accordingly, the markets can have similarities if prudential standards of investor protection and market regulation market organization rules are structured and harmonized for traders. Short of these, markets were nowhere near comovement safe by coincidence, which was also rare. Caesar (2016); “Levy and Sarnat (1970); Solnik (1974); Lessard (1976) established a resounding case for international portfolio diversification”. These advocates of the International Investment Diversification (IID) contend extra that there are other numerous probable gains that make it striking for investors to internationalize their portfolios. The supposed benefits are the motivating dynamism and drive to engage in IID and they include;

the participation in the growth of other (foreign) markets; hedging of the investor's consumption basket; risk and reward; diversification effects; and possibly abnormal returns due to market segmentation political risks, costs and other institutional restraints and obstacles, for example, a host of tax issues, at best limit the possible merits, at worst contravene the benefits. The study further found that despite the return difference enticements that may come along, investors consistently fail to exploit these effects, preferring to concentrate their investments in the equities of their home country, leading to what is popular known as “equity home-bias puzzle”.

Heaney and Hooper (2001) studied Asia-Pacific markets to investigate the degree of market segmentation of financial markets by analyzing the stock market returns of both developed and developing markets using cluster analysis. The study findings showed that markets were generally segmented on a regional basis and there was a high correlation between political risk and capital market segmentation, so that markets within the same geo-political segments were affected by similar exogenous shocks.

Previous studies by Choi and Rajan (1997) on world market relationships between financial market segmentation and index performance similarity concluded that capital markets were mainly segmented due to a variety of factors such as exchange rate risk, different tax systems, capital controls, limits on foreign ownership and political risk with no mention of geographical clustering. This was confirmation of Bekaert and Harvey (1995), in which there were strong grounds to suggest that markets were neither completely segmented nor fully integrated as polarized extremes but exhibited characteristics of both and, displayed time-varying comovement with the world market portfolio.

In their study of segmentation versus integration of the Canadian and Global North American markets, Jorion and Schwartz (1986) compared the international and domestic versions of the CAPM, and found that integration, or the mean variance efficiency of the global market index, was rejected by the data. Segmentation on the other hand was the preferred model, based on a maximum likelihood procedure correcting for thin trading. They further divided the sample into securities that were interlisted in Canada and the U.S., and those that were not. Integration was rejected for both groups, which meant that the source of segmentation could be traced to legal barriers based on the nationality of issuing firms. They concluded that with geopolitical segmentation came index return differences across national stock markets. Further, market segmentation was brought about by a number of attributes which inhibited the theoretical CAPM from operating in a real-world context. The attributes were macroeconomic or geopolitical or both, hence there was no clear relationship between any of the sub-attributes and investment flow, that cut across all markets.

2.5 Critique of the existing literature relevant to the study

The empirical review in this study has established evidence of international portfolio investment (IPI) risk diversification as a preference to in-country portfolio risk diversification, concurring with Carl (2006); Aiello and Chieffe (1999). In concurrence with Tim (2017) and Rostad (2013) for all these studies, index investing (passive investment strategy) was an apparent preference over active portfolio construction.

None of the reviewed studies however, included (or at least assumed off) important IPI risk diversification factors of hedging, arbitrage and behavioral investor characteristics, despite these having a significant bearing on research findings. In Baumol (1997) and Eaton (2014), although hedging (risk neutralization) is a remedy to speculative loss potential, it limits investment upside potential as it involves taking of long and short positions in real assets, through derivative contracts.

Arbitrage on the other hand, though also linked to investment risk mitigation serves to maintain or influence the stability of real asset returns, through the law of one price, immediately following market mispricing-the absence of either interest rate or purchasing power parities or both (Chen et al., 2003; Krugman et al., 2013). Implicitly, in the presence of arbitrageurs (and all else equal), investment return differences will significantly be affected by differences in the total amount of economic rent earned by the portfolio constituents.

The diversification studied in the literature seems to be of insufficient scope, covering only the presence or absence of benefits and not the size of the finding (for example in Beine & Candleon, 2006). Nevertheless, all the literature has taken diversification as the main dependent variable in their studies (as in Beine & Candleon, 2006; Kei, 2018; Meric et al, 2006; Suva, 2013; Esin, 2004), shunning arbitrage and risk neutralization.

Following intuition in Eaton (2014), the latter two variables are neither directly observable nor strictly regulated by securities exchange laws, hence the laxity in their study.

The studies also used different currency denominations in the market portfolios. While some used domestic currency indexes (for instance Collins & Biekpe, 2003; King et al., 1994 and Stuart & Kabundi, 2011), others used a uniform currency (for instance Darrat & Cheng, 2007; Hogan, 2017). The indexes studied also had construction differences, since there is no law regarding which formula, style and manner of weighting should be used.

Performance benchmarking was also lacking in all the studies. This is a fundamental flaw in financial studies, as unbenchmarked returns can be deceptive. If index performance is tracked, the return will be relative to a specific amount of risk taken and portfolio performance comparison will be workable.

While most of the studies (including De Gregorio & Rodrigo, 2001, Esin, 2004, King et al., 1994; Aked & Max, 2013) only examined nominal index relationships, some others (like Madhvan & Ming, 2002) studied return linkages, while the study of portfolio returns based on a benchmark was scant.

Finally, the economic development profiles of the sample countries, methodology and geographical scopes were heterogeneous throughout the studies: - Regarding geographical coverage, while some researches were intra-regional (for example Wong & Du, 2005; Scott, 2012), others covered beyond one region (like Kim, 1993; Palamalai et al., 2013) and others had no specific focus on regionalism (like Mwega, 2009; Stewart & Kabundi, 2011). The second aspect of economic profiles is development rankings. There were those researches based on developing countries (such as Hussein, Hess & Lu, 2015), others researched on developed countries only (Like Yarde, 2006) while others had no specific emphasis of development (industrialization) perspective.

Methodologically, the study time horizons were different. Sample size, data source, analysis levels and techniques were also not uniform. The use of different crisis periods (or none) as breakpoints was also evident. This critique is evident from: - Dornbusch et al. (2000), Kollman and Malherbe (2011); Claesens and Forbes (2009); Lee and Kwang (1993).

Apart from the first (affirmative) and the second (negative) points of critique, the empirical literature reviewed was disparate in diversification scope, lacked uniformity in measurement currency, analytical methodology, market development profile and lacked performance benchmarks, no wonder the divergence of findings even in studies dealing with the same variable. Their findings and conclusions are hence not generalizable to others.

2.6 Summary

This section is a summary of findings on the relationships among the variables delineated by the conceptual framework. Specifically, the summary is about the findings of other scholarly works on financial market development levels, financial market integration, contagion and segmentation and their effects on international portfolio investment diversification.

Regarding financial market development level, the literature had dissimilar findings: -it was not possible to benefit from diversification (Kei, 2018; Hogan, 2017), there were conditional benefits depending on the study sub-period (Esin, 2004; Erb et al., 1994), the market responses were disparate (Suva, 2014, Roll, 1992; Mathur & Subrahmanyam, 1990).

Studies touching on financial market integration and IPI risk diversification found that integration eliminated diversification benefit (Beine & Candleon, 2006), it had no effect on stock market comovement (Collins & Biekpe, 2003; King et al., 2004; Esin, 2004), or it had mixed effects (Naime, 2001; Hellstrom et al., 2014; Aviral, 2013).

Regarding information filtration, the studies found no particular pattern of contagion in the markets due to measurement differences and study methodology. Contagion was found to be reducing during crisis periods enhancing diversification impetus (Wadhwani, 1990, Baig & Goldfjan, 1998; Nathaniel, 2008). From the studies, there was no particular mention of a standard measure of contagion. The studies also showed that contagion was not high among developing countries, so these countries were a hedge against volatility spillovers from the developed world (Stuart & Kabundi, 2012). Studies like Zuheir and Faysal (2013) and Bordo and Murshid (2000) affirmed negative effect of contagion on IPI risk diversification practicality while others like Calvo and Reinhart (1995); Stewart and Kabundi (2011) found no particular causality pattern.

Finally, all studies dealing with market segmentation revealed that some stock markets responded more sensitively to country-contextual factors than geographical clustering (as in Heaney & Hopper, 2011; Choi & Rajan, 1997), Bekaert and Harvey (1995); Campbel and Hamoa (1992), while there was evidence of risk and return comovements on regional clusters due to similarity of geopolitical and cultural similarities (Caesar, 2016). What the foregoing summary implies is that the conceptual relationships among the study variable are not generalizable and hence the need for more research.

2.7 Research Gaps

The research gap of this study consists of five grey areas drawn from the literature critique and summary First, all the studies reviewed were heterogeneous in regional scope, economic development focus, time horizon and index characteristics and research methodology, no wonder the heterogeneity of findings. Given this realization, there is justification for not only another study, but also many more.

Secondly, none of the studies used a benchmark portfolio. The studies thus presented findings only on raw indexes, meaning that the conclusions are insufficient for IPI risk diversification decisions. In this case if a losing index outperforms another losing one, the better of the two can be included in a portfolio, leading to an unnecessary net investment loss.

The third part of this gap is non-inclusion of financial metrics in the researches. All the studies reviewed violated Global Investment Professional Standard III (C), by not considering a risk tolerance level. No prudent investor goes to the market without an investment policy statement. The statement outlines the characteristics of the desired portfolio and this should be reflected in the risk diversification solution.

Contrastingly, the reviewed studies (like Stuart & Kabundi, 2012; Mwega, 2009; Baig & Goldfjan, 1998; Collins & Biekpe, 2003) tended to focus only on testing

whether the international diversification was viable or not, largely ignoring this standard. This makes the studies reliable to only those investors without a target diversification policy.

Finally, none of the foregoing studies is purely on developing markets. One study category concentrates on developed and developing markets (in Heaney & Hooper, 2001, Campbell & Hamoa, 1992; Esin, 2004; Mathur & Subrahmanyam, 1990), another on frontier markets only (in Suva, 2004) and a third category with no particular basis of market classification (for instance King et al., 2004; Beine & Candleon, 2006).

The study fills the afore-highlighted gap by incorporating a benchmark portfolio, incorporating Roy's Safety-First ratio as a measure of excess risk, introducing a performance benchmark (FTSE 100) and having a focus only on developing markets.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is a sequel to literature review and introduction to the study. It is a scheme of how data will be handled to answer the research questions postulated in Chapter one and an examination of the generalizability of the empirical literature. Chapter three also contains the research design, paradigm and methodology to be followed in coming up with the fourth chapter.

3.2 Research Design

This research was longitudinal in time nature, being a time series study of stock market indices. It relied on secondary (historical) data and was archival in strategy. Methodologically, the study was multi-method as it employed more than one analysis techniques and was also quantitative in analysis. The study was deductive in approach in that the findings formed an inference reference point. The study was objective in axiology. Such a study is described in Kothari (2009), as guided by rigidity in formulating objectives, selecting sample size and designing data collection and analysis methodology and reporting the findings. Saunders et al. (2012) deliberate that such a research, in which the researcher is independent from the data and maintains an objective stance belongs to positivism philosophy. As concur Chava et al. (2005), this study was positivist.

3.3 Population

The target population of this study was constituted from different sources of financial literature, consisting of developing markets both in the emerging and frontier tiers.

As of June 2016, both developing and frontier markets were differently documented in different sources. They numbered between 21 and 46 depending on classifiers.

Some of these sources enumerated as follows: The international Monetary fund ((21), Financial Times Stock Exchange -FTSE (21), Standard and Poor's (24), Dow Jones Industrial Average-DJIA (24), Russel (25), Columbia University (46); MSCI (43) This research targets all the 46 markets (the maximum number according to the different sources).

3.4 Sampling frame for stock markets

The sampling frame of this study is the MSCI (2016) database of developing markets. 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 also prepared indexes, stratified by regions: - Europe, Middle East and Africa-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)

3.5 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 fitted 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. GIMI methodology (summarized in Table 3.2.) classifies index constituents on the basis of different parameters.

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; 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 3.2 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		

3.6 Instruments

The studies used electronic capture sheets to record and summarize the historical (secondary) data. This was so because historical data is already documented from the data vendors. The target secondary data sources were two: - For index returns, the main data source was Wall Street Journal, while for the benchmark portfolio, the study used the FTSE 100 market index.

3.7 Data Collection Procedure

Using 17th July to 16th August 2007 as the sub-prime mortgage crisis breakpoint, the research used historical data on two 50-day sub-periods: -the pre-crisis sub-period (up to July 17th, 2007) and crisis sub-period (from 16th August, 2007). The justification of this crisis breakpoint is provided in 14 empirical studies, summarized by Guidolin and Tam (2012). Fourteen of these conjecture July-August 2007 to be the crisis breakpoint duration. They include Wu (2011), Brave and Gray (2011), Campbell et al. (2011); Cocchetti (2011); Dwyer and Tkak (2011) citing August 9th 2007, Frank and Hesse (citing July 2007); Baba (2009); Adrian et al. (2010) respectively giving 9th and 15th August, 2007. On a different study, Gary and Lei (2015) give the start of the crisis as July 2007.

Regarding the crisis date then, this study took a one-month range within the 2-month duration proposed in the said studies (July and August) hence having a moderate position. The secondary data was obtained from Wall Street Journal through its online market database and captured into a spreadsheet.

3.8 Data Processing and Analysis

3.8.1 Model specification

Based on the mixed enumeration nature of the variables, this study modeled the relationships implied by the specific objectives using classical linear regression. At diagnostic level, other models including the HAR-RX model suggested by Corsi (2004). The regression model was:

$Y = \beta_0 + \beta_i X_i + \varepsilon_i$, also expressible as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where β_0 is a constant, with B_i representing $\beta_1, \beta_2, \beta_3; \beta_4$ which are the respective coefficients of the independent variables, X_i , such as X_1(financial market development level), X_2 (financial market integration level), X_3 (financial market contagion level) and X_4(financial market segmentation level). In the model, Y represented the level of International portfolio investment risk diversification and ε, the regression error term. The ε was assumed to be normally distributed with mean 0 and a constant variance.

In order to input the index data to the multiple regression model, background diagnostics had to be done through other sub-models and tests. These are described in the model diagnostics section.

3.8.2 Variable measurement

The dependent variable (IPI risk diversification level) was proxied by pairwise aggregation of index constituents. It was determined by the difference between the weighted average number of constituents in a market pair and the average portfolio size engulfing all market sizes, so that the greater the difference, the higher the level of investment diversification in the corresponding markets. This was done in concordance with Markowitz (1999)'s portfolio theory basics.

The index returns were measured at two levels. At first, they were extracted from raw index data through compounding. Following Campbell, Lo and McKinlay (1997), Continuously compounded returns enjoy advantages over simple net returns, since in a multi-period, setup, they are simply the sum of continuously compounded one-period returns involved. The statistical properties of log returns are also more pliable (Tsay, 2005; Poon & Taylor, 1992; Nikkinen *et al.,* 2008).

Letting a market index portfolio at time i= (t−1, t), be Pi and the periodic returns be Rt, the periodic absolute and log returns on the portfolio index were obtained as:

$$R_t = (P_t - P_{(t-1)})/P_{t-1} \qquad 3.8.1$$

So that,

$$R(t) = ln\left(\frac{P_t}{P_{(t-1)}}\right) \qquad 3.8.2$$

At the second level, the market returns from 3.8.1/2 were processed into risk-adjusted returns via Roy's Safety-First ratio (RSFR) to control for portfolio size differences and enhance comparability, consistent with Chris (2012), Eaton (2014) and Dominique (2019) in section 1.1.8 of this study. The RSFR figures were the inputs for analysis of the objectives and hypotheses. The specific attended using non-basic measures as shown in Table 3.5.

Table 3.5: Variables and Measurement

Variable	Measurement used
Financial market development level	Market's development level classification in Section 3.4 as 3: Frontier; 2: Emerging/Frontier; 1: Emerging
Financial market Integration Level	Correlation coefficient for short run dynamics; Cointegration status for the long run: Cointegrated (1); Not cointegrated (2).
Financial market contagion level	Volume-Volatility causality using Corsi (2004) HAR-RX model -1: Evidence of MDH; 2: Evidence of SIAH
Financial Market Segmentation level	Geographical clustering of market pairs. 1: In the same region; 0: In different regions.
IPI risk diversification level	Total divergence of market portfolio size from the sample mean.

3.8.3 Model diagnostic tests

The first step of diagnostic testing was to check for the presence of unit roots in each benchmark return series. Using Augmented Dickey-Fuller test in Eviews, all financial market return series were not stationary at level form. Using Akaike and Bayesian Information Criteria (AIC and BIC), each series was first-differenced and the error term generated on lag length 2 as per the information criteria. All the series produced computed ADF statistics that was more negative than the critical value, meaning that none of them was nonstationary upon first differencing.They were all Integrated of order 1, I (1), and therefore suitable for error correction modeling, on the basis of similarity in first order stationarity.

Next was a check of normality of distribution of the error terms in the Vector Error Correction Models (VECMs) of HAR-RV and of the index series. The study employed Jacque-Bera joint normality test with the H_0: The residuals were multivariate- normal. Only those series (of Benchmarked index returns, Volumes and Volatility counts) which did not reject the H0 were finally taken to the final stage of analysis.

Finally, the study sought to test for heteroscedasticity of the error. From Eviews again, it applied White's Heteroscedasticity Test with H_0: there were no cross terms (no heteroscedasticity). All the variable pairs that did not reject the H_0 were included in the ECMs and VECMs.

While the first objective (on financial market development level and IPI risk diversification level) and the fourth on (financial market segmentation and level and IPI risk diversification level) were investigated through descriptive statistics and statistical inference, the second and third respectively used Johansen cointegration, Corsi (2004)'s Heteroskedastic Autoregressive Realized Volatility (HAR-RV) and Vector Error Correction models as in the ensuing representation.

The second objective partly used pairwise cointegration analysis to determine long-run relationships among the stock market indices. The empirical modeling approach used in this study borrows from Johansen (1990, 1991; 1995).

The Johansen maximum likelihood procedure provides a unified framework for the estimation of multivariate cointegrating systems based on the error correction mechanism of the VAR (*k*) model with Gaussian errors and its usefulness in the analysis of convergence issues would be described as follows: Letting X_t to be a set of I (1) variables consisting of n stock market indices, a VAR (*k*) model, was expressed as:

$$X_t = \mu + A_1 X_{t-1} + A_2 X_{t-2} + \ldots + A_k X_{t-k} + \varepsilon_t \qquad 3.8.3$$

In equation 3.8.3, A_k is an n × n coefficient matrix, $t = 1,2,..T$ and ε_t is a random error term. Equation (3.8.3) may be reformulated into an error correction model as:

$$\Delta X_t = \mu + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-1} + \prod_i X_{t-k} + \varepsilon_t \qquad 3.8.4$$

In this case, Δ is the first difference operator, Γ is an n × n coefficient matrix, defined as $\Gamma_i = -(I - A_1 - ... - A_k)$, which represents the short-run dynamics, and Π is an n × n matrix defined as $\Pi = -(I - A_1 - ... - A_k)$, where I is an identity matrix, whose rank determines the number of distinct cointegrating vectors. If Π has rank r, then there are r cointegrating relationships between the X_t or n - r common stochastic trends.

The number of cointegrating vectors reveals the extent of integration across stock markets. If n - r = 0 (r = n) (full rank), we have the absence of any stochastic trends, with all elements in X_t being stationary [I(0)] and cointegration is not defined. If n - r = n (r = 0) there are no stationary long-run relationships among the elements of X_t.

This latter statement has implications for diversification across international equity markets, since a common trend implies relatively high cross-market correlation, thereby diluting any potential diversification benefit over the long-run. Reduced rank (n > n-r > 0) implies the existence of at least one common stochastic trend, and there will then exist n × r matrices α and β such that $\Pi = \alpha\beta$. The β matrix gives the cointegrating vectors, while α gives the amount of each cointegrating vector entering each equation of the VECM, also known as the adjustment matrix. A finding of reduced rank would imply that, while long-run integration is not complete, the convergence process is underway, with the number of independent stochastic

trends reflecting the extent of this convergence and any diversification and institutional issues arising from this.

The third objective of study (analyze the effect of financial market contagion level on international portfolio investment risk diversification in developing stock markets) used Heteroskedastic Autoregressive Realized Volatility (HAR-RV) proposed by Corsi (2004). The author recommended this model due to its ability to capture effects of shocks on high frequency data as the one used in this study. The model tested for Mixture-of-Distribution Hypothesis, MDH against the alternative of Sequential Information Arrival Hypothesis (SIAH). The objective utilized the high frequency volatility forecasting model HAR-RV with a VECM in two sub-periods (pre-crisis and crisis) to detect the Volume-Volatility nexus.

In financial literature, it is found that structural breaks (for instance financial crises) affect both volatility dynamics (Dungey et al., 2011) and the volatility-volume relationship (Karanasos & Kyrtsou, 2011).

Based on 17 July –16 August, 2007 as the breakpoint duration (as justified in Sub-section 3.7), this study used two 50-day sub-periods. The pre-crisis sub-period was from 18.05.2007 to 16.07.2007 and crisis period, from 16.08.2007 to 15.10.2007).

Following Andersen et al. (2001), various papers in financial literature use high frequency data for volume-volatility studies.

This study used daily closing index data to calculate the volume-volatility relationship in the series. Letting the δ - period returns to be $r_{t,\delta} = p(t) - p(t-\delta)$, the daily realized volatility is the sum of the constituent $1/\delta$ high frequency intraday squared returns as in Equation:

$$RV_{t+1}(\delta) = \sum_{j=1}^{1/\delta} (r_{t+j.\delta,\delta})^2 \qquad 3.8.5$$

The model is based on heterogeneity of traders' reaction to new information, against the null hypothesis of mixture of distribution (in Müller et al., 1993). It captured three volatility dimensions: - short term (Daily, labeled "D"), medium (weekly, labeled "W") term and long (monthly, labeled "M") term- and was expressed as follows:

$$RV_{t+1} = \beta_0 + \beta_D RV_D + \beta_W RV_{W,t} + \beta_M RV_{M,t} + \xi_{t+1} \qquad 3.8.6$$

Where the subscripts *D, W; M* respectively represent daily, weekly and monthly time gaps.

The Corsi (2004)-based HAR-RV model is devoid of trade volume, since it just contains volatility autoregression and a stochastic error term. The object of this section of analysis was to examine the effect of the arrival of information on both volume and volatility. To include volume, it was necessary to extend the HAR-RV model by adding the trade volume as a proxy for the financial market contagion as proposed by Aguilar and Ringgenberg (2011). This results in the HARX-RV, where X stands for "Extension". The model is described as in 3.8.7.

$$RV_{t+1} = \beta_0 + \beta_D RV_D + \beta_W RV_{W,t} + \beta_M RV_{M,t} + \alpha Vol_{t+1} + \xi_{t+1} \qquad 3.8.7$$

With α as the financial market contagion coefficient, such that if financial market contagion affected the volatility, $\alpha > 0$ and significantly so.

The final part of the volume-volatility was the use the Vector Error Correction Model (VECM) to test for causality between the different return series (in equations 3.8.8 and 3.8.9): -

$$\Delta RV_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta RV_{t-i} + \sum_{i=1}^{p} \theta_i \Delta Vol_{t-i} + \vartheta_1 \varepsilon_{t-1} + \varphi_t \qquad 3.8.8$$

$$\Delta Vol_t = \omega_0 + \sum_{i=1}^{p} \eta_i \Delta Vol_{t-i} + \sum_{i=1}^{p} \upsilon_i \Delta RV_{t-i} + \Im_1 \varepsilon_{t-1} + \lambda_t \quad 3.8.9$$

With the null hypotheses that: - "RV does not Granger-cause Vol" and "Vol does not Granger cause RV".

3.8.4 Descriptive statistics

This study distributed the descriptive statistics by specific study objective according to the level of data processing required, as shown in Table 3.6.

Table 3.6: Summary of Descriptive Statistics

Specific Objective	Descriptive Statistics	Justification
1. Market development level and IPI risk Diversification level	a) Benchmark return means, Standard deviation. b) F-statistic: One Way ANOVA	-Development categories are binary in property. -Checking for influence of the binary categories on benchmark returns.
2. Market integration level and IPI risk diversification.	- Pearson's Correlation coefficient. -Cointegration status	-To capture short run market comovement dynamics.
3. Market Contagion and IPI risk diversification.	-Evidence of MDH or SIAH	Contagion cannot be described by a statistic. It is a stationarity phenomenon.
4. Market Segmentation and IPI risk diversification.	a) One-Way ANOVA (F-statistic) b) Kruskal-Wallis Independent Samples statistic)	-Returns are a continuous variable and financial market segments are categorical. -Confirmation of ANOVA

3.8.5 Tests of hypotheses

Following the postulation of objectives on the study variable relationship, this study proposed corresponding hypotheses, tested in Chapter four (ensuing) according to the presentation in Table 3.7.

Table 3.7: Summary of Hypothesis Tests

Specific objective and Hypothesis postulated.	**Hypothesis test (s)**
1. $H_{0:}1$: The level of financial market development has no effect on the level of IPI risk diversification in emerging and frontier markets.	F-test = One Way ANOVA; T-test of β_1 significance at 5% level.
2. H_0: The level of financial market integration has no effect on the level of IPI risk diversification in emerging and frontier markets.	Johansen cointegration test; T-test of β_2 significance at 5% level.
3. H_0: The level of financial market contagion has no effect on the level of IPI risk diversification in emerging and frontier markets.	Volume-Volatility Granger Causality tests; T-test of β_3 significance at 5% level.
4. H_0: The level of financial market segmentation has no effect on the level of IPI risk diversification in emerging and frontier markets.	-One-Way ANOVA -Kruskal-Wallis independent samples test; T-test of β_4 significance at 5% level.

3.8.6 Findings presentation

The findings of this study were summarized in statistical aggregates and presented through statistical tables, explanations and discussions with reference to the empirical literature review found in Chapter three.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter combines the first three chapters. It discusses the empirical findings of this study, based on the specific research objectives and questions. Combining the specific objectives and the corresponding research methodology in chapter three, each research question is answered according to the findings. At the end of each set of findings is a brief discussion with respect to the empirical literature review of Chapter two.

4.2 Financial Market Development Level and IPI risk diversification

4.2.1 Descriptive properties of returns by market development level

The first specific objective of this study was to determine the effect of financial sector development level on IPI risk diversification against the null hypothesis of insignificant dependency of benchmark returns on industrial category. In the research, the market pairs were under three clusters- "Emerging", "Emerging/Frontier" and "Frontier". Benchmarked on FTSE 100 global index, the study used Roy's Safety-First Ratio (RSFR) on all the aggregated index series. The study found the benchmark returns to have descriptive characteristics as in Table 4.1.

Table 4.1: Benchmark returns by market development level

Development Level	Mean	Standard deviation
Emerging	0.1687	0.13614
Emerging/Frontier	0.0992	0.11674
Frontier	0.0723	0.10465

This finding shows that emerging markets had a higher aggregate benchmark return (0.1687 or 16.87 percent) compared to Frontier markets (0.0723 or 7.23 percent), for every unit of risk taken. The developing market category also has a greater variation of returns, consistent with Markowitz's (1952) theory of risk-return concordance in investment. The significance of the differences in return and risk divergence were confirmed by the results from One-way Analysis of Variance (ANOVA) and Correlation ratio (Eta) in Tables 4.2.2 and 4.2.3, respectively.

The finding that return properties of a particular market pair differ according the level of market development ranking is evident in Hess and Lu (2115) according to whom industrial structure similarity is the backing factor and Kollman and Malherbe (2011) according to whom higher financial market development level negatively affects return volatility levels.

Table 4.2: ANOVA table of returns by financial sector development category

Source of variation	Sum of squares	d.f	Mean Square	F-Ratio	Significance
Between Groups	0.32	1	0.032	2.649	0.126
Within Groups	0.168	14	0.012		
Total	0.200	15			

The F-statistic of 2.649 reveals that the p-value (of 0.126) is greater than the conventional 5% (or 0.05), suggesting that there is no evidence against H_0. This means that for the sampled stock market pairs, the financial sector development differences did not pose significant return variation differences. This result is confirmed by the Correlation Ratio (Eta), in Table 4.3.

Table 4.3: Correlation ratio of return variations

	ETA	ETA Squared
Roy's SFR	0.399	0.159

Regarding the source of the overall variation in benchmark returns (whether it was caused by individual index or industrial category differences), the foregoing results were guided by Chapter three. According to the study methodology, if $\eta = 1$ the overall sample dispersion is purely due to dispersion among the market development clusters and not at all due to dispersion within the individual market returns. This enhances risk diversification benefit.

The limit $\eta = 0$ refers to the case without dispersion in the development clusters contributing to the overall dispersion, whereby diversification is not beneficial. This evidence (yielding a correlation ratio limit not different from limit $\eta = 0$) suggests that the variation in benchmark returns is weekly associated with cross-development category differences, hence it was individual index characteristics were responsible for the overall dispersion of returns.

The findings in Tables 4.2 sand 4.3 determine that financial market development level had some effect on the level of benchmark return comovements, where in both tables, the effect was not significant. This was because of the insignificant levels of the p-value and the value of the correlation ratio, both on the last columns of the respective tables. The evidence of the effect was provided in Hess and Lu (2015) and Celik (2013), who cite negative correlations. It is however incompletely supported in Zimmerman (2003) in the position that it applies in the long run and Aiello and Cliffe (1999) in that it depends on the sampled markets.

4.1.2 Regression of IPI risk diversification level on development level

Further to the foregoing description of risk-return characteristics of specific objective 1, the IPI diversification levels of the market pairs were regressed on the development level, with an input of 120 cases across three development rank options. The results ensue in Table 4.4.

Table 4.4(a): Market Development Level and IPI Risk Diversification Summary

Model	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.056	.048	63.85421	1.404

From the foregoing table, it can be seen that the level of financial market development explained only 5.6% of total variation in IPI risk diversification. This is because of the human behavior included in the investment decision mix. The $1.4 < 2$

Durbin-Watson Statistic shows that there was positive serial correlation of returns as is common in Time Series data, displaying the data characteristic. Field (2009), suggests this to be normal, only considering values under 1 or more than 3 are a definite cause for concern.

Table 4.4(b): Market Development and IPI risk diversification ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	28627.540	1	28627.540	7.021	.009
	Residual	481128.525	118	4077.360		
	Total	509756.065	119			

The ANOVA results determine that the independent variable is a significant cause of differences in IPI risk diversification, since it is significant (at 0.9% level).

Table 4.4(c): Regression of IPI risk diversification on Market Development Levels

Model	B	Std. Error		Significance
(Constant)	53.241	16.121	3.303	.001
Development level	-28.964	10.931	-2.650	.009

The results in Table 4.4 determine that $Y = 53.241 - 28.94X_1 + \varepsilon$ with a significant β_1 (-28.94) coefficient (significance level = 0.009 or 0.9% < the hypothetical 5%).

This implies that there is a significant negative influence of financial market development level on IPI risk diversification level. This is in contrast to Christofi and Christofi (1983) according to whom sample markets were interrelated through a common factor whose effect appeared to be consistent over time, rendering international investment portfolio investment risk diversification untenable. Mathur and Subrahmanyam (1990) was also in discord with this result, citing the basis of IPI risk diversification to be influenced by other factors such as consumer prices and expected consumer prices and associating economic variables with insignificant predictive power on the indices. This study's finding are however supported in those by Hogan (2017), Kei (2018) and Elizaberta and Tung (2015) to the effect that economic development status had an unconditional bearing on stock market comovement or divergence. Suva (2014), Esin (2004) and Collins and Biekpe (2003) differ in assertion that market development level influence was disparate.

4.3 Financial market integration and IPI risk diversification

This analysis section is two-phased, capturing the short run and long run investment horizons. Over the sample study (short run) investment period, the research analysis focused on excess return correlations of the index series, while analysis of long run relationships was through Johansen cointegration testing.

4.3.1 Short run description of financial market integration

This section analyzed excess stock market index returns, benchmarked on Financial Times Stock Exchange (FTSE) 100 world index series. First, the study provides the correlation structure of the market pairs to highlight on the short run dynamics integration dynamics. Further, the long run dynamics were captured in the cointegration structure of the studied benchmark returns as demonstrated in Table 4.5.

Table 4.5: Benchmark return correlations

	ARG	BRA	CHIL	CHI N	CZE	EGX	HUN	IND	JOH	MAL	MEX	RUS	PAK	POL	SKO	TAI
ARG	1.00															
BRA	0.56	1.00														
CHIL	0.46	0.62	1.00													
CHIN	0.34	0.42	0.19	1.00												
CZEC	0.57	0.65	0.48	0.31	1.00											
EGX	0.67	0.69	0.58	0.25	0.66	1.00										
HUN	0.54	0.65	0.62	0.28	0.74	0.53	1.00									
IND	0.47	0.62	0.51	0.53	0.64	0.66	0.60	1.00								
JOH	0.20	0.12	0.16	0.14	0.18	0.14	0.18	0.18	1.00							
MAL	0.54	0.71	0.66	0.34	0.73	0.65	0.74	0.79	0.27	1.00						
MEX	0.62	0.69	0.60	0.24	0.73	0.61	0.67	0.55	0.25	0.71	1.00					
RUS	0.30	0.46	0.21	0.17	0.55	0.42	0.50	0.41	0.14	0.48	0.27	1				
PAK	**-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			
POL	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		
SKO	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	
TAI	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

Yellow filled: Significant correlations Bold only: Insignificant negative or zero correlations.

No fill no bold: Insignificant positive correlations
Not filled; not bold insignificant positive correlations

From Table 4.5, Pakistan stock returns were negatively correlated with those of all the other markets. These correlations were significant, except for South Korea. This means that there is 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. This finding is similar to the simple regression results provided in Table 4.6.

Table 4.6: Short run market integration and IPI risk diversification

Model		**B**	**Std. Error**	**t**	**Significance level**
1	(Constant)	13.738	9.225	1.489	.139
	Market integration level	-.862	18.749	-.046	.963

From the simple regression summary (of IPI risk diversification level on short run market integration level), it is evident that in the short run, the dependent variable negatively affects IPI risk diversification, though in an insignificant manner (significance of 96.3%), since:

$$Y = 13.738 - 0.862X_2 + \varepsilon$$

According to this result, the postulated null hypothesis, H_0:2: Financial market integration level has no significant effect on international portfolio investment risk diversification in developing stock markets, is affirmed.

This finding partially agrees with Hellstrom et al. (2014) on grounds of mixed short-term dynamics, Aviral (2013) on grounds of lack of effect at lower time frequencies, Suva (2014) in that market dependencies are disparate and Collins and Biekpe (2003) in that integration effort is a week IPI risk diversification determinant.

4.3.2 Market Cointegration and IPI risk diversification

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 integrated in the long run for analysis of IPI risk diversification gains with extended investment time horizon, hence cointegration testing. Table 4.7 presents the results.

Table 4.7: Pairwise market Cointegration summary

	ARG	BRA	CHIL	CHIN	CZE	EGX	HUN	IND	JOH	MAL	MEX	RUSS	PAK	POL	SKOR	TAI
ARG	1	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
BRA	0.56	1	NO	NO	NO	X	NO	NO	NO	NO	NO	NO	X	NO	NO	NO
CHIL	0.46	0.62	1	NO	NO	NO	NO	NO	NO	NO	NO	NO	X	NO	NO	NO
CHIN	0.34	0.42	0.19	1	NO	NO	NO	NO	NO	NO	NO	NO	X	NO	NO	NO
CZE	0.57	0.65	0.48	0.31	1	NO	X	NO	NO	NO	NO	X	NO	NO	NO	NO
EGX	0.67	0.69	0.58	0.25	0.66	1	X	NO	NO	NO	NO	X	X	NO	NO	NO
HUN	0.54	0.65	0.62	0.28	0.74	0.53	1	X	X	X	NO	X	X	NO	NO	NO
IND	0.47	0.62	0.51	0.53	0.64	0.66	0.6	1	X	X	NO	X	NO	NO	NO	NO
JOH	0.2	0.12	0.16	0.14	0.18	0.14	0.18	0.18	1	X	NO	X	X	NO	NO	NO
MAL	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
MEX	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
RUS	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
PAK	-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
POL	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
SKO	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
TAI	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

The findings in Table 4.7 present the long run investment diversification opportunities depending on the market integration levels. Of the 120 market pairs tested for integration, only 25 were integrated in the long run. Notably, all market pairs had short term comovement (with Pakistan) though which vanished into time (in the short run, these market pairs had significant negative correlation of benchmark returns and in the long run, the market pairs were found to be co-movement). Table 4.7 shows that only the South Korea-Pakistan portfolio investment diversification was beneficial across time (since initial returns were significantly negative and the markets were not co integrated). Moreover, Argentina and South Korea were 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. Feebly feasible for short run and long run diversification were portfolio combinations involving Poland (with India, Pakistan and Czech Republic) and Pakistan (with Malaysia, India, Mexico and Czech Republic), since these markets had insignificant negative correlations of benchmark returns and were all not I (1).

Following the descriptive representation of market cointegration pattern in Table 4.7, this study considered some inferential insight on dichotomy of diversification level on the basis of cointegration status of the stock market pairs. The summary is in Tables 4.8 and 4.9

Table 4.8: IPI risk diversification and cointegration model summary

Model	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.047	.039	64.15827	1.363

The foregoing table indicates that the coefficient of determination of the regression of IPI risk diversification level on financial market cointegration (integration in the long run) is 4.7%, to say that there is low explanatory power of the independent on the dependent variables. This again is attributable to investor behavior in decision making about IPI diversification. The Analysis of Variance however (following) shows that the long run relationship was significantly predictable, as in Table 4.9.

Table 4.9: IPI risk diversification and Cointegration ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance.
1	Regression	24034.592	1	24034.592	5.839	.017
	Residual	485721.473	118	4116.284		
	Total	509756.065	119			

Table 4.8 depicts that based on Analysis of Variance, there was a significant relationship between the level of stock market return diversification level and cointegration status of the sample market pairs. This is evident from the significance level of the F-statistic which was 0.017, smaller than the hypothetical 0.05 significance level assumed by this study. The concurrent linear regression model can be summarized as in Table 4.10.

Table 4.10: IPI risk diversification versus market Cointegration

Model	B	t	Significance	VIF
(Constant)	55.212	3.023	.003	
Market cointegration level	-34.353	-2.416	.017	1.000

These regression results suggest that the predictive relationship between IPI risk diversification and long run integration status of the sampled markets' returns can be modeled as:

$\dot{Y} = 55.212 - 34.353X_2 + \varepsilon$, with 0.017 significance level (establishing significant negative correlation between the two variable), since 0.017<0.05. I this (long run) case, H_0:2: Financial market integration level has no significant effect on international portfolio investment risk diversification in developing stock markets, is rejected.

The general premise of this result is concurrent with Naime (2001), that though some markets were integrated, IPI risk diversification among them was still feasible even in the long run. In other market pairs, prospects of diversifications diminished and/or vanished in the long run. The results in King et al. (1994), Beine and Candelon (2006) and Liu (2016) confirm the long run characteristic. Further, these study results partly agree with Hellstrom et al. (2014) in the aspect of mixed dynamics in the short run and therefore IPI risk diversification feasibility.

The findings are however unable to fully support Elizaberta and Tung (2015) who associate risk diversification benefit to cross-industry rather than cross-country factors. The finding is also consistent with Aviral (2013) whose study results showed that Asian stock markets were highly integrated at lower frequencies and comparatively less integrated at higher frequencies, conjecturing that the Asian stock markets offered little potential gains from international portfolio diversification especially for monthly, quarterly, and bi-annual time horizon investors, whereas, higher potential gains were expected at intraweek, weekly, and fortnightly time horizons.

Conversely, Martikainen et al. (1997)'s study findings disclosed independence of markets despite trade ties, while Modi and Patel (2010) and Meric et al. (2006) found integration effect to be effective on IPI risk diversification for developed countries only. The findings were contrasted by Ng (2000), who uses the same methodology and found the degree of integration to be inconsequential on correlations structure.

4.4 Financial Market Contagion Level and IPI risk diversification

4.4.1 Volume-Volatility causality tests

In each continental segment, the median-performance (representative) index was selected and its volatility compared to volume, with the null hypotheses that: "Volume does not Granger-cause Volatility" and "Volatility does not Granger-cause volume".

able 4.11: Pre-GFC Volume-Volatility Granger Causality

Null Hypothesis:	Obs.	F	Prob
AFR_JSE_VOLUME does not Granger Cause AFR_JSE_VOLAT	40	1.27247	0.2666
AFR_JSE_VOLAT does not Granger Cause AFR_JSE_VOLUME		0.05627	0.8138
BOVESPA_VOLUME does not Granger Cause BOVESPA_VOLAT	40	0.33561	0.5659
BOVESPA_VOLAT does not Granger Cause BOVESPA_VOLUME		14.1665	0.0006
EUR_FTSE_VOLUME does not Granger Cause EUR_FTSE_VOLAT	40	0.88136	0.3539
EUR_FTSE_VOLAT does not Granger Cause EUR_FTSE_VOLUME		9.43829	0.0040
SHANGAI_VOLUME does not Granger Cause SHANGAI_VOLAT	40	1.05547	0.3109
SHANGAI_VOLAT does not Granger Cause SHANGAI_VOLUME		0.00042	0.9838

In the pre-GFC sub-period, the foregoing Granger causality test results show that in all the markets, volume did not Granger-cause volatility (since none of the null hypotheses is rejected). This is evidence of Mixture of Distribution Hypothesis (MDH). In the two regions, there were no speculative opportunities based on trading volume, since knowledge on trading volume only insignificantly improved forecasts on volatility. Conversely, Volatility Granger-caused Volume in Europe (represented by FTSE 100 index) and Latin America (represented by BOVESPA). In the latter two cases hence, there was evidence of Sequential Information Arrival Hypothesis (SIAH). This signifies a lead- lag relationship between volume and volatility, where information about trading volume can be used to speculate on stock market volatility.

Table 4.12: GFC Volume-volatility Granger causality

Null Hypothesis:	Obs.	F	Prob.
AFR_JSE_VOLUME does not Granger Cause AFR_JSE_VOLAT	64	0.02582	0.8729
AFR_JSE_VOLAT does not Granger Cause AFR_JSE_VOLUME		0.72029	0.3994
BOVESPA_VOLUME does not Granger Cause BOVESPA_VOLAT	64	7.56632	0.0078
BOVESPA_VOLAT does not Granger Cause BOVESPA_VOLUME		0.36575	0.5476
EUR_FTSE_VOLUME does not Granger Cause EUR_FTSE_VOLAT	64	0.02272	0.8807
EUR_FTSE_VOLAT does not Granger Cause EUR_FTSE_VOLUME		1.18727	0.2802
SHANGAI_VOLUME does not Granger Cause EUR_FTSE_VOLUME	64	1.86318	0.1773
EUR_FTSE_VOLUME does not Granger Cause SHANGAI_VOLUME		0.12017	0.7300
SHANGAI_VOLUME does not Granger Cause SHANGAI_VOLAT	64	0.00359	0.9524
SHANGAI_VOLAT does not Granger Cause SHANGAI_VOLUME		10.2317	0.0022

In the crisis period, Mixture of distribution Hypothesis (MDH) applied across all the markets safe for Latin America and Asia-Pacific. In the two cases respectively, volume Granger-caused volatility and volatility Granger-caused volume.

Table 4.13: Pre-GFC Volatility Spillovers

Null Hypothesis:	Obs.	F	Prob
BOVESPA_VOLAT does not Granger Cause AFR_JSE_VOLAT	39	2.75844	0.0776
AFR_JSE_VOLAT does not Granger Cause BOVESPA_VOLAT		4.03204	0.0268
EUR_FTSE_VOLAT does not Granger Cause AFR_JSE_VOLAT	39	0.28757	0.7519
AFR_JSE_VOLAT does not Granger Cause EUR_FTSE_VOLAT		21.1202	1.E-06
SHANGAI_VOLAT does not Granger Cause AFR_JSE_VOLAT	39	0.31967	0.7285
AFR_JSE_VOLAT does not Granger Cause SHANGAI_VOLAT		0.17871	0.8371
EUR_FTSE_VOLAT does not Granger Cause BOVESPA_VOLAT	39	3.00437	0.0629
BOVESPA_VOLAT does not Granger Cause EUR_FTSE_VOLAT		0.68587	0.5105
SHANGAI_VOLAT does not Granger Cause BOVESPA_VOLAT	39	0.13294	0.8760
BOVESPA_VOLAT does not Granger Cause SHANGAI_VOLAT		0.68674	0.5101
SHANGAI_VOLAT does not Granger Cause EUR_FTSE_VOLAT	39	0.00500	0.9950
EUR_FTSE_VOLAT does not Granger Cause SHANGAI_VOLAT		0.05349	0.9480

In Pre-GFC period, there was no particular pattern of stock market influence. Nevertheless, Africa influenced Latin America and Europe (p-values of 0.0268 and 1.E-06 respectively). The rest of market pairs had no causality relationships. From the findings in Table 4.13, only two of the six market pairs had uni-directional causality from Johannesburg Stock Exchange.

Table 4.14: GFC Volatility Spillovers

Null Hypothesis:	Obs.	F.	Prob.
BOVESPA_VOLAT does not Granger Cause AFR_JSE_VOLAT	63	0.00193	0.9981
AFR_JSE_VOLAT does not Granger Cause BOVESPA_VOLAT		17.6443	1.E-06
EUR_FTSE_VOLAT does not Granger Cause AFR_JSE_VOLAT	63	2.35382	0.1040
AFR_JSE_VOLAT does not Granger Cause EUR_FTSE_VOLAT		27.9067	3.E-09
SHANGAI_VOLAT does not Granger Cause AFR_JSE_VOLAT	63	3.07196	0.0539
AFR_JSE_VOLAT does not Granger Cause SHANGAI_VOLAT		0.90744	0.4092
EUR_FTSE_VOLAT does not Granger Cause BOVESPA_VOLAT	63	0.79038	0.4585
BOVESPA_VOLAT does not Granger Cause EUR_FTSE_VOLAT		9.67341	0.0002
SHANGAI_VOLAT does not Granger Cause BOVESPA_VOLAT	63	3.53216	0.0357
BOVESPA_VOLAT does not Granger Cause SHANGAI_VOLAT		0.31995	0.7275
SHANGAI_VOLAT does not Granger Cause EUR_FTSE_VOLAT	63	3.83966	0.0272
EUR_FTSE_VOLAT does not Granger Cause SHANGAI_VOLAT		0.02563	0.9747

Column 4 of Table 4.14 shows that in the GFC sub-period, there were volatility spillovers from Africa and Asia-Pacific to other markets but no causality between the two and no spillovers from the other markets to the two.

Five out of the 6 market pairs studied had unidirectional causality, with the dominance of China and South Africa. Upon regressing the level of investment diversification against bidirectional causality, the outcome was presented in Table 4.15 (a) to 4.16.

Table 4.15(a): Contagion-IPI risk diversification summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.005	.000	-.008	65.72568	1.296

From Table 4.15 (a), it is evident that even though there is no serial correlation of the returns (Durbin-Watson 1.296 which is between 1 and 3), variation in the independent variable of IPI risk diversification levels was inexplicable from variation in the level of financial market contagion. This was further examined via Analysis of Variance (ANOVA), ensuing.

Table 4.15(b): Contagion-IPI risk diversification level ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	12.027	1	12.027	.003	.958
	Residual	509744.038	118	4319.865		
	Total	509756.065	119			

Table 4.15(b) gives an F-statistic of 0.003 which has 95.8 percent significance. This tells that there is no significant relationship in variance of IPI diversification level o the basis of financial market contagion. Based on the contagion evidence of MDH and SIAH, Table 4.16 further demonstrates that the predictive relationship was not significant.

Table 4.16: Contagion-IPI risk diversification level regression

Model		B	t	Significance	VIF
1	(Constant)	14.184	.901	.370	
	Contagion level	-.283	-.053	.958	1.000

Table 4.16 shows that financial market contagion across the 2007/8 financial crisis date had some negative influence on IPI risk diversification (Beta coefficient of -.283). This influence was however insignificant (0.370 significance compared to the hypothetical 0.05 of this study).

Accordingly, this study is unable to reject the null hypothesis that financial market contagion had no significant effect on IPI risk diversification in Emerging and Frontier markets on the regression model:

$$\dot{Y} = 14.184 - 0.283X_3 + \varepsilon,$$

where X_3 was the level of financial market contagion and Y the level of IPI diversification. The main findings of this section can be discussed on the basis of two contagion variants-Volume –volatility causality and Volatility spillover. First, Volume-volatility causality increased across the 2007/8 Global Financial Crisis (GFC), but not in a particularly generalizable pattern.

The evidence of effect of financial market contagion contrasts Ng (2000), is supported in reverse Esin (2004) who found that market coupling was in the pre-crisis period rather than later, and partly agrees King and Wadhwani (1990); Zuheir and Faysal (2013); Calvo and Reinhart (1995) on the presence of effect but lack of generalizable pattern. Secondly, there were cross-crisis volatility spillovers for some markets and none for others.

This finding diverges from that of Nathaniel et al. (2008) on grounds of low coupling after crises, but agrees with findings by Mwega (2009), Bordo and Murshid (2000), King and Wadhwani (1990) and Stewart and Kabundi (2011) on the assertion that contagion level influenced variation of cross-market returns disparately.

4.5 Financial Market Segmentation and IPI risk diversification

This part of research analysis contains description of excess returns of indexes on the benchmark on the basis of geographical segmentation of the stock exchanges. Since objective 2 dealt in part with individual markets with a long run investment horizon perspective, the individual markets can thence be evaluated for investment diversification benefit or debenefit in the long run. The short run scenario is however different. This study divided the sampled markets into 4 geographical segments according to the proximity of the host countries. The segments included Africa (coded 1), Europe (coded 2), The Americas (coded 3) and Asia-pacific (coded 4).

The analysis was under two assumptions, according to the underlying distribution of the study variables: Assuming that the benchmark returns are normally distributed, the study conducted a One-Way Analysis of Variance (ANOVA) with the null hypothesis that the samples came from populations whose man was the same-and under the assumption of non-normal distribution of market segments, nonparametric analysis ensued via the n-independent samples Kruskal-Wallis test- with the null hypothesis that the samples came from populations with the same distribution. One-way analysis of variance of benchmarked returns yielded the outcome in Table 4.17.

Table 4.17: One-Way ANOVA of excess returns by market segment

	Sum of Squares	Degrees of freedom	Mean Square	F	Significance
Between Groups	.021	3	.007	.459	.716
Within Groups	.180	12	.015		
Total	**.200**	**15**			

Table 4.17 yielded an F-statistic of 0.459 which is insignificant (with a p-value of 0.716), to mean that financial market segmentation had no significant influence on international portfolio investment risk diversification. To this effect, the benchmark risk and returns to any geographical financial market segment were equally risky in the short run investment horizon. Based on market segmentation therefore, there was no evidence of short run international portfolio investment risk diversification benefit.

Following the nonparametric nature of the geographical market clusters this research further analyzed the effect of financial market segmentation on investment diversification using nonparametric methods. The most applicable technique was the Kruskal-Wallis test for independent samples, against the alternative hypothesis that the distribution of benchmark returns per unit of risk taken was not different across geographical market segments. Ensuing is a summary of the test results.

Table 4.18(a): Kruskal-Wallis independent samples test summary

Null Hypothesis	Test	Significance	Decision
The distribution of returns per unit of risk taken is the same across the market segments.	Independent samples Kruskal-Wallis test	0.741	Retain the null hypothesis

Based on the statistical test results from Tables 4.17 and 4.18 (a), there is no ground to reject the Null Hypotheses postulated. Table 4.18 (b) ensues.

Table 4.18(b): Market segmentation-IPI risk diversification model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.107	.011	.003	65.35014	1.340

From Table 4.18 (b), it was found that just as the rest of the discussed IPI risk diversification determinants, variation in the level of financial market segmentation accounted for only 1.1% of the overall variation in the diversification level and with a Durbin-Watson statistic of 1.340, there was no serial correlation of the random error terms. Finally, the predictive relationship was modeled as summarized in Table 4.19.

Table 4.19: Market segmentation and IPI risk diversification regression

Model	B	Std. Error	Beta	t	Significance	VIF
(Constant)	46.867	29.268		1.601	.112	
Region similarity of market pair	-18.33	15.700	-.107	-1.17	.245	1.0

In Table 4.19 is evidence a negative predictive relationship between a market pair's geographical region cluster and the level of IPI risk diversification. Given a Variance Inflation Factor (VIF) of 1 (meaning the model appropriately fits the data), the regression relationship was:

$$\dot{Y} = 46.867 - 18.329X_4,$$

With X_4 being the level of financial market segmentation. The Beta value was however found insignificant (0.112>0.05) leading to affirmation of H_0:4 (Financial market segmentation level has significant effect on international portfolio investment risk diversification in developing stock markets).

This signifies that all investors with equally weighted foreign investment portfolios had the same risk exposures across the geographical investment destinations, thus the basis of short run investment diversification decisions would be different from geopolitical financial market segmentation.

The finding somewhat disagrees with those of others in empirical literature such as Jorion and Schwartz (1986) on the basis that nationality-based legal barriers are a strong source of segmentation, rendering exogenous shock effects immaterial, and agrees with Heaney and Hooper (2001) wherein IPI risk diversification effect is not directly attributable to market segmentation but to regionalism, Fischer (1995) whereby market segmentation is not an utter determinant of risk diversification and Caesar (2016) according to whom financial market segmentation has effect on IPI risk diversification, but investor decision to benefit from the effect is confounded by home-country bias.

4.6 Joint effect of the determinants

In this subsection the study adopted the linear regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon,$$

where $\beta_1, \beta_2, \beta_3$ *and* β_4 are the respective slope coefficients of X_1, X_2, X_3 *and* X_4, respectively representing the levels of Financial market development, Financial market integration, Financial market contagion and Financial market segmentation, all of which were independent variables in the study. ε was the random error term and Y was the dependent variable of the study. The results, interpretation and discussion of this modeling ensue.

Table 4.20: Overall regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.339	.115	.084	62.64374

The summary result shows that only 11.5 percent of the variation in dependent variable (investment diversification level) could jointly be explained by the dependent variables identified. This makes their joint influence insignificant as supported by different significance levels of the determinants, individually.

Table 4.21: Overall regression ANOVA

Model	Sum of Squares	Degrees of freedom	Mean Square	F	Significance
Regression	58468.610	4	14617.153	3.725	.007
	451287.455	115	3924.239		
Residual	509756.065	119			
Total					

From the foregoing Analysis of Variance (ANOVA) table, individual determinants of IPI diversification had different effects on IPI risk diversification. This divergence of effects was significant, considering a benchmark of 5% (since the computed data is 0.7% significant). Each of the independent variable is hence differently effective on the dependent variable.

Table 4.22: Overall Model Coefficients

	B	Std. Error	t	Significance	VIF
(Constant)	116.611	36.493	3.195	.002	
Development level	-29.447	10.811	-2.72	.007	1.016
Cointegration level	-35.690	13.963	-2.56	.012	1.012
Contagion level	2.412	5.158	.468	.641	1.019
Segmentation level	-14.155	15.103	-.937	.351	1.007

The overall coefficients model determined that there was no serial correlation of the regression errors, since all the Variance Inflation Factors (VIF) were around 1.000. Financial market development and cointegration levels were significantly influential on IPI risk diversification with respective p-values of 0.007 and 0.012, both less than the hypothetical 0.05. This result is supported in the individual regressions in sub-sections 4.1.2 and 4.3.5 where correspondingly, the level of financial market development was significantly responsible for IPI risk diversification and the long run dynamics of market integration accounted for a significant change in IPI risk diversification level despite disparate short run integration dynamics. As it is in subsections 4.4 and 4.5, financial market contagion level (with 0.641 significance) and Financial market segmentation level (with significance level of 0.351) were not significantly effective on IPI risk diversification, confirming the foregoing results. From column B of this Table, all the determinants had negative relationship with IPI risk diversification, except for the case of financial market contagion level (Beta value of 2.412). The finding, though different from that in individual factor regression agrees with Mwega (2009); Bordo and Murshid (2000); King and Wadhwani (1990); Stewart and Kabundi (2011) on the assertion that contagion level influenced variation of cross-market returns disparately.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter represents the summary of the findings, the conclusions drawn from the findings and the corresponding recommendations. This study aimed at analyzing the determinants of international portfolio investment risk diversification in developing (frontier and emerging) stock markets. Statistical description of the study findings included Pearson's correlation coefficients, Correlation ratio, F statistics and Kruskal-Wallis statistic of independent samples, Mean and Standard deviation of benchmark returns. Taking a 95% confidence level, inferential tests on the return series included Johansen cointegration tests, Granger causality tests, Kruskal-Wallis independent samples test and F-tests. All the market returns were benchmarked on the Financial Times Stock Exchange (FTSE 100) composite index which is similar in characteristics with emerging and frontier market indexes.

5.2 Summary of Findings

Under this section, the study topically presents a summary of key findings on each specific objective and the implications of the rejection or failure to reject the corresponding null hypotheses postulated in section 1.7 of Chapter one.

5.2.1 Financial market development and IPI risk diversification levels

On the first question of financial market development level and IPI risk diversification, all the FTSE 100-benchmarked returns were comparatively higher (16.87%) for emerging markets than those of frontier markets (at 7.23%).

Analysis of Variance results gave an F-statistic of 2.649 which is insignificant (significance of 0.126); leading to affirmation of the null hypothesis that financial market development had no significant effect on IPI risk diversification in developing stock markets. The benchmark returns by development category yielded a correlation ratio (ETA) of 0.399, meaning that the overall dispersion of benchmark returns in emerging and frontier markets was weekly associated to financial market development category. The least squares regression results yielded a significant Beta (-28.964 with 0.009 significance level). Generally, the results establish that financial market development level was a source of bench mark return difference. Nevertheless, following the non-rejection of the null hypothesis, it can be concluded that though the development-based return differences are feebly evident, IPI risk diversification is enormously feasible.

5.2.2 Financial market integration and IPI risk diversification levels

The second question to be answered by this research was on the effect of financial market integration level and international portfolio investment risk diversification level in developing stock markets. The study used correlations and Johansen cointegration analysis to respectively identify short run (integration) and long run (cointegration) comovement patterns on the benchmarked returns. A total of 120 market pairs were studied in these two-time dimensions. In the short run analysis, 14 market pairs exhibited negative return correlations with Karachi Stock exchange (Pakistan). Twelve of these had insignificant negative correlations, while two (Pakistan-Russia; Pakistan-South Korea) were significant. Poland had insignificant non-positive correlations with all markets safe for Latin America and China, where the positive correlations were insignificant.

Moreover, the Polish Bourse had zero correlations with Egypt and Hungary. The rest (92) of the market pairs had positive correlations-signifying some level of integration.

Johansen cointegration analysis results established 95 market pairs to be integrated in the long run. In contrast, two sets of markets were not cointegrated: Poland and Egypt; Pakistan with any of Taiwan, South Korea, Poland, Argentina, Czech Republic, India, Malaysia; Mexico. Notably, these pairs were divergent both in the short run and long run time horizons. The study outcomes connoted that financial market integration was effective on IPI risk diversification in emerging markets only in the short run, but the long run dynamics were mixed. Taking a regression view of the cointegration status of the market pairs against IPI risk diversification revealed that there was a negative relationship but without predictive importance. This was due to non-rejection of the null hypothesis.

5.2.3 Financial market contagion and IPI risk diversification levels

Regarding the third question of the study (What is the effect of financial market contagion level on international portfolio investment risk diversification in developing stock markets?), mixture of distribution of Volume-volatility information arrival to the markets was dominant in both the pre-crisis and crisis sub-periods, meaning there was evidence of contemporaneous arrival of information to the markets-evidence of financial contagion. In the two study periods however, there were volatility spillovers (evidence of Sequential Information Arrival Hypothesis-SIAH), from Africa and Asia-pacific to the rest of the markets, Europe and Latin America, but no spillover effects between the latter two. The regression results then indicated that financial market contagion across the 2007/8 financial crisis date had some negative influence on IPI risk diversification (Beta coefficient of -.283).

This influence was however insignificant (0.370 significance compared to the hypothetical 0.05 of this study) hence, there was no ground to reject the null hypothesis that financial market contagion had no significant effect on IPI risk diversification in Emerging and Frontier markets.

5.2.4 Financial market segmentation and IPI risk diversification levels

Fourthly, the effect of financial market segmentation on benchmark return characteristics was tested using One-Way ANOVA and the n-sample Kruskal-Wallis test of independent samples. The results yielded an insignificant F-statistic of 0.459 which is to mean that financial market segmentation had no influence on investment risk differences. According to the Kruskal-Wallis test, the distribution of returns per unit of risk taken was not different across the market segments. Both tests failed to reject the null hypothesis that the sample markets were drawn from populations with the same distributions and the same mean. The linear regression of IPI diversification level on market segmentation level predicted negatively (with -18.329 Beta coefficient) and insignificantly (with 0.112 significance level compared to the hypothetical 0.05), leading to affirmation of the null hypothesis H_0:4 Financial market segmentation level had insignificant effect on international portfolio investment risk diversification in developing stock markets.

5.3 Conclusions

Based on the findings of the study and in line with the specific objectives and hypotheses proposed, this section presents findings of the study and compares and contrasts them with other scholarly findings in review.

5.3.1 Financial market development and IPI risk diversification level

From this study's findings, Frontier markets yielded remarkably higher returns and higher dispersion of returns and overall dispersion of benchmark returns in emerging and frontier markets was weekly associated to financial market development category. Based on this result, the null hypothesis to the first specific objective of the study ($H_{0:}$ The level of financial market development has no effect on the level of IPI risk diversification in emerging and frontier markets) was not rejected, conjecturing no significant effect.

Accordingly, Investors can diversify investment in any market pair regardless of the development status. The difference in risk and return is attributable to factors other than financial market development level. The investment focus should however be directed to frontier markets as they have returns superior to those of emerging markets. This conclusion of differential return and risk characteristics is supported in Hogan (2017), MSCI (2017) and Kei (2018). The regression results attested according to Christofi and Christofi (1983); Mathur and Subrahmanyam (1990); Roll (1992). Literature in partial support of insignificant or no predictive relationship includes Aiello and Cliffe (1999), Suva (2004); Esin (2004); Celik (2013).

5.3.2 Financial market integration and IPI risk diversification levels

Both in the short run and long run investment horizons, only two market sets were 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, IPI risk diversification would be infeasible.

These other market pairs were co-movement in the short run and cointegrated. Based on the long run hence, the study findings rejected the hypothesis on Specific objective two (H_0: The level of financial market integration has no effect on the level of IPI risk diversification in emerging and frontier markets) to the effect that financial market integration was negatively effective on IPI risk diversification in emerging markets only in the short run, but the long run dynamics were mixed.

The finding on low-frequency (short run) availability of investment diversification opportunity, then inability of this to continue to the long run, is also evident in Hellstrom et al. (2014); Aviral (2013); Elizaberta and Tung (2015); Liu (2016); King et al. (1990). It is partly manifest in Collins and Biekpe (2003); Naime (2000).

5.3.3 Financial market contagion and IPI risk diversification levels

The third conclusion of this study concerned financial market integration and IPI risk diversification in the sampled markets) In times of financial crises, Africa and Asia pacific dominated Europe and Latin America in terms of volatility spillovers. Remarkably, Volume-volatility causality increased across the 2007/8 Global Financial Crisis (GFC) but not in a particularly generalizable pattern and there were cross-crisis volatility spillovers for some markets and none for others. The least squares regression result attested to a negative predictive relationship which was predictively insignificant. The finding translates to disparate volume and volatility spillovers as witnessed by such studies as Ng(2000), Esin (2004); King and Wadhwani (1990); Zuhair and Faysal (2013); Calvo and Reinhardt (1995); Stewart and Kabundi (2011) and a low coupling after crisis as somewhat supported in Nathaniel et al. (2004); and Esi (2004).

5.3.4 Financial market segmentation and IPI risk diversification levels

Fourthly, the hypothesis to the last specific objective of the study (H_0:4 Financial market segmentation level has significant effect on international portfolio investment risk diversification in developing stock markets) was affirmed from the findings. This non-rejection attests that investors with equally weighted foreign investment portfolios had the same risk exposures across the geographical investment destinations, thus the basis of IPI risk diversification decisions would be different from geopolitical financial market segmentation. In empirical literature, this finding differs with Jorion and Schwartz (1986) but agrees with Heaney and Hooper (2001); Fischer (1995); Caesar (2016) according to whom financial market segmentation has effect on IPI risk diversification, but investor decision to benefit from the effect is confounded by home-country bias.

5.4 Recommendations

The recommendations arising from this from this study concern investment in developing markets, by the investment fraternity (investors, investment managers, policy makers) as well as scholars.

The first recommendation of this research regards the relationship between IPI risk diversification and financial market development level. To investment managers and retail investors, this study recommends consideration of financial market development level as a critical decision factor, since country differences in development ranking have been found to have a base level positive effect on risk and return characteristics. The development aspect should be central in international portfolio investment diversification because it is strongly predictive.

The second recommendation of this research concerns IPI risk diversification and financial market integration level. International investment portfolio managers should be encouraged to take advantage of short run market integration effort as these have a bearing on investment diversification benefit. The users are however cautioned about long run investment diversification planning, since the risk-reward situation is disparate.

Thirdly, regarding financial market contagion and investment diversification, it is indorsed that international investors and the investment fraternity at large consider each target investment market sample on its own, as the markets will exhibit dissimilar characteristics in the light of contagion. Moreover, contagion relationships and diversification level are not determinate, hence the need for case-wise analysis of target market contagion and diversification feasibility patterns.

Fourthly and on the basis of financial market segmentation, it is recommended that international investors and managers and brokers use geopolitical factors as international portfolio investment diversification decision inputs.

They should however, do it with reservation as market segmentation is not a critical determinant of diversification. To investment policy makers, it is recommended that they rid their citizenry of country bias and policy dilemma, as these confound efforts towards benefiting from cross-national investment benefit. The liberation can be done through proactive investor education on the benefits of diversifying across national frontiers.

5.5 Recommendations for further research

To other researchers, this study recommends a further study on behavioral characteristics of investors in investment strategizing. This is due to the importance of prospect and other behavioral finance theories that despite assumption of rational expectation, can lead the investors to contrarian investing. Since the determinants under this study only explained 11.5 percent of IPI portfolio risk diversification level further studies on other factors that influence international investment portfolio risk diversification need to be conducted.

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APPENDICES

Appendix I: Index Raw Data

YEAR	ARG	BRAZIL	CHILE	CHINA	CZECH	EGYPT	HUNGAR
2007Q1	2247.8	52877.49	3288.73	4178.11	1844.4	7461.47	26751.28
2007Q2	2225.52	54783.04	3472.87	3319.35	1859.5	7852.41	29944.26
2007Q3	2198.25	61054.34	3253.15	5560.52	1833.5	8650.05	28703.74
2007Q4	2177.38	64123.55	3076.18	5336.5	1817.1	10256.05	26239.1
2008Q1	2107.91	60982.43	3109.17	3555.82	1560.3	11360.07	22051.89
2008Q2	2115.08	65352.54	3050.41	2766.8	1488.7	9967.36	20434.92
2008Q3	1607.52	45941.27	2759.03	2310.45	1219.1	7066.67	18906.89
2008Q4	1092.69	37782.8	2383.9	1844.37	884.8	4516.73	12404.33
2009Q1	1161.91	41908.97	2554.08	2380.19	771.9	4211.44	11440.76
2009Q2	1611.37	52435.45	3129.55	2997.27	908	5704	15037.64
2009Q3	2092.37	61926.31	3378.06	2803.86	1171.1	6761.73	20653.74
2009Q4	2328.14	68588.44	3582.98	3282.21	1195.7	6477.86	21445.97
2010Q1	2423.94	70450.66	3789.86	3132.58	1213.8	6806.11	24748.23
2010Q2	2218.55	62644.69	4102.06	2411.44	1123.8	6033.09	21219.97
2010Q3	2665.86	69736.76	4805.83	2656	1132.4	6634.27	23239.93
2010Q4	3403.08	67981.22	5014.99	2898.81	1206.8	6968.51	21506.82
2011Q1	3396.74	68003.87	4598.04	2968.18	1265.9	5463.72	23086.2
2011Q2	3386.24	62574.33	4880.14	2774.38	1226.2	5373	22797.91
2011Q3	2515.59	53384.84	3901.13	2226.49	939.6	4137.35	15792.17
2011Q4	2434.33	56823.04	4153.43	2225.54	862.4	3918.35	17467.14
2012Q1	2683.99	65363.3	4674.83	2266.21	979.5	5018.55	18754.47
2012Q2	2353.18	54354.63	4401.75	2226.49	900.9	4708.59	17341.07

2012Q3	2489.05	60239.79	4234.23	2089.63	954.7	5887.04	18774.21
2012Q4	2859.84	61270.79	3716.63	2190.4	1036.5	5162.94	17948.31
2013Q1	3415.23	56373.7	3820.88	2246.87	968	5183.2	19729.28
2013Q2	2976.27	52976.26	3429.56	1987.98	875.3	4685.09	19023.96
2013Q3	4783.77	53736.75	3288.87	2176.3	960.2	5620.53	18670.96
2013Q4	5379.33	51640.98	3143.59	2131.74	981.4	6748.07	18630.57
2014Q1	6373.82	50417.58	3178.18	2048.13	1007.1	7805.03	17602.46
2014Q2	7963.43	53311.04	3204.23	2052.34	1012.2	8162.2	18758.03
2014Q3	12599.42	54625.83	3259.75	2365.49	933.2	9811.4	17997.44
2014Q4	8033.01	49657.58	3146.43	3117.53	957.3	8593.51	16463.31
2015Q1	11009.78	51465.78	3198.09	3835.57	1039	9134.78	20107.53
2015Q2	11668.75	53345.15	3134.77	4279.97	981.5	8371.53	21903.13
2015Q3	9929.85	45294.37	2969.69	3073.3	972.1	7332.88	21047.11
2015Q4	11960.67	45208.67	2937.87	3614.7	933.2	6669.8	23833.06
2016Q1	13064.42	51248.29	3137.49	3023.41	902.4	7524.99	26452.41
2016Q2	14715.88	51619.06	3116.4	2938.14	817.2	6942.52	26590.33
2016Q3	16798.73	58900.44	3158.12	3009.2	875	7881.11	27993.98

YEAR	INDIA	JOHANN	MALAYS	MEXICO	RUSSIA	PAKIST	POLAND
2007Q1	14573.81	28770.23	1350.46	32029.45	1780.66	12994.28	63722.27
2007Q2	14663.25	28522.24	1357.36	31377.78	1899.05	13805.55	66351.13
2007Q3	17361.47	30204.38	1344.13	30551.99	2075.25	13353.68	61279.61
2007Q4	20259.45	29781.39	1447.04	29820.33	2292.96	14874.22	56445.56
2008Q1	16226.66	30050.88	1259.1	29005.25	2056.58	15293.08	48108.45
2008Q2	13872.06	30757.09	1189.25	29477.31	2333.53	12289.03	41745.3
2008Q3	12995.2	23835.97	1023.24	24888.9	1211.84	9182.71	3767.33
2008Q4	9825.9	21530.15	884.73	22660.59	631.89	6035.37	27530.48
2009Q1	9902.35	20661.32	882.86	20314.42	3375.17	7076.82	24471.11
2009Q2	14907.48	22527.73	1082.74	24634.41	987.02	7246.37	30942.11
2009Q3	17142.52	25226.01	1208.3	29760.47	1268.91	9589.63	38079.8
2009Q4	17530.94	27673.74	1272.78	32519.64	1448.86	9525.71	40184.22
2010Q1	17783.35	29025.05	1323.83	33589.09	1562.29	10131.18	42691.63
2010Q2	17725.04	26709.52	1316.36	31793.68	1362.09	9749.82	39639.21
2010Q3	20114.73	29456.04	1466.21	33530.83	1509.89	10031.19	45236.72
2010Q4	19897.22	31815.46	1500.8	38532.42	1744.61	8860.38	47651.51
2011Q1	19357.1	32313.5	1532.68	37233.95	2040.19	11822.93	49073.05
2011Q2	18873.39	31936.37	1579.07	36823.06	1910.58	12544.38	48744.76
2011Q3	16745.16	29749.35	1408.14	33759.42	1391.46	11800.39	38498.97
2011Q4	16068.9	32016.73	1472.76	36289.35	1406.12	11139.52	37841.45
2012Q1	17439.51	33733.16	1596.33	39567.99	1652.82	13763.97	41368.84
2012Q2	17448.48	33829.8	1605	40248.42	1352.56	13885.57	40810.88
2012Q3	18869.94	35880.98	1639.79	40871.5	1500.3	15535.11	43872.45
2012Q4	19394.55	39220.96	1668.52	43913.03	1529.84	16967.82	47556.27
2013Q1	18882.54	39943.75	1681.03	44087.34	1460.31	18056.65	45370.56

2013Q2	19432.94	39666.6	1773.54	40624.02	1279.22	21171.47	44748.75
2013Q3	19651.31	44358.74	1781.84	40903.61	1437.2	22387.31	50583.02
2013Q4	21117.99	44609.07	1848.79	42600.58	1433.76	25640.52	51097.75
2014Q1	22467.21	48137.67	1852.29	40461.6	1222.96	27252.67	52373.67
2014Q2	25460.96	50945.26	1882.71	42795.15	1380.57	29724.57	51972.99
2014Q3	26851.33	49420.58	1854.21	45051.91	1140.74	29745.25	54957.55
2014Q4	27497.12	49797.22	1720.78	42810.18	768.06	31037.22	51783.36
2015Q1	28180.64	52619.16	1832.85	43916.1	888.44	30246.77	54200.26
2015Q2	27814.53	52042.23	1708.93	45054.08	939.93	34444.19	53433.58
2015Q3	26179.7	50155.09	1621.86	42703.07	797.3	32560.52	49824.59
2015Q4	25789.51	49706.29	1651.77	43507.84	788.23	33176.72	46068.73
2016Q1	25479.62	52495.46	1719.74	46276.99	882.75	33189.03	49017.35
2016Q2	27069.23	52684.99	1654.17	45967.22	936.41	37994.75	44800.29
2016Q3	27955.21	5269.58	1669.85	47961.39	994.68	40580.33	47446.57

YEAR	POLAND	SKOREA	TAIWAN	DJIA	FTSE100
2007Q1	63722.27	1702.01	8220.81	295.82	6449.20
2007Q2	66351.13	1766.25	8932.96	302.75	6360.10
2007Q3	61279.61	1951.18	9474.05	309.08	6721.60
2007Q4	56445.56	1911.67	8460.18	298.68	5879.80
2008Q1	48108.45	1709.31	8627.53	273.1	6087.30
2008Q2	41745.3	1689.61	7604.42	266.86	5411.90
2008Q3	3767.33	1448.06	5719.28	221.98	4377.30
2008Q4	27530.48	1144.24	4627.98	169.61	4149.60
2009Q1	24471.11	1244.78	5362.9	153.59	4343.70
2009Q2	30942.11	1409.1	6503.98	185.03	4608.40
2009Q3	38079.8	1704.24	7534.55	217.8	5044.60
2009Q4	40184.22	1682.77	8188.8	221.65	5188.50
2010Q1	42691.63	1705.57	7994.62	223.78	5553.30
2010Q2	39639.21	1699.55	7337.32	204.96	5258.00
2010Q3	45236.72	1872.81	8267.55	233.48	5675.20
2010Q4	47651.51	2027.55	8860.38	248.82	5862.90
2011Q1	49073.05	2100.2	8671.59	263.94	6069.90
2011Q2	48744.76	2105.47	8652.59	262.73	5815.20
2011Q3	38498.97	1774.29	7251.87	214.72	5544.20
2011Q4	37841.45	1842.94	6810.08	222.42	5681.60
2012Q1	41368.84	2018.09	7933	255.09	5737.80
2012Q2	40810.88	1854.01	7296.28	238.16	5635.30
2012Q3	43872.45	2000.01	7721.29	253.52	5782.70
2012Q4	47556.27	2004.67	7606.81	257.27	6276.90
2013Q1	45370.56	2013.21	7931.7	276.55	6430.10

2013Q2	44748.75	1864.09	8062.21	272.5	6621.10
2013Q3	50583.02	2005.41	8204.4	294.18	6731.40
2013Q4	51097.75	1984.44	8439.37	307.81	6510.40
2014Q1	52373.67	1989.8	8848.28	316.84	6780.00
2014Q2	51972.99	2002.21	9393.07	330.7	6730.10
2014Q3	54957.55	2029.17	8998.73	320.44	6546.50
2014Q4	51783.36	1930.08	9035.77	305.19	6749.40
2015Q1	54200.26	2046.9	9594.75	327.67	6960.60
2015Q2	53433.58	2075.02	9323.02	327.18	6696.30
2015Q3	49824.59	1962.84	8181.24	294.24	6361.10
2015Q4	46068.73	1981.42	8317.48	302.91	6083.80
2016Q1	49017.35	2007.43	8803.91	307.36	6241.90
2016Q2	44800.29	1972.81	8666.51	308.21	6463.60
2016Q3	47446.57	2056.33	9240.65	323.54	

Appendix II: Markets and their classification

	STOCK MKT	CATEGORY	REGION	CONST	DIVLEV
1	ARGENTINA(MERVAL)	FM	LATAM	28	-34.75
2	BRAZIL (BOVESPA)	EM	LATAM	65	2.25
3	CHILE (SANTIAGO)	EM	LATAM	40	-22.75
4	CHINA	EM	ASIA-	161	98.25
5	COLOMBIA (COLCAP)	EM	LATAM	25	-37.75
6	CZECH (PX 50)	EM	EUROPE	50	-12.75
7	EGYPT (CASE 30)	FM	AFRICA	30	-32.75
8	HUGARY(BUX)	EM	EUROPE	25	-37.75
9	INDIA (S & P BSE)	EM	ASIA-	31	-31.75
10	JOH (JSE)	EM	AFRICA	91	28.25
11	KUWAIT (KWSELDX)	FM	ASIA-	50	-12.75
12	MALAYSIA (KILC)	EM	ASIA-	30	-32.75
13	MEXICO (IPC All share)	EM	LATAM	73	10.25
14	NIGERIA(NSE)	FM	AFRICA	30	-32.75
18	RUSSIA (RTS)	EM	ASIA-	50	-12.75
15	PAKISTAN (KSE 100)	FM	ASIA-	100	37.25
16	PERU (SP BVL)	EM	LATAM	36	-26.75
17	POLAND (WIG)	EM	EUROPE	20	-42.75
19	SKOREA (KOSPI)	EM	ASIA-	200	137.25
20	TAIWAN (TAIEX WEIGHTED)	EM	ASIA-	100	37.25

KEY

DEVCATEG = Development CONST = Number of constituents

Category

FM = Frontier Market

EM = Emerging Market

LATAM = Latin America

DIVLEV = The level of portfolio diversification

ASIA- = Asia-Pacific