

# Design of Portfolio using Multivariate Analysis

B. Lohith Kumar

Received: 8 September 2021 Accepted: 2 October 2021 Published: 15 October 2021

---

## Abstract

Stock markets are considered a barometer of the respective country's economy around the world. Modern portfolio theory advocates diversification for risk management, which helps maintain returns as long as indices around the world are not perfectly correlated. The relationship exists across markets; as a result, co-movement has drawn the attention of individual investors and portfolio managers for the construction of their portfolios to maximize returns for a given level of risk. The study of co-movements provides inputs for portfolio construction and facilitates the identification of markets where indices may move in the same direction or the opposite direction and the country's stock markets that are not correlated. A review of the literature revealed that statistical tools like Correlation, Factor analysis, and Granger causality test, etc., are some of the tools that can be used to understand co-movements of markets. Alan harper et al. (2012) study used principle component analysis and inferred that Indian stock returns are aligned with its trading partners and concluded that maximizing the investors' returns by reducing the risk. Tak Kee Hui concluded that factor analysis provides inputs for selecting foreign markets for risk diversification. This study examines the potential for diversification using 22 world stock market indices using multivariate analysis.

---

*Index terms*— diversification, co-movements, factor analysis, portfolio.

## 1 I. Introduction

Stock markets worldwide are the most researched topic by different people like portfolio managers, investors, researchers, policymakers and academicians, etc. One of the barometers for measuring the economy is the stock market index. Among the many techniques for risk management, diversification is the one. It can be done by mixing the variety of assets, including stocks and indices which are non-perfectly correlated into a portfolio. Harry Markowitz, a Nobel prize winner, has laid the foundation for Modern Portfolio Theory in 1952. There on investment community started focusing on portfolio risks, expected returns, and diversification and its advantages. Many researchers attempted to understand the stock markets' comovement of various markets across the globe and selected markets over time. Presently, the topic has become the most popular topic in finance for research. In a globalized economy, the integration of financial markets provides an opportunity to investors, i.e., institutional as well as individual, to generate returns and at the same time manage risk. It gives a platform to strike a balance between risk and return. The integration of various world economies and their liberal policies has provided an opportunity for investors if they wish to diversify. The intention behind the international diversification across countries that are not perfectly correlated is to minimize the variability in the returns on portfolios. Optional risk-reward is also one of the objectives of international diversification as it offers many benefits to all investors around the world. (Mansourfar, et.al, 2010). Stock markets worldwide do not move in the same direction as the country's economic indicators, viz., industrial growth, monetary and fiscal conditions, political scenario, and taxation are unique and specific to the respective country, and returns offered by the markets also vary.

Co-movements of the market's information guide the investors on investment alternatives. A high level of co-movement of stock markets does not benefit from diversification across markets and countries, whereas Low levels of co-movement of stock prices offer investors the benefit of diversifying their holdings across the markets.

45 Diversification strategies can be designed based on acumens of various market comovements, which affect the risk-  
46 return relationship or the expected return from investing in a portfolio of markets. Economists and Capitalists  
47 are interested in understanding co-movements of needs. The former is interested in capital movements among  
48 countries, and the latter is keen on the effects of co-movements on equity segmentation. (Panton, Lessig, and Joy  
49 1976). For an international investor co-movement of the world, markets are critical for developing a diversification  
50 strategy. Many countries have encouraged inflows of capital by having liberal economic policies that result in  
51 capital account surplus. Capital market reforms create suitable conditions for investors to take care of riskreturn  
52 profiles. The present work emphasizes examining an opportunity to investors, both retail and institutional, for  
53 diversification by considering 22 world stock indices using multivariate analysis. Alan Harper and Zhenhu Jin  
54 (2012) concluded that investors could diversify their portfolios to increase their returns while managing the risk,  
55 which has been adopted for the present study.

## 56 2 II. Review of Literature

57 The inter-relationship between national stock markets has been the subject of several papers in the general  
58 area of investment management and international finance research. Apart from exploring and presenting the  
59 relationship between national stock markets, these papers have helped develop essential tools necessary for the  
60 statistical analysis of correlation structure. Numerous studies have been conducted to explore the linkages among  
61 various financial markets around the world. Integration of world markets has provided many opportunities to the  
62 investors to look for different investments options across world markets to manage risk and returns. Diversification  
63 is a strategy to manage the risk that investors can use by understanding other stock markets globally. As risk  
64 diversification is the primary concern for most investors, they tend to look into the possibility of widening  
65 their investment choices across the countries or creating a region-based investment strategy. This requires the  
66 understanding of regional and global linkages of stock markets.

67 Abbas Valadkhani et al. (2008) investigated the relationship among the selected 13 stock markets returns.  
68 To understand the co-movements, the authors deployed principle components analysis and maximum likelihood  
69 methods on the monthly data from 1987 to 2007. The authors found that stock markets in the Asian countries are  
70 correlated highly, and factor analysis proved a well-defined common factor, and both the methods like ML and  
71 PC have provided similar results. Alan Harper and Zhenhu Jin (2012) study was conducted to find the linkage  
72 between Indian stock market returns with its eleven major trading partners. Monthly stock data for 11 years,  
73 i.e., 2000 to 2010, was used for analysis and found that investors can enhance their returns by managing the risks  
74 in India's trading partners' country's stock markets. Principle component analysis has been used and inferred  
75 that Indian stock returns are aligned with its trading partners. Hence, investors can diversify their investments  
76 by choosing the country's stock indices to improve their returns and minimize risk.

77 Maran Marimuthu (2010) has examined the comovements of the Asian markets with developed markets by  
78 considering Malaysian, Indian, Chinese, the US, and the UK equity markets using Statistical models like Johansen  
79 multivariate cointegration, Vector Error Correction Model, and Granger causality test. The author found that  
80 there is a long-run relationship among the regional markets. Malaysia and India Granger cause each other.  
81 There is no role of China in the regional market. In addition, shocks in one country seem to affect other countries  
82 briefly in the Asian context. Maran has concluded that the US market is still the main influential factor in  
83 the Asian markets. Wen-Chung Guoa and Hsiu-Ting Shihb (2008) investigated the comovement of stock prices  
84 and its association with herd behavior during a period of high-tech mania using daily equity returns for each  
85 stock. The analysis consists of return dispersion, volatility dispersion, and the directional co-movement of stock  
86 prices for a sample of 443 stocks from January 1996 to December 2000, covering industries like electronics, the  
87 Internet, communication, etc., semiconductors. The authors found that both return dispersion and volatility  
88 dispersion correlate with extreme market movements for high-tech stocks. It was found that herding, measured  
89 by directional co-movement, is more prevalent in hightech industries than traditional economic industries. It also  
90 found an asymmetric result that herding has tremendous significance during extreme up markets.

91 Tak-Kee Hui (2005) studied the possibility of Singaporean investors diversifying into US and Asia Pacific  
92 markets. Factor analysis was performed on weekly data for the ten stock market indices, covering the period  
93 January 1990 to June 2001 to investigate the systematic covariation of the stock market returns to select markets  
94 for a Singaporean investor to invest in. Tak suggested that Singaporean investors or portfolio managers select  
95 relatively large and well-developed markets for risk diversification and invest in the USA, Australia, and Japan  
96 markets. In addition to that, there would not be any significant risk reduction by investing in the Hong Kong,  
97 Philippines, South Korea, Thailand, and Singapore markets simultaneously. Therefore, a Singaporean investor  
98 can invest in the USA, Australia, Japan, and Taiwan. Kivilcim Metin and Gulnur Muradoglu (2001) focus  
99 is forecasting stock returns in emerging markets using their interrelations to significant world stock exchanges  
100 and regional counterparts by using international co-movements for weekly stock prices by employing the Engle-  
101 Granger (1987) two-step cointegration technique. Kivilcim et al. found that unconditional variances were much  
102 higher for emerging markets than their mature counterparts. All national markets are cointegrated with the  
103 world leaders and other emerging markets according to their geographical proximity.

104 Jorg Bley (2007) focused on determining the contemporary interactions of the stock markets of Bahrain,  
105 Egypt, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Tunisia, Turkey, and  
106 the United Arab Emirates by using daily historical prices for a period ranging from 1/2000 to 12/2004. The data

---

107 series is divided into two sub-periods, the first period includes 130 weekly observations, and the second period  
108 covers the subsequent 128 weeks. The author found that changing stock market dynamics within the Middle  
109 East and North African (MENA) countries region still yield substantial intraregional diversification benefits and  
110 suggest the inclusion of regional equity in a global portfolio. In addition, Jorg opinioned that Gulf Cooperation  
111 Council (GCC) stock markets are likely to achieve the highest level of homogeneity within the MENA region,  
112 as its economies are increasingly synchronized in preparation for an economic union and may lead to a greater  
113 level of selfsufficiency of the regional economies which could translate into the manifestation of the currently low  
114 external stock market dependency.

115 Kedarnath Mukharjee and RK Mishra (2007) studied how Indian equity markets responded to the world  
116 markets movements and tried to examine the interdependencies of markets worldwide by considering daily closing  
117 prices of all the major equity indices for a period of 16 years starting from 1990 to 2005. Twentythree countries  
118 are taken for the study to find comovements of prices among the markets using Geweke measures of feedback.  
119 The annual feedback measures indicated that a significant same day relationship among the stock markets in  
120 India with that of almost all other foreign countries considered in the study and also found that there is a degree  
121 of integration among the markets over some time, resulting in a higher co-movement of prices among markets  
122 and therefore higher market efficiency at the international market scenario. Shaista Wasiuzzaman and Lim Ai  
123 Li (2009) examined whether co-movements between stock markets exist for four stock markets included in this  
124 study: Malaysia, Singapore, the US, and Japan. The indices used are Kuala Lumpur Composite Index (KLCI),  
125 Straits Times Index (STI), Standard and Poor's 500 (S&P 500), and Nikkei 225 for Malaysia, Singapore, the US,  
126 and Japan, respectively. The sample has been considered based on the liquidity criterion measured by a stock's  
127 average daily traded value. The period of investigation spans January 2000-December 2006. The observations  
128 consist of the daily returns of each stock market. Daily returns are used instead of weekly or monthly returns  
129 because daily returns are more capable of capturing all possible interactions. The study used three methods to  
130 examine the linkages or comovements, namely, correlation analysis, cointegration analysis, and Granger causality  
131 test. The results of the correlation analysis suggest that financial market linkages are weak among the four  
132 countries undertaken in this study. Cointegration tests reveal that there is a long-run relationship as there is at  
133 most a single cointegrating vector. Finally, the Granger causality test shows that most stock markets influence  
134 the other stock markets. Overall, the four stock markets seem to have financial market linkages or co-movements.

135 Preeti Sharma (2011) studied the issue of comovement between Asian emerging stock markets and developed  
136 economies using cointegration and correlations in the index returns using Six years' weekly data of 8 Asian Stock  
137 Markets and United States of America for the period of six years, spans from January 2002 to December 2007.  
138 The author found that among the selected Asian markets, the highest positive correlation is found between  
139 Singapore and the Philippines, followed by Singapore and Malaysia and the Philippines and Malaysia. This  
140 signifies that Singapore, the Philippines, and Malaysia are the economies whose stock markets usually move in  
141 tandem. Japan and China, followed by the United States of America and China, have the most minor correlation  
142 among the sample. But as the economies are undergoing different reforms and fundamentals keep on changing,  
143 the author cautioned that due care should be taken while making investment decisions.

144 Searat Ali et al. (2011) study investigated the co-movement of Pakistan's Equity Market with the markets  
145 of India, China, Indonesia, Singapore, Taiwan, Malaysia, Japan, USA, and the UK by using a cointegration test  
146 on monthly stock prices from the period of July 1998 to June 2008. The results disclosed that there is no co-  
147 movement of Pakistan's equity market with the UK, USA, Taiwan, Malaysia, and Singapore markets. In contrast,  
148 the stock prices of the Pakistan equity market move together with the stock prices of India, China, Japan, and  
149 Indonesia; hence there is no scope of risk minimization for investors through diversification of international  
150 markets in these countries. Furthermore, the authors found that the role of the stock exchange structure is not  
151 found in the co-movement of the Pakistan stock market with the selected stock markets.

152 Razan Salem et al. (2011) focused on examining significant portfolio benefits diversification internationally,  
153 especially for middle east investors. The authors considered developed markets like USA, Germany, and Japan  
154 and a few developing markets, including Oman, for the study by taking daily data from 2008 to 2010. By using  
155 statistical tools like correlation and partial correlation, it was found that investors in the middle east can enjoy  
156 the benefits of international portfolio diversification despite regional political uncertainties and uncertainties at  
157 the global level, including financial. The authors recommended that middle-east investors consider including  
158 Brazil, Jordan, Japan, and Oman markets as part of constructing an international portfolio.

159 Rajesh Chakrabarti examined the nature of regional inter-dependence among selected Asian stock markets  
160 and that among selected European markets before and during the Asian crisis while looking at both the  
161 "spillover" angle of stock market interrelationship as well as the evolution of the correlation structure over  
162 time. The data consists of daily close-to-close returns for eight East Asian developing countries and eight West  
163 European developed countries. The East Asian countries are Hong Kong, Indonesia, South Korea, Malaysia,  
164 Philippines, Singapore, Taiwan, and Thailand. In contrast, the European countries are France, Germany, Italy,  
165 the Netherlands, Portugal, Spain, Switzerland, and the United Kingdom. This gives us two groups of equal size  
166 for comparison purposes. Because we use groups of neighboring countries and the time zone difference within  
167 either group does not exceed 2, issues of lead-lag structure for studying volatility spillovers and covariance are  
168 not critical for us, and current data can be used for this study. The data covers five years from 12/31/93 to  
169 12/31/98. Thus, we have 1305 data points in our sample. We consider 7/2/97 to be the beginning of the Asian

170 crisis. In our study, we look at the correlation structure of the eight Asian countries and compare it with the  
171 correlation structure among the European countries.

172 Salim M Darbar and Partha Deb (1997) investigated the co-movements of equity returns for indices of four  
173 major equity markets, namely Toronto 300 share index, Topix, the financial times stock exchange 100 shares, and  
174 S&P 500 index for a period of 1 Jan 1989 to 31 Dec 1992 by using Multivariate GARCH framework. The authors  
175 found that the US and Japan have transitory correlations, but there is no evidence of permanent correlation,  
176 and conditional correlations can change considerably in reaction to the news. Portfolios can be adjusted based  
177 on the variations shown in correlations. Michel Beine and Bertrand Candelon (2007) examined the impact of  
178 trade and financial liberalization on the degree of stock market comovement among emerging economies using  
179 a sample of 25 developing countries observed over 15 years. The authors estimate the impact of reforms that  
180 aim at opening these countries to trade and financial channels to the rest of the world. Estimating time-varying  
181 crosscountry correlations allows the econometric investigation to be performed using a panel data framework,  
182 raising the quality of the statistical inference. Our results offer strong support in favour of a positive impact of  
183 trade and financial liberalization reforms on the degree of cross-country stock market linkages.

184 Ritesh Patel (2017) found that various investors like Foreign institutional investors, High net worth individuals,  
185 institutional investors, retail investors derive an advantage in diversifying the fourteen stock markets that the  
186 author considered in the study. The author used the Johansen cointegration test to find the relationship among  
187 the selected stock markets and found a longterm relationship among the selected stock markets. The Granger  
188 causality test proved that BSE returns are affected by BVSP, FTSE-100, and MXX. The author suggested that  
189 investors take their portfolio investment decision by observing the long-and short-term markets integration Indian  
190 market.

### 191 3 III. Rationale for the Study

192 The literature review revealed that many studies had been carried out to understand the co-movements and  
193 integration of the various stock markets. The studies focused more on American, European, Asia, and Asia  
194 Specific markets, but limited work has been done covering Asia Pacific, Europe, American, and Middle East  
195 markets. Hence, the present study included middle east markets apart from the other world markets. The study's  
196 findings can be used by the retail and institutional investors, especially the Indian investors, for designing their  
197 portfolio and those who are seeking other than their markets for risk minimization. This study has been carried  
198 out to investigate the potential for diversification into various stock indices by using the concept of cointegration  
199 and co-movement among world stock markets. One of the well-known multivariate analysis techniques, like  
200 factor analysis, has been used in the study to understand the relationship among the latent variables. It obtains  
201 a reduced set of uncorrelated latent variables using a set of linear combinations of the original variables to  
202 maximize the variance of these components, and few studies have been conducted using the Principle Component  
203 analysis and Maximum Likely hood methods (Abbas Valadkhani et al. 2008). Factor analysis is used to determine  
204 the co-movements among the 22 selected world markets covering major continents like Asia, Asia Pacific, Europe,  
205 North America, America, Belgium, etc. Alan Harper and Zhenhu Jin's (2012) approach has been adopted for  
206 the present study.

### 207 4 IV. Methodology of the Study

208 Monthly indices data for the period from 1 Jan 2000 to 31 Dec 2018 are used in the present study. Twenty-two  
209 stock markets indices were considered for the study. They are ASX 200 (Australia), Nikkei 225 (Japan), KOSPI  
210 (South Korea), Hang Seng (Hong Kong), Jakarta Composite Index (Indonesia), SSE Composite Index (China),  
211 Taiwan Capitalization Weighted Stock Index, Sensex (India), Amman SE General (Jordan), BLOM (Lebanon),  
212 QE General (Qatar), MSM 30 (Oman), Tadawul (Saudi Arabia), Tel Aviv (Israel), CAC 40 (France), DAX 30  
213 (Germany), BEL 20 (Belgium), Euronext 100, DJIA (United States), TSE (Canada), BOVESPA (Brazil) and  
214 BMV (Mexico). The monthly returns have been calculated and tested their stationary by using ADF and PP  
215 tests. Factor analysis conceptually helps identify the variables that have similar patterns associated with the  
216 latent factor or variable. Factor analysis traditionally assumes that there is no unit root in time series data. This  
217 model is well known multivariate analysis model ??Hair et al., 1998; ??abachnick and Fidell, 2001; ??say, 2002).  
218 Similarly, the same concept can be used to identify the markets which are associated and not associated. This  
219 information is vital for the design portfolio. The linear combination of stock market returns accounts for the  
220 variance in the data as a whole Alan Harper and Zhenhu Jin (2012).

### 221 5 V. Empirical Results

222 In this section, quantitative results obtained from the statistical analysis have been presented in the below tables.  
223 Various tests conducted are: correlations test, KMO test, component matrix test, communalities test, and rotated  
224 component matrix test. 1 depicts stock market returns correlation with all the sample countries in the study.  
225 Sensex is correlated among the sample ranging from weak to highly correlated. Further, it can be inferred  
226 that Sensex has a weak correlation with few indices like Tadawul (Saudi Arabia, Amman SE General (Jordan),  
227 BLOM (Lebanon), and MSM (Oman). A geographical and economic association is one of the critical drivers for  
228 having such a relation. From the results depicted in Table 1, China, Jordan, Lebanon, Qatar, and Saudi Arabia

---

229 are weakly correlated with other countries except with the countries geographically associated similarly France,  
230 Germany, Belgium, US, Canada, and Mexico are highly the rest having moderately correlated. For measuring the  
231 sample adequacy, the Kaiser-Meyer-Olkin (KMO) statistical method can be used, which measures the proportion  
232 of variance in the data variables that underlying factors might cause.

233 Values close to 1 generally indicate that the factor analysis is helpful for the present study data. As the KMO  
234 measure of sampling, adequacy was as high as the measure of .940, which is excellent as per the review of the  
235 literature, and it is an indication that the study can proceed with Principle Component Analysis and the Bartlett  
236 test of sphericity

## 237 6 Source: Authors calculations

238 The co-movements of stock market returns can be examined using the Principle Component analysis, a  
239 multivariate technique that helps in reducing the number of variables. Precisely it reduces the number of factors  
240 through observed correlations among the variables or factors. The above table 3 shows variance explained in each  
241 of the factor(s). It can be observed from the above-stated results that four factors have an Eigenvalue greater  
242 than one. The cumulative percentage of the summation of percentage variance for factor 1 is 42.206, for factor  
243 2 is 49.811, for factor 3 is 56.181, and for factor 4 is 60.822. This analysis helped to find out an optimal number  
244 of factors, i.e., four.

245 Saudi Arabia, Oman, and Jordan, and the last factor has only two countries like Lebanon and Qatar. Hence,  
246 it can be inferred that constructing a portfolio using countries under each of the factors will not benefit the  
247 portfolio. Hence, while designing the portfolio, investors and institutions should include a country stock index  
248 from all four factors to diversify. For example, a portfolio could have indices like DJIA, SSE Composite Index,  
249 MSM 30, and BLOM. The factors also have geographical diversification, which helps in deriving the advantage.

## 250 7 VI. Conclusion

251 The correlation values in the study find that Sensex has a weak relationship with few indices and strong  
252 relationships with other stock market indices. Sensex has a weak correlation with few indices like Tadawul  
253 (Saudi Arabia), Amman SE General (Jordan), BLOM (Lebanon), and MSM (Oman). Rotated component matrix  
254 results concur with it because these markets indices have fallen in a different factor. Hence investors, including  
255 institutions in India, can use this grouping of the indices while constructing their portfolios. For instance, an  
256 investor designed a portfolio using indices like ASX 200 (Australia), Nikkei 225 (Japan), CAC 40 (France), DAX  
257 30 (Germany), BEL 20 (Belgium), Euronext 100, DJIA (United States), etc., the benefits of diversification are  
258 minimal. Though the number of indices is included, their correlations are high and fall in the same factor. Hence,  
259 investors need to design portfolios by considering factor 1, factor 2, factor 3, and factor 4 to have wide diversity.  
260 As these countries are geographically and economically spread out, the investor can enjoy the risk and return  
261 portfolio benefits. <sup>1</sup>

---

<sup>1</sup>© 2021 Global Journals Design of Portfolio using Multivariate Analysis

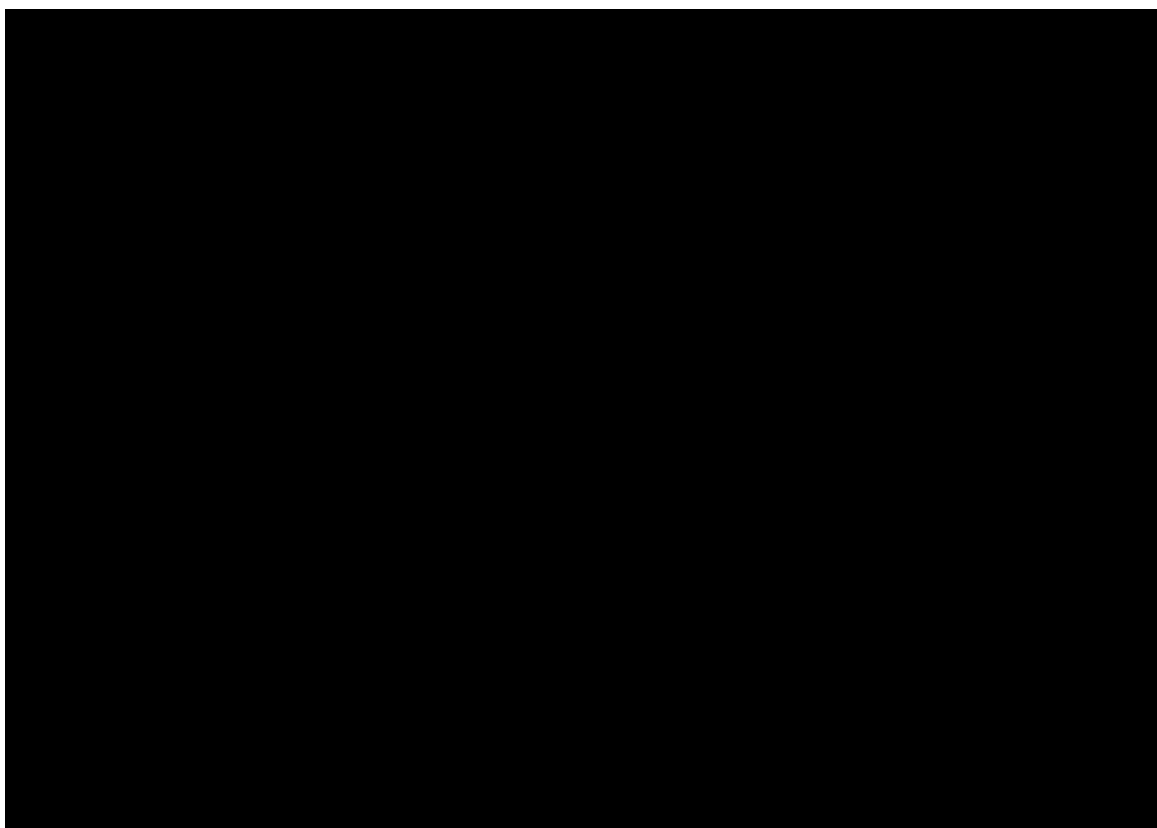


Figure 1:

1

[Note: Source: Authors calculationsTable]

Figure 2: Table 1 :

2

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.940
Bartlett's Test of Sphericity Approx. Chi-Square	15311.880
Df	231
Sig.	.000
Source: Authors calculations	

Figure 3: Table 2 :

3

Component	Initial Eigenvalues				Total Variance Explained				
	Total % of Variance	Cumulative %	Total % of Variance	Cumulative %	Extraction Sums of Squared Loadings	Total % of Variance	Cumulative %	Total % of Variance	Cumulative %
1	9.285	42.206	42.206	42.206	9.285	42.206	42.206	42.206	42.206
2	1.673	7.605	49.811	49.811	1.673	7.605	49.811	49.811	49.811
3	1.401	6.370	56.181	56.181	1.401	6.370	56.181	56.181	56.181
4	1.021	4.641	60.822	60.822	1.021	4.641	60.822	60.822	60.822
5	.959	4.357	65.179	65.179					
6	.921	4.188	69.368	69.368					
7	.769	3.498	72.865	72.865					
8	.731	3.322	76.188	76.188					
9	.711	3.232	79.419	79.419					
10	.661	3.004	82.423	82.423					
11	.611	2.778	85.201	85.201					
12	.531	2.415	87.616	87.616					
13	.504	2.290	89.906	89.906					
14	.393	1.786	91.692	91.692					
15	.386	1.754	93.446	93.446					
16	.329	1.494	94.941	94.941					
17	.294	1.336	96.276	96.276					
18	.287	1.305	97.582	97.582					
19	.251	1.139	98.721	98.721					
20	.181	.821	99.542	99.542					
21	.089	.405	99.947	99.947					
22	.012	.053	100.000	100.000					

Extraction Method: Principal Component Analysis.

Figure 4: Table 3 :





262 .1 Source: Authors calculations

263 The component matrix results in table ?? above; many of the stock markets results are highly correlated with  
264 factor 1 followed by factor 2, factor 3, and factor 4.

265 In factor 1, Indian stock market returns are correlated with many world stock market returns covering South  
266 Asia and European countries.

267 .2 Source: Authors calculations

268 Table ?? shows communalities which can be between 0 to 1, and the values reported in the above table indicate  
269 that all initial communalities have a value of 1; hence it can be inferred that the common factors explain all of  
270 the variances in the stock market returns among the sample markets Alan Harper and Zhenhu Jin (2012).

271 .3 Source: Author calculations

272 The rotated component matrix results are depicted in Table ?? above, and the findings show that the first factor  
273 has large weights for France, Germany, Belgium, Euronext, US, Canada, Mexico, which can be concluded that  
274 these stock market returns are highly correlated and designing a portfolio using these markets indices will not  
275 help to derive the diversification benefits. The second factor extracted countries like India, Taiwan, China, Japan,  
276 South Korea, Hong Kong, and Indonesia are correlated. The third factor extracted countries like

277 [Valadkhani ()] 'A factor analysis of international portfolio diversification'. Abbas Valadkhani .  
278 10.1108/108673708108946. *Studies in Economics and Finance* 2008. 25 (3) p. .

279 [Mansourfar et al. ()] 'A review on international portfolio diversification in Middle East and North African  
280 region'. G Mansourfar , A Mohamad , T Hassan . [www.academicjournals.org/AJBM](http://www.academicjournals.org/AJBM) *African Journal*  
281 *of Business Management* 2010. 4 (19) p. .

282 [Ali et al. ()] Searat Ali , Zaheer Babar , Butt , Kashif Ur Rehman . *Comovement Between Emerging and*  
283 *Developed Stock Markets: An Investigation Through Cointegration Analysis*, 2011. 12 p. .

284 [Sharma ()] 'Asian emerging economies and united states of America: Do they offer a diversification benefit?'.  
285 Preeti Sharma . *Australian Journal of Business and Management Research* 2011. 1 (4) p. .

286 [Patel (2017)] 'Co-Movement and Integration Among Stock Markets: A Study of 14 Countries'. Ritesh Patel .  
287 10.17010/ijf/2017/v11i9/118089. *Indian Journal of Finance* 2017. September 2017. 11 (9) .

288 [Chakrabarti] *Co-movements among National Stock Markets in a Region: A Comparison of*  
289 *Asia and Europe*, Rajesh Chakrabarti . [https://pdfs.semanticscholar.org/3821/](https://pdfs.semanticscholar.org/3821/156e445ff13c2089d4d1c6b7971b451839e4.pdf)  
290 [156e445ff13c2089d4d1c6b7971b451839e4.pdf](https://pdfs.semanticscholar.org/3821/156e445ff13c2089d4d1c6b7971b451839e4.pdf)

291 [Salim et al. ()] 'Co-Movements in International Equity Markets'. M Salim , Partha Darbar , Deb . *The Journal*  
292 *of Financial Research* 1997. (3) p. .

293 [Komlavi Elubueni ()] *Cointegration of Major Stock Market Indices during the*, Assidenou Komlavi Elubueni .  
294 2011. 2008.

295 [Panton et al. ()] 'Comovement of international equity markets: A taxonomic approach'. D B Panton , P Lessig  
296 , Joy Om . *Journal of Financial and Quantitative Analysis* 1976. 11 (3) p. .

297 [Harper and Jin (2012)] 'Comovements and Stock Market Integration between India and its top trading partners:  
298 A Multivariate analysis of International Portfolio Diversification'. Alan Harper , Zhenhu Jin . *International*  
299 *Journal of Business and Social Science* 2012. Feb 2012. 3 (3) .

300 [Metin and Muradoglu (2001)] *Forecasting Integrated Stock Markets Using International Co-Movements Russian*  
301 *and East European Finance and Trade*, Kivilcim Metin , Gulnur Muradoglu . 2001. September-October 2001.  
302 37 p. .

303 [Global Financial Distress International Journal of Economics and Finance (May 201)] 'Global Financial Dis-  
304 tress'. *International Journal of Economics and Finance* May 201. 3 (2) p. .

305 [Bley ()] 'How Homogeneous are the Stock Markets of the Middle East and North Africa?'. Jorg Bley . *Quarterly*  
306 *Journal of Business & Economics* 2007. 46 (3) p. .

307 [Salem et al. ()] 'International Portfolio Diversification Benefits for Middle Eastern Investors'. Razan Salem ,  
308 Al Thair , Ohoud Shaher , Khasawneh . <http://www.eurojournals.com/JMIB.htm> *Journal of Money,*  
309 *Investment and Banking*, 2011.

310 [Mukharjee and Rk Mishra (2007)] 'International stock market integration and its economic determinants: A  
311 study of Indian and World equity markets'. Kedarnath Mukharjee , Rk Mishra . *Vikalpa* 2007. October  
312 -December 2007. 32 (4) p. .

313 [Beine and Candelon (2007)] *Liberalization and Stock Market Co-Movement Between Emerging Markets, CE-*  
314 *SIFO Working Paper No. 2131category 6: Monetary Policy and International Finance*, Michel Beine ,  
315 Bertrand Candelon . 2007. October 2007.

## 7 VI. CONCLUSION

---

- 316 [Wasiuzzaman et al. ()] 'Linkages Between the Malaysian Stock Market and Some Selected Markets'. Shaista  
317 Wasiuzzaman , Ai Lim , Li . *The ICAFI University Journal of Financial Economics* 2009. 2009. VII (1) p. .
- 318 [Hui ()] 'Portfolio diversification: a factor analysis approach'. Tak-Kee Hui . *Applied Financial Economics* 2005.  
319 15 p. .
- 320 [Guoa and Shihb ()] 'The co-movement of stock prices, herd behaviour and high-tech mania'. Wen- , Chung Guoa  
321 , Hsiu-Ting Shihb . *Applied Financial Economics* 2008. 18 p. .
- 322 [Marimuthu ()] 'The Co-Movements of the Regional Stock Markets and Some Implications on Risk Diversifica-  
323 tion'. Maran Marimuthu . *The IUP Journal of Applied Economics* 2010. IX (2) .