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Stock market Interdependencies: A comprehensive analysis of correlations among india and global indices

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Abstract
In an era of increasing global financial interdependence, understanding the integration of Indian stock indices with international markets is essential for stakeholders navigating the complexities of the financial landscape. This study seeks to provide valuable insights into this dynamic stock market relationship, focusing on the evolving interactions between India's S&P BSE SENSEX and twenty-one indices across Asia, America, and Europe over a 16-year period, from June 3, 2003, to December 30, 2019. The analysis utilizes descriptive statistics to examine the nature of return series calculated from daily index closing data of the selected indices and applies correlation measures to assess market integration. The normality test results led to the adoption of the non-parametric Spearman Rank Correlation method. The findings reveal weak correlations among the S&P BSE SENSEX and the selected twenty-one indices, indicating limited financial integration and highlighting significant potential for portfolio diversification. In contrast, the study identifies moderate associations among the American and European indices, reflecting strong regional market integration and suggesting limited diversification opportunities within these markets.

Keywords: Stock market correlation, S&P BSE SENSEX, asian markets, american markets, european markets

Introduction

Diversification remains a fundamental principle of fund management, enabling investors and portfolio managers to mitigate threats and enhance returns by allocating funds across global markets. Over the past several decades, globalization has accelerated worldwide, driving liberalization across economic and financial spheres, supported by the relaxation of cross-border capital flows and progressive domestic regulatory reforms. This shift has encouraged investors to participate more actively in international capital markets, leading to a significant rise in global investments and deeper financial integration characterized by stronger associations among stock indices. Technological advancements and improvements in communication networks have further streamlined the process of integration, reshaping economic interconnectedness, enhancing index trading efficiency, maintaining liquidity, and boosting investor confidence (Chambet and Gibson, 2008) [3]. Financial integration acts as a driving force for economic growth and contributes to economic stability by promoting risk-sharing, while providing investors with broader diversification opportunities. Emerging markets present opportunities for higher returns but come with elevated risks, whereas more structured markets provide greater stability, more likeable to those pursuing to balance their risk profiles. Integrated markets improve price efficiency by adjusting for global risks, enabling investors to diversify portfolios and mitigate localized economic exposures. Additionally, they offer access to advanced financial services, fostering innovation and positive spillover effects. As a rapidly growing economy, India occupies a pivotal position in the global financial system, with its dynamic stock market both shaping and responding to global trends. The study of the stock markets integration of India with international benchmarks holds significant relevance for investors, fund managers, policymakers, and academicians, influencing critical areas such as portfolio diversification, market efficiency, capital budgeting and macroeconomic policy.

Past Studies and Research Gap

Durai and Bhaduri (2011) [4] explored the correlation dynamics between Indian equity markets and global indices using daily return data spanning July 1997 to August 2006. The analysis encompassed 11 indices, including developed markets—NASDAQ and S&P 500 (USA), FTSE 100 (UK), and DAX 30 (Germany)—and Asian markets—Nikkei (Japan), KLSE (Malaysia), JCI (Indonesia), Straits Times (Singapore), Seoul Composite (South Korea), TSEC (Taiwan), and CNX Nifty (India). Bhunia (2012) [2] examined the short-term and long-term interdependence between Indian stock markets (BSE Sensex and Nifty) and those of eight South Asian nations, *viz*. China (SSE), South Korea (KOSPI), Taiwan (TSEC), Hong Kong (HIS), Indonesia (JSX), Japan (Nikkei), Malaysia (FTSE), and Singapore (STI) considering the study period from August 2002 to August 2011. Kumar and Srividya (2014) [5] examined the financial interconnections between two prominent Asian stock markets: BSE SENSEX (India) and Shanghai Stock Exchange Composite Index (China) over a ten-year period from January 2005 to December 2014. The study utilized monthly returns computed from monthly closing index values from the first trading day of each month and carried on Correlation analysis, Cointegration and Causality applications to evaluate stock market association. Gajera (2020) [6] analyzed the financial

interconnections among sixteen global stock indices—India, Japan, Australia, South Korea, Taiwan, Singapore, China, Germany, South Africa, Swaziland, France, Spain, the United Kingdom, the United States, and Canada—from January 2015 to December 2019. The study estimated daily returns derived from the daily index values and applied correlation test. This was followed by a series of statistical tests, including a one-way Analysis of Variance (ANOVA), as well as country-wise and year-wise ANOVA comparisons. The correlation matrix revealed that Asian markets exhibited strong correlations with one another, indicating that these markets tended to move in the same direction with significant synchrony. Bhardwaj, Sharma, and Mavi (2023) [1] examined the financial integration of the Indian stock market (SENSEX) with those of China (SSE), Hong Kong (Hang Seng), Japan (Nikkei), the UK (FTSE 100), and the USA (S&P 500) over the period from November 1, 2002, to October 31, 2022. Utilizing daily data, the study estimated return series and employed a comprehensive suite of statistical techniques to assess market integration, including unit root tests, correlation analysis, cointegration tests, the Vector Error Correction Model (VECM), and Granger causality tests. The existing literature exposes significant gap in understanding stock market correlations, especially over extended periods. Few studies have examined countries globally within a unified timeframe. Additionally, there has been limited focus on pre-statistical diagnostics, such as normality testing, in determining the appropriate use of parametric or non-parametric methods. This study aims to fill these gaps by conducting a comprehensive analysis of the correlation patterns between the Indian stock market and five major American economies from 2003 to 2019.

Objectives

The objective of the study is to observe the statistical properties of the calculated return series of the twenty-two sample stock indices with an emphasis on analyzing the correlation among the calculated returns related to India's S&P BSE SENSEX and the indices of twenty-one countries covering a 16-year period from June 3, 2003, to December 30, 2019.

Data and Methodological Approach

1. Sample Design & Study Period

For the purpose of analyzing the stock market correlations among Indian and other major global stock indices, the current study considers 22 economies including India, from three continents—America, Asia-Pacific, and Europe. Employing judgment sampling technique, the sample countries are framed based on the list of countries arranged in terms of their GDP (nominal) in the World Bank 2019 report. The sample nations and their representative stock indices are tabulated as follows:

The study spans a 16-year period from June 3, 2003, to December 30, 2019, preceding the onset of the COVID-19 pandemic. To analyze stock market associations among the 22 sample indices across three continents, daily index returns are computed from adjusted daily index closing values using the formula $R_t = \ln(P_t) - \ln(P_{t-1})$, where R_t stands for the logarithmic return, and P_t and P_{t-1} denote the current and previous day's adjusted market closing values respectively. The secondary data of index closing values are adopted from the web-platforms, such as www.yahoofinance.com and www.investing.com and the official websites of the respective indices. Statistical analysis is conducted using SPSS software, version 21.

Table 1: List of Select Sample Nations and adjoining Stock Indices

Regions	Sl. No.	Country	Name of Stock Index
America	1	US	S&P 500
	2	Canada	S&P/TSX Composite index
	3	Brazil	IBOVESPA
	4	Mexico	IPC MEXICO
	5	Argentina	MERVAL
Asia-Pacific	6	India	S&P BSE SENSEX
	7	Australia	S&P/ASX 200
	8	Israel	TA-125
	9	Japan	Nikkei 225
	10	Hong Kong	HANG SENG INDEX
	11	Taiwan	TSEC weighted index
	12	China	SSE Composite Index
	13	Singapore	FTSE Singapore
	14	Indonesia	Jakarta Composite Index
	15	South Korea	KOSPI Composite Index
	16	Russia	MOEX Russia Index
Europe	17	Germany	DAX PERFORMANCE-INDEX
	18	UK	FTSE 100
	19	France	CAC 40
	20	Netherland	EURONEXT 100
	21	Belgium	BEL 20
	22	Italy	FTSE MIB

1.2 Statistical Tools Adopted

The study of correlation analysis begins with the compilation of descriptive statistics, followed by the test of correlation among the sample twenty-two indices. To ensure the accuracy and reliability of the correlation application, a normality test is performed to assess the appropriateness of applying parametric or non-parametric methods. To verify this assumption, the study applies the Shapiro-Wilk test. In cases where the normality test indicates non-normality, the Spearman Rank Correlation method is being employed. The coefficient of correlation always ranges from -1 to +1. A

positive (negative) value indicates that the two variables move in the same (opposite) direction, signifying a positive (negative) correlation. After performing the correlation, hypothesis testing is conducted to find whether the observed sample correlation perfectly signifies the true population correlation. This process evaluates whether the population correlation coefficient (ρ) is approximately zero, indicating no monotonic association in the population, versus the alternative hypothesis (H_1), which suggests the presence of a monotonic association.

Empirical Results and Interpretations

1. Descriptive Statistics

The descriptive statistics table is as follows:

Table 2: A Summary of Descriptive Statistics

Countries and Index Returns	Sample Size	Minimum Statistics	Maximum Statistics	Mean Value	Standard Deviation	Variance	Skewness		Kurtosis	
							statistics	Standard Error	statistics	Standard Error
US (S&P 500)	2035	-0.15202	0.095224	0.000589	0.014365	0.000	-1.192	0.054	14.647	0.108
Canada (S&P/TSX Composite Index)	2035	-0.20408	0.107015	0.000444	0.013848	0.000	-1.735	0.054	29.332	0.108
Brazil (IBOVESPA)	2035	-0.20786	0.168725	0.001062	0.023068	0.001	-0.385	0.054	7.221	0.108
Mexico (IPC Mexico)	2035	-0.16479	0.125903	0.000918	0.016628	0.000	-0.523	0.054	12.782	0.108
Argentina (MERVAL)	2035	-0.30323	0.167449	0.002003	0.031198	0.001	-0.875	0.054	9.869	0.108
India (S&P BSE SENSEX)	2035	-0.18108	0.144126	0.001259	0.019743	0.000	-0.25	0.054	10.286	0.108
Australia (S&P/ASX 200)	2035	-0.11107	0.085888	0.000398	0.013462	0.000	-0.69	0.054	7.195	0.108
Israel (TA-125)	2035	-0.17134	0.090174	0.000638	0.014946	0.000	-1.13	0.054	14.567	0.108
Japan (Nikkei 225)	2035	-0.1674	0.118755	0.000503	0.020141	0.000	-0.936	0.054	7.846	0.108
Hong Kong (Hang Sang Index)	2035	-0.22247	0.149114	0.000528	0.020615	0.000	-0.311	0.054	14.91	0.108
Taiwan (TSEC)	2035	-0.11799	0.140547	0.000465	0.017147	0.000	-0.51	0.054	8.841	0.108
China (SSE Composite Index)	2035	-0.13239	0.165211	0.000327	0.023576	0.001	-0.205	0.054	5.503	0.108
Singapore (FTSE Singapore)	2035	-0.12152	0.168212	0.000425	0.016017	0.000	0.151	0.054	16.176	0.108
Indonesia (Jakarta Composite Index)	2035	-0.14376	0.185558	0.001243	0.019483	0.000	-0.556	0.054	13.867	0.108
S Korea (KOSPI Composite Index)	2035	-0.14523	0.17342	0.000609	0.017578	0.000	-0.566	0.054	13.77	0.108
Russia (MOEX Russia)	2035	-0.37624	0.258412	0.000974	0.027578	0.001	-1.003	0.054	27.923	0.108
Germany (DAX Performance Index)	2035	-0.1362	0.120848	0.000726	0.017881	0.000	-0.75	0.054	6.714	0.108
UK (FTSE 100)	2035	-0.12438	0.096404	0.000301	0.014464	0.000	-0.961	0.054	9.037	0.108
France (CAC 40)	2035	-0.12988	0.103717	0.000333	0.017318	0.000	-0.759	0.054	5.902	0.108
Netherland (EURONEXT 100)	2035	-0.13473	0.100822	0.000385	0.016118	0.000	-0.951	0.054	7.69	0.108
Belgium (BEL 20)	2035	-0.20936	0.087054	0.00035	0.016611	0.000	-1.715	0.054	18.35	0.108
Italy (FTSE MIB)	2035	-0.17356	0.908826	0.00041	0.028592	0.001	15.387	0.054	502.469	0.108

The descriptive statistics table demonstrates that all series comprise 2,035 observations, with no missing data detected. The highest return is recorded in the FTSE MIB (Italy) series, while the MOEX Russia series exhibits the lowest return value. Low standard deviation (SD) values suggest that the return observations are closely clustered around their mean values. Most series exhibit negative skewness, indicating longer left tails and a concentration of values on the right side, except for the FTSE MIB (Italy) and FTSE Singapore series, which show positive skewness, reflecting longer right tails and values concentrated on the left. Skewness values diverging from zero confirm that all series are asymmetric and significantly deviate from normality. Notably, the BEL 20 (Belgium), MOEX Russia, TA-125 (Israel), S&P/TSX Composite Index (Canada), and S&P 500 (USA) exhibit skewness exceeding -1, signifying pronounced left-tailed distributions due to negative skewness. The FTSE MIB (Italy), with a skewness value of 15.39, indicates extreme positive skewness, highlighting a highly asymmetric distribution with an exceptionally long right tail, pointing to the presence of significant outliers or extreme values. Furthermore, all series display kurtosis values greater than 3, signifying leptokurtic distributions. These are characterized by sharper peaks and fatter tails, indicating the presence of more extreme outliers compared to a normal distribution. Overall, the findings confirm that none of the return series follow a normal distribution.

1.1 Shapiro-Wilk Test of Normality

The Shapiro-Wilk test results with p-value, decision rule and test implications are as follows:

All p-values are below the 0.05, necessitating the rejection of the null hypothesis and indicating that the return series do not follow a normal distribution. As a result, the analysis adopts a non-parametric approach, utilizing the Spearman Rank Correlation test to account for the observed non-normality of the data.

1.2 Spearman Rank Correlation

The Spearman rank correlation matrix is presented in three distinct panels. The first panel highlights the correlation relationships between Asian and American markets, showcasing their inter-regional dynamics. The second panel illustrates the associations between Asian and European markets, reflecting their financial interconnectedness. Lastly, the third panel delves into the correlations within and between American and European markets, emphasizing

cross-continental integration. The detailed matrix panels are outlined below.

Findings (Table-6-Panel A)

The correlation analysis highlights the selective integration between Asian and American indices, shaped by regional dynamics and global economic interdependencies. India's S&P BSE SENSEX demonstrates weak associations with American markets, peaking with the S&P 500 (US), reflecting limited co-movement despite shared macroeconomic influences. Similar patterns are observed for other Asian indices like South Korea's KOSPI Composite Index and FTSE Singapore Index, which maintain low correlations with American indices, typically below 0.3, signaling partial integration. Japan's Nikkei 225 stands out with moderate correlations, indicating closer financial alignment with global markets. Within Asia, inter-market correlations show moderate linkages, reflecting regional economic ties but varying levels of integration. India's distinct dynamics underscore its selective engagement, with weaker intra-Asian and transcontinental correlations compared to Japan and South Korea. Overall, the findings capture a complex interplay of regional and global factors influencing market interconnectedness across Asia and the Americas. With p-values listed in parentheses beneath each coefficient and all falling below 0.01, the results confirm statistical significance across the 1%, or 5% thresholds for the two-tailed test.

Findings (Table-7-Panel B)

The correlation analysis underscores the limited financial integration between Asian and European indices, with India's S&P BSE SENSEX exhibiting weak associations across the board. Its highest correlation with a European index is with the FTSE 100 (UK) at 0.275, reflecting marginal co-movement and highlighting the distinct dynamics of India's market relative to Europe. Other Asian indices, such as Japan's Nikkei 225 and South Korea's KOSPI Composite Index, show moderate correlations with European markets, particularly the DAX (Germany) and CAC 40 (France), suggesting stronger economic and financial interlinkages. Within Asia, indices like the FTSE Singapore Index show relatively higher correlations with European indices, reflecting their intermediary roles in global trade and finance. These findings reveal that India remains relatively insulated from European market movements compared to its Asian counterparts, which demonstrate more pronounced regional and transcontinental alignments. Overall, the analysis highlights heterogeneous integration patterns shaped by structural, geographic, and economic factors. All p-values, presented in parentheses under the coefficients, are less than 0.01, demonstrating statistical significance at the 1%, or 5% significance levels under a two-tailed testing framework.

Findings (Table-8-Panel C)

The correlation analysis underlines strong financial interdependencies within American and European markets, shaped by their advanced economies and interconnected financial systems. Among the American indices, the S&P 500 (US) and the S&P/TSX Composite Index (Canada) exhibited the highest association, reflecting close economic ties and aligned market dynamics. The other American indices, including Brazil's IBOVESPA and Argentina's MERVAL, show moderate internal associations but significantly weaker connections to American counterparts, signaling a divide between developed and emerging markets. Among European markets, indices such as the DAX (Germany), FTSE 100 (UK), and CAC 40 (France) demonstrate high levels of cohesion, driven by shared regional factors and synchronized market movements.

Connections between American and European indices are moderate, with the S&P 500 (US) showing notable ties to the FTSE 100 (UK) and DAX (Germany), influenced by global economic drivers. These findings highlight strong regional integration within Europe and North America, while intercontinental interactions remain shaped by differing economic and structural attributes. The p-values, displayed in parentheses below the correlation coefficients, are all below 0.01, signifying statistical significance at the 1%, or 5% significance levels for a two-tailed test.

Conclusion

The Spearman Rank correlation analysis of India's S&P BSE SENSEX with American indices reveals a relatively weak integration with the US and Canada, reflecting India's distinct market dynamics. The SENSEX's highest correlation is with the S&P 500 (US), indicating a modest co-movement, likely influenced by shared global macroeconomic factors, but limited overall synchronization. The correlation with the S&P/TSX Composite Index (Canada) is similarly low, and other American indices, such as IPC (Mexico), show even weaker associations. These results underscore India's selective integration with North American markets, with minimal financial connectivity to South American indices, including Brazil's IBOVESPA and Argentina's MERVAL, which exhibit even weaker correlations with the SENSEX.

In the Asia-Pacific region, the SENSEX's correlation with other indices remains weak, further highlighting India's relatively independent market behavior. Correlations with the KOSPI Composite Index (South Korea) and the FTSE Singapore Index demonstrate India's limited integration within the region. This suggests that India's stock market operates with a degree of autonomy, less influenced by the regional economic fluctuations that drive the movements of other Asia-Pacific markets.

The analysis of European indices reveals strong financial interlinkages within the region, with the DAX Performance Index (Germany), FTSE 100 (UK), and CAC 40 (France) exhibiting high correlations, often exceeding. This reflects a high degree of economic and market integration within Europe, where market movements are largely synchronized due to shared economic and financial systems. The correlation between the DAX and FTSE 100 and between the FTSE 100 and CAC 40 are particularly robust, emphasizing the cohesion among major European markets. In contrast to its limited connections with markets in America and Asia-Pacific, the SENSEX's weak correlations with European indices underline its relatively independent position within the global market landscape. All correlations are statistically significant at the 1%, 5%, and 10% levels, further solidifying the interpretation of India's selective integration in the global financial system. The findings emphasize the influence of regional proximity and economic factors on market interdependence, with developed markets showing greater cohesion compared to the more isolated dynamics of emerging markets.

Table 3: Result of the Shapiro-Wilk Test of Normality

Name of Stock Index	Statistic	P−Value	Decision Rule	Decision on H_0 (H_0: The return series are normally distributed.)	Inferences
US (S&P 500)	0.878	0.000	P<0.05	Rejected	Non-normal series
Canada (S&P/TSX Composite Index)	0.851	0.000	P<0.05	Rejected	Non-normal series
Brazil (IBOVESPA)	0.941	0.000	P<0.05	Rejected	Non-normal series
Mexico (IPC Mexico)	0.892	0.000	P<0.05	Rejected	Non-normal series
Argentina (MERVAL)	0.904	0.000	P<0.05	Rejected	Non-normal series
India (S&P BSE SENSEX)	0.894	0.000	P<0.05	Rejected	Non-normal series
Australia (S&P/ASX 200)	0.919	0.000	P<0.05	Rejected	Non-normal series
Israel (TA-125)	0.886	0.000	P<0.05	Rejected	Non-normal series
Japan (Nikkei 225)	0.906	0.000	P<0.05	Rejected	Non-normal series
Hong Kong (Hang Sang Index)	0.87	0.000	P<0.05	Rejected	Non-normal series
Taiwan (TSEC)	0.89	0.000	P<0.05	Rejected	Non-normal series
China (SSE Composite Index)	0.916	0.000	P<0.05	Rejected	Non-normal series
Singapore (FTSE Singapore)	0.847	0.000	P<0.05	Rejected	Non-normal series
Indonesia (Jakarta Composite Index)	0.848	0.000	P<0.05	Rejected	Non-normal series
S Korea (KOSPI Composite Index)	0.874	0.000	P<0.05	Rejected	Non-normal series
Russia (MOEX Russia)	0.819	0.000	P<0.05	Rejected	Non-normal series
Germany (DAX Performance Index)	0.920	0.000	P<0.05	Rejected	Non-normal series
UK (FTSE 100)	0.904	0.000	P<0.05	Rejected	Non-normal series
France (CAC 40)	0.927	0.000	P<0.05	Rejected	Non-normal series
Netherland (EURONEXT 100)	0.913	0.000	P<0.05	Rejected	Non-normal series
Belgium (BEL 20)	0.871	0.000	P<0.05	Rejected	Non-normal series
Italy (FTSE MIB)	0.529	0.000	P<0.05	Rejected	Non-normal series

Table 4: Panel A: The Spearman Rank Correlation Matrix of the calculated Returns from select Asia-Pacific and the American Indices

Indices (Countries)	US (S&P 500)	Canada (S&P/TSX Composite Index)	Brazil (IBOVESPA)	Mexico (IPC Mexico)	Argentina (MERVAL)	India (S&P BSE SENSEX)	Australia (S&P/ ASX 200)	Israel (TA-125)	Japan (Nikkei 225)	Hong Kong (Hang Sang Index)	Taiwan (TSEC)	China (SSE Composite Index)	Singapore (FTSE Singapore)	Indonesia (Jakarta Composite Index)	S Korea (KOSPI Composite Index)	Russia (MOEX Russia)
US (S&P 500)	1	.685** (0.000)	.562** (0.000)	.624** (0.000)	.452** (0.000)	.310** (0.000)	.276** (0.000)	.369** (0.000)	.187** (0.000)	.316** (0.000)	.291** (0.000)	.124** (0.000)	.330** (0.000)	.204** (0.000)	.298** (0.000)	.336** (0.000)
Canada (S&P/TSX Composite Index)	.685** (0.000)	1	.561** (0.000)	.548** (0.000)	.465** (0.000)	.301** (0.000)	.320** (0.000)	.314** (0.000)	.205** (0.000)	.332** (0.000)	.311** (0.000)	.173** (0.000)	.354** (0.000)	.259** (0.000)	.312** (0.000)	.412** (0.000)
Brazil (IBOVESPA)	.562** (0.000)	.561** (0.000)	1	.577** (0.000)	.527** (0.000)	.261** (0.000)	.238** (0.000)	.289** (0.000)	.131** (0.000)	.324** (0.000)	.250** (0.000)	.159** (0.000)	.302** (0.000)	.245** (0.000)	.266** (0.000)	.400** (0.000)
Mexico (IPC Mexico)	.624** (0.000)	.548** (0.000)	.577** (0.000)	1	.436** (0.000)	.288** (0.000)	.284** (0.000)	.302** (0.000)	.169** (0.000)	.337** (0.000)	.298** (0.000)	.169** (0.000)	.338** (0.000)	.260** (0.000)	.305** (0.000)	.373** (0.000)
Argentina (MERVAL)	.452** (0.000)	.465** (0.000)	.527** (0.000)	.436** (0.000)	1	.191** (0.000)	.213** (0.000)	.273** (0.000)	.122** (0.000)	.272** (0.000)	.230** (0.000)	.141** (0.000)	.251** (0.000)	.203** (0.000)	.207** (0.000)	.332** (0.000)
India (S&P BSE SENSEX)	.310** (0.000)	.301** (0.000)	.261** (0.000)	.288** (0.000)	.191** (0.000)	1	.229** (0.000)	.202** (0.000)	.148** (0.000)	.278** (0.000)	.251** (0.000)	.075** (0.000)	.245** (0.000)	.253** (0.000)	.267** (0.000)	.242** (0.000)
Australia (S&P/ASX 200)	.276** (0.000)	.320** (0.000)	.238** (0.000)	.284** (0.000)	.213** (0.000)	.229** (0.000)	1	.348** (0.000)	.317** (0.000)	.544** (0.000)	.504** (0.000)	.234** (0.000)	.548** (0.000)	.410** (0.000)	.513** (0.000)	.331** (0.000)

Israel (TA-125)	.369** (0.000)	.314** (0.000)	.289** (0.000)	.302** (0.000)	.273** (0.000)	.202** (0.000)	.348** (0.000)	1	.205** (0.000)	.408** (0.000)	.333** (0.000)	.162** (0.000)	.403** (0.000)	.323** (0.000)	.361** (0.000)	.368** (0.000)
Japan (Nikkei 225)	.187** (0.000)	.205** (0.000)	.131** (0.000)	.169** (0.000)	.122** (0.000)	.148** (0.000)	.317** (0.000)	.205** (0.000)	1	.288** (0.000)	.310** (0.000)	.119** (0.000)	.321** (0.000)	.205** (0.000)	.346** (0.000)	.171** (0.000)
Hong Kong (Hang Sang Index)	.316** (0.000)	.332** (0.000)	.324** (0.000)	.337** (0.000)	.272** (0.000)	.278** (0.000)	.544** (0.000)	.408** (0.000)	.288** (0.000)	1	.601** (0.000)	.449** (0.000)	.682** (0.000)	.510** (0.000)	.611** (0.000)	.399** (0.000)
Taiwan (TSEC)	.291** (0.000)	.311** (0.000)	.250** (0.000)	.298** (0.000)	.230** (0.000)	.251** (0.000)	.504** (0.000)	.333** (0.000)	.310** (0.000)	.601** (0.000)	1	.281** (0.000)	.555** (0.000)	.439** (0.000)	.648** (0.000)	.347** (0.000)
China (SSE Composite Index)	.124** (0.000)	.173** (0.000)	.159** (0.000)	.169** (0.000)	.141** (0.000)	.075** (0.000)	.234** (0.000)	.162** (0.000)	.119** (0.000)	.449** (0.000)	.281** (0.000)	1	.293** (0.000)	.236** (0.000)	.278** (0.000)	.197** (0.000)
Singapore (FTSE Singapore)	.330** (0.000)	.354** (0.000)	.302** (0.000)	.338** (0.000)	.251** (0.000)	.245** (0.000)	.548** (0.000)	.403** (0.000)	.321** (0.000)	.682** (0.000)	.555** (0.000)	.293** (0.000)	1	.507** (0.000)	.572** (0.000)	.379** (0.000)
Indonesia (Jakarta Composite Index)	.204** (0.000)	.259** (0.000)	.245** (0.000)	.260** (0.000)	.203** (0.000)	.253** (0.000)	.410** (0.000)	.323** (0.000)	.205** (0.000)	.510** (0.000)	.439** (0.000)	.236** (0.000)	.507** (0.000)	1	.459** (0.000)	.335** (0.000)
S Korea (KOSPI Composite Index)	.298** (0.000)	.312** (0.000)	.266** (0.000)	.305** (0.000)	.207** (0.000)	.267** (0.000)	.513** (0.000)	.361** (0.000)	.346** (0.000)	.611** (0.000)	.648** (0.000)	.278** (0.000)	.572** (0.000)	.459** (0.000)	1	.355** (0.000)
Russia (MOEX Russia)	.336** (0.000)	.412** (0.000)	.400** (0.000)	.373** (0.000)	.332** (0.000)	.242** (0.000)	.331** (0.000)	.368** (0.000)	.171** (0.000)	.399** (0.000)	.347** (0.000)	.197** (0.000)	.379** (0.000)	.335** (0.000)	.355** (0.000)	1
** Correlation is significant at the 0.01 level (2-tailed) / P values are in parenthesis																

Table 5: Panel B: The Spearman Rank Correlation Matrix of the calculated Returns from select Asia-Pacific and the European Indices

Indices (Countries)	**India (S&P BSE SENSEX)**	**Australia (S&P/ASX 200)**	**Israel (TA-125)**	**Japan (Nikkei 225)**	**Hong Kong (Hang Sang Index)**	**Taiwan (TSEC)**	**China (SSE Composite Index)**	**Singapore (FTSE Singapore)**	**Indonesia (Jakarta Composite Index)**	**S Korea (KOSPI Composite Index)**	**Russia (MOEX Russia)**	**Germany (DAX Performance Index)**	**UK (FTSE 100)**	**France (CAC 40)**	**Netherland (EURONEXT 100)**	**Belgium (BEL 20)**	**Italy (FTSE MIB)**
India (S&P BSE SENSEX)	1	.229** (0.000)	.202**(0.000)	.148** (0.000)	.278** (0.000)	.251**(0.000)	.075** (0.000)	.245** (0.000)	.253** (0.000)	.267** (0.000)	.242** (0.000)	.298** (0.000)	.282**(0.000)	.295**(0.000)	.299** (0.000)	.297**(0.000)	.264**(0.000)
Australia (S&P/ASX 200)	.229** (0.000)	1	.348**(0.000)	.317** (0.000)	.544** (0.000)	.504**(0.000)	.234** (0.000)	.548** (0.000)	.410** (0.000)	.513** (0.000)	.331** (0.000)	.396** (0.000)	.431**(0.000)	.419**(0.000)	.434** (0.000)	.405**(0.000)	.354**(0.000)
Israel (TA-125)	.202** (0.000)	.348** (0.000)	1	.205** (0.000)	.408** (0.000)	.333**(0.000)	.162** (0.000)	.403** (0.000)	.323** (0.000)	.361** (0.000)	.368** (0.000)	.512** (0.000)	.474**(0.000)	.517**(0.000)	.527** (0.000)	.499**(0.000)	.464**(0.000)
Japan (Nikkei 225)	.148** (0.000)	.317** (0.000)	.205**(0.000)	1	.288** (0.000)	.310**(0.000)	.119** (0.000)	.321** (0.000)	.205** (0.000)	.346** (0.000)	.171** (0.000)	.255** (0.000)	.235**(0.000)	.245**(0.000)	.255** (0.000)	.226**(0.000)	.198**(0.000)
Hong Kong (Hang Sang Index)	.278** (0.000)	.544** (0.000)	.408**(0.000)	.288** (0.000)	1	.601**(0.000)	.449** (0.000)	.682** (0.000)	.510** (0.000)	.611** (0.000)	.399** (0.000)	.442** (0.000)	.456**(0.000)	.450**(0.000)	.467** (0.000)	.444**(0.000)	.398**(0.000)
Taiwan (TSEC)	.251** (0.000)	.504** (0.000)	.333**(0.000)	.310** (0.000)	.601** (0.000)	1	.281** (0.000)	.555** (0.000)	.439** (0.000)	.648** (0.000)	.347** (0.000)	.403** (0.000)	.399**(0.000)	.398**(0.000)	.416** (0.000)	.397**(0.000)	.348**(0.000)
China (SSE Composite Index)	.075** (0.000)	.234** (0.000)	.162**(0.000)	.119** (0.000)	.449** (0.000)	.281**(0.000)	1	.293** (0.000)	.236** (0.000)	.278** (0.000)	.197** (0.000)	.167** (0.000)	.185**(0.000)	.160**(0.000)	.172** (0.000)	.168**(0.000)	.148**(0.000)
Singapore (FTSE Singapore)	.245** (0.000)	.548** (0.000)	.403**(0.000)	.321** (0.000)	.682** (0.000)	.555**(0.000)	.293** (0.000)	1	.507** (0.000)	.572** (0.000)	.379** (0.000)	.448** (0.000)	.470**(0.000)	.463**(0.000)	.477** (0.000)	.451**(0.000)	.403**(0.000)
Indonesia (Jakarta Composite Index)	.253** (0.000)	.410** (0.000)	.323**(0.000)	.205** (0.000)	.510** (0.000)	.439**(0.000)	.236** (0.000)	.507** (0.000)	1	.459** (0.000)	.335** (0.000)	.313** (0.000)	.328**(0.000)	.312**(0.000)	.325** (0.000)	.325**(0.000)	.252**(0.000)

S Korea (KOSPI Composite Index)	.267** (0.000)	.513** (0.000)	.361** (0.000)	.346** (0.000)	.611** (0.000)	.648** (0.000)	.278** (0.000)	.572** (0.000)	.459** (0.000)	1	.355** (0.000)	.402** (0.000)	.403** (0.000)	.397** (0.000)	.416** (0.000)	.386** (0.000)	.329** (0.000)
Russia (MOEX Russia)	.242** (0.000)	.331** (0.000)	.368** (0.000)	.171** (0.000)	.399** (0.000)	.347** (0.000)	.197** (0.000)	.379** (0.000)	.335** (0.000)	.355** (0.000)	1	.478** (0.000)	.497** (0.000)	.482** (0.000)	.493** (0.000)	.463** (0.000)	.437** (0.000)
Germany (DAX Performance Index)	.298** (0.000)	.396** (0.000)	.512** (0.000)	.255** (0.000)	.442** (0.000)	.403** (0.000)	.167** (0.000)	.448** (0.000)	.313** (0.000)	.402** (0.000)	.478** (0.000)	1	.794** (0.000)	.908** (0.000)	.911** (0.000)	.821** (0.000)	.806** (0.000)
UK (FTSE 100)	.282** (0.000)	.431** (0.000)	.474** (0.000)	.235** (0.000)	.456** (0.000)	.399** (0.000)	.185** (0.000)	.470** (0.000)	.328** (0.000)	.403** (0.000)	.497** (0.000)	.794** (0.000)	1	.844** (0.000)	.859** (0.000)	.776** (0.000)	.733** (0.000)
France (CAC 40)	.295** (0.000)	.419** (0.000)	.517** (0.000)	.245** (0.000)	.450** (0.000)	.398** (0.000)	.160** (0.000)	.463** (0.000)	.312** (0.000)	.397** (0.000)	.482** (0.000)	.908** (0.000)	.844** (0.000)	1	.986** (0.000)	.868** (0.000)	.856** (0.000)
Netherland (EURONEXT 100)	.299** (0.000)	.434** (0.000)	.527** (0.000)	.255** (0.000)	.467** (0.000)	.416** (0.000)	.172** (0.000)	.477** (0.000)	.325** (0.000)	.416** (0.000)	.493** (0.000)	.911** (0.000)	.859** (0.000)	.986** (0.000)	1	.895** (0.000)	.849** (0.000)
Belgium (BEL 20)	.297** (0.000)	.405** (0.000)	.499** (0.000)	.226** (0.000)	.444** (0.000)	.397** (0.000)	.168** (0.000)	.451** (0.000)	.325** (0.000)	.386** (0.000)	.463** (0.000)	.821** (0.000)	.776** (0.000)	.868** (0.000)	.895** (0.000)	1	.800** (0.000)
Italy (FTSE MIB)	.264** (0.000)	.354** (0.000)	.464** (0.000)	.198** (0.000)	.398** (0.000)	.348** (0.000)	.148** (0.000)	.403** (0.000)	.252** (0.000)	.329** (0.000)	.437** (0.000)	.806** (0.000)	.733** (0.000)	.856** (0.000)	.849** (0.000)	.800** (0.000)	1

** Correlation is significant at the 0.01 level (2-tailed) / P values are in parenthesis

Table 6: Panel C: The Spearman Rank Correlation Matrix of the calculated Returns from select American and the European Indices

Indices (Countries)	US (S&P 500)	Canada (S&P/TSX Composite Index)	Brazil (IBOVESPA)	Mexico (IPC Mexico)	Argentina (MERVAL)	Germany (DAX Performance Index)	UK (FTSE 100)	France (CAC 40)	Netherland (EURONEXT 100)	Belgium (BEL 20)	Italy (FTSE MIB)
US (S&P 500)	1	.685** (0.000)	.562** (0.000)	.624** (0.000)	.452** (0.000)	.596** (0.000)	.575** (0.000)	.600** (0.000)	.604** (0.000)	.546** (0.000)	.537** (0.000)
Canada (S&P/TSX Composite Index)	.685** (0.000)	1	.561** (0.000)	.548** (0.000)	.465** (0.000)	.524** (0.000)	.556** (0.000)	.547** (0.000)	.552** (0.000)	.494** (0.000)	.491** (0.000)
Brazil (IBOVESPA)	.562** (0.000)	.561** (0.000)	1	.577** (0.000)	.527** (0.000)	.416** (0.000)	.445** (0.000)	.427** (0.000)	.432** (0.000)	.391** (0.000)	.385** (0.000)
Mexico (IPC Mexico)	.624** (0.000)	.548** (0.000)	.577** (0.000)	1	.436** (0.000)	.469** (0.000)	.477** (0.000)	.486** (0.000)	.493** (0.000)	.456** (0.000)	.439** (0.000)
Argentina (MERVAL)	.452** (0.000)	.465** (0.000)	.527** (0.000)	.436** (0.000)	1	.361** (0.000)	.364** (0.000)	.364** (0.000)	.369** (0.000)	.353** (0.000)	.351** (0.000)
Germany (DAX Performance Index)	.596** (0.000)	.524** (0.000)	.416** (0.000)	.469** (0.000)	.361** (0.000)	1	.794** (0.000)	.908** (0.000)	.911** (0.000)	.821** (0.000)	.806** (0.000)
UK (FTSE 100)	.575** (0.000)	.556** (0.000)	.445** (0.000)	.477** (0.000)	.364** (0.000)	.794** (0.000)	1	.844** (0.000)	.859** (0.000)	.776** (0.000)	.733** (0.000)
France (CAC 40)	.600**	.547** (0.000)	.427** (0.000)	.486**	.364** (0.000)	.908** (0.000)	.844** (0.000)	1	.986** (0.000)	.868** (0.000)	.856**
Netherland (EURONEXT 100)	.604** (0.000)	.552** (0.000)	.432** (0.000)	.493** (0.000)	.369** (0.000)	.911** (0.000)	.859** (0.000)	.986** (0.000)	1	.895** (0.000)	.849** (0.000)
Belgium (BEL 20)	.546** (0.000)	.494** (0.000)	.391** (0.000)	.456** (0.000)	.353** (0.000)	.821** (0.000)	.776** (0.000)	.868** (0.000)	.895** (0.000)	1	.800** (0.000)
Italy (FTSE MIB)	.537** (0.000)	.491** (0.000)	.385** (0.000)	.439** (0.000)	.351** (0.000)	.806** (0.000)	.733** (0.000)	.856** (0.000)	.849** (0.000)	.800** (0.000)	1

** Correlation is significant at the 0.01 level (2-tailed) / P values are in parenthesis

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