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US Equity Market Linkages with India and Selected Emerging Markets

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Abstract

This paper examines whether Indian equity investors receive meaningful international diversification benefits by analysing the linkage between the United States equity market, India and selected emerging equity markets. Daily closing prices of the S&P 500, NIFTY 50, BIST 100, S&P Merval, Karachi 100, EGX 30 and QE All Shares are studied for January 2010 to December 2024. The paper uses empirical design consisting of daily log returns, descriptive statistics, Augmented Dickey-Fuller unit-root tests, Pearson correlation, pair-wise Granger causality and Johansen cointegration. The evidence shows that India is moderately correlated with the US market and that US returns significantly Granger-cause Indian returns as well as the returns of the selected emerging markets. At the same time, the Johansen results do not indicate a stable long-run price-level relationship between the S&P 500 and the selected local indices. The findings suggest that the main linkage is short-run and predictive rather than long-run equilibrium-based. The paper contributes by placing India inside a simple comparative emerging-market framework and by showing that international diversification should not be judged only from geographic exposure.

Keywords: Indian equity market; US equity market; international diversification; Granger causality; cointegration; emerging markets

JEL Classification: G11, G15, C32, F36

1. Introduction

International diversification has remained an important question in portfolio management. Modern portfolio theory argues that portfolio risk depends not only on the risk of individual assets, but also on the way those assets move together (Markowitz, 1952). The diversification benefits only happen when the assets do not react to the same shocks in the same manner.

This matters for Indian investors for several reasons. There are international funds, exchange-traded funds, feeder structures, and other cross-border products. Indian equity prices are exposed to foreign portfolio flows, global liquidity, monetary-policy, and risk appetite. So, when assessing foreign exposure, we can't just look at country labels, be it domestic, emerging or frontier. We need to consider actual market linkages.

American equity markets are at the center of this. The S&P 500 is viewed as the gauge for world equity market sentiment since the American market evaluates global growth, earnings and liquidity, as well as risk appetite. Previous studies showed that equity price movements among different countries is connected through information flows, investor rebalancing, and financial market integration which can be further transmitted though crisis contagion (Eun and Shim, 1989; Hamao, Masulis and Ng, 1990; King and Wadhwani, 1990; Forbes and Rigobon, 2002).

Additionally, generalized assumptions about emerging markets would be inaccurate. Their integration with global markets relies on the openness of their capital accounts, the depth of their markets, their institutional structures, liquidity, currencies and the level of foreign participation.

Harvey (1995), Bekaert and Harvey (1995) and Carrieri, Errunza and Hogan (2007) show that emerging-market integration changes across time and across countries. India, Turkey, Argentina, Pakistan, Egypt and Qatar may therefore react differently to the same US market movement.

The present paper asks a simple question: how closely is India linked to the US market when compared with selected emerging equity markets? The study uses daily data from January 2010 to December 2024 for the S&P

500, NIFTY 50, BIST 100, S&P Merval, Karachi 100, EGX 30 and QE All Shares. The paper focuses only on linkage tools: correlation for contemporaneous co-movement, Granger causality for predictive transmission and Johansen cointegration for long-run price-level association.

The contribution of this paper is applied rather than methodological. The paper provides a clean and comparable India-centred examination of US equity market linkages with selected emerging markets over a daily sample. The paper is useful because diversification advice often assumes that foreign exposure automatically reduces risk. The evidence below shows that this assumption requires empirical checking.

2. Review of Literature

2.1 Portfolio Diversification and International Equity Risk

Diversification research traces back to Markowitz (1952), who argued that covariances (together with variances) play an important role in portfolio selection. Sharpe (1964) and Lintner (1965) put systematic risk at the forefront of asset pricing, and Solnik (1974) expanded the diversification argument to include international portfolios. The core idea of this body of research is that international investment serves to placate the domestic concentration problem, but only when foreign and domestic assets do not exhibit high degrees of association.

What came out in the later studies is that the benefits of international diversification are not constant. De Santis and Gerard (1997) associate diversification benefits with the concept of time-varying risk. Goetzmann, Li and Rouwenhorst (2005) and Bekaert, Hodrick and Zhang (2009) argued that international return co-movements are time-varying. The essence of these studies is that, from a spacial perspective, diversification cannot be taken for granted, and must be assessed for the period in question.

2.2 Emerging Market Integration and Cross-Border Links

Emerging markets have been the subject of research as markets exhibiting different risk and return behaviour. Harvey (1995) identified some degree of predictability in emerging market returns, while Bekaert and Harvey (1995) argued that the degree of market integration is variable over time. Henry (2000), Bekaert, Harvey and Lundblad (2005), and Carrieri, Errunza and Hogan (2007) contended that the degree of global integration of an emerging market is influenced by domestic financial and capital market liberalization and development.

The research on cross-border equity transmission also helps create a structure for your study. Eun and Shim (1989) utilize VAR and examine international market transmission. Hamao, Masulis and Ng (1990), and King and Wadhwani (1990) suggest price and volatility shocks can travel between markets. Evidence of US-Japan co-movement is provided by Karolyi and Stulz (1996), and Forbes and Rigobon (2002) separate crisis period contagion from normal interdependence. These studies justify the examination of not only contemporaneous but also lagged linkages.

2.3 Indian Equity Market and Global Spillover Evidence

India remains a focus in global portfolios and its equity market is affected by foreign portfolio flows, global liquidity, exchange rates and changes in global risk appetite. Mukherjee and Mishra (2010) analyze integration and volatility spillovers between India and key Asian markets and find Indian equities are not insulated from regional and global movements.

Indian spillover studies are numerous. Thangamuthu, Maheshwari, and Naik (2022) analyze Indian market spillovers and the impact of COVID-19. Yadav, Singh and Tandon (2023) analyze India's connectivity and global market volatility spillover using a DCC-GARCH approach. Finally, the work of Maharana, Panigrahi and Chaudhury (2024) confirms the context of the post-COVID-19 period restructuring volatility. These studies highlight global shocks to India, but offer an important simplified relative argument. What does the evidence suggest concerning the US market linkages of India versus a sample of its emerging market contemporaries?

2.4 Econometric Approach in Prior Studies

The empirical tools used in this paper are well established. Unit-root testing is based on Dickey and Fuller (1979) and Phillips and Perron (1988). The framework of predictive-causality is based on Granger (1969). It is used to check whether the past returns of one market help to predict the returns of another market. Cointegration is based on Johansen (1988, 1991) and used to verify whether non-stationary price series are mutually related in the long-run equilibrium.

These tools are used in this paper because the goal is not to propose new methods, but to make an applied contribution that is necessary. The standard tools of correlation, Granger causality and Johansen cointegration, allow differentiation between same-day co-movement, short-run predictive transmission and long-run price-level association.

3. Research Objectives and Hypotheses

3.1 Research Gap

The literature suggests that Indian equities are linked to global markets, but many studies either examine India in isolation or rely on broad global countries. Less attention is given to a straightforward comparison of India with selected emerging markets using the same daily period and the same basic linkage tests. This paper addresses that gap by comparing the US linkage of India with Turkey, Argentina, Pakistan, Egypt and Qatar.

3.2 Research Objectives

The main objective is to examine whether the Indian equity market is linked to the US equity market differently from selected emerging equity markets. The specific objectives are: (a) to examine contemporaneous co-movement between US returns and the returns of India and selected emerging markets; (b) to test whether US returns predict the returns of India and selected emerging markets; and (c) to examine whether US and local equity price levels share long-run cointegrating relationships.

3.3 Hypotheses of the Study

H01: There is no significant contemporaneous correlation between US equity returns and the returns of India and selected emerging equity markets.

H02: US equity returns do not significantly Granger-cause Indian and selected emerging-market equity returns.

H03: There is no long-run cointegrating relationship between the US equity price index and the selected local equity price indices.

4. Data and Methodology

4.1 Data Description

The study uses daily closing prices for seven equity indices: the S&P 500 for the United States, NIFTY 50 for India, BIST 100 for Turkey, S&P Merval for Argentina, Karachi 100 for Pakistan, EGX 30 for Egypt and QE All Shares for Qatar. The sample covers January 2010 to December 2024.

Each price series is converted into continuously compounded daily returns as follows:

$$R(i,t) = 100 \times \ln[P(i,t) / P(i,t-1)] \quad (1)$$

where P(i,t) is the closing index value for market i on day t. Price levels are used in the Johansen cointegration test, while return series are used for other techniques.

Duplicate observations are removed and missing values are checked.

4.2 Descriptive Statistics

Descriptive statistics provide an overview of how returns behave in each market. The average daily return is captured by the mean. Daily volatility is captured by the standard deviation. Skewness captures asymmetry and kurtosis captures fat tails. The Jarque-Bera statistic tests deviation from normality.

4.3 Unit-Root Testing

The Augmented-Dickey-Fuller test is performed on each daily return series to test for stationarity. The null hypothesis is that the series has a unit root. If the null hypothesis is rejected, then the return series is stationary and is appropriate for testing correlation and Granger causality.

4.4 Correlation Analysis

Pearson correlation is used to check co-movement of US returns and each receiving market on the same day. A more positively correlated return denotes a stronger same day return among the markets. Correlation is the first measure of linkage and shall not be viewed as an all-encompassing measure of the benefit of diversification.

4.5 Granger Causality

Granger causality is used to check if the lagged US returns are sufficient to explain the returns of India and selected emerging markets. While the test is referred to as causality, the philosophical implications of the term are not examined.

The baseline bivariate form is:

$$R(j,t) = \alpha + \Sigma\, \beta(k)R(j,t-k) + \Sigma\, \gamma(k)R(US,t-k) + \varepsilon(t) \quad (2)$$

where R(j,t) is the return of the local market and R(US,t) is the S&P 500 return. The null hypothesis is that lagged US returns do not jointly predict the local market return. A two-lag specification is used for the baseline comparison.

4.6 Johansen Cointegration

Johansen cointegration is applied to the natural logarithm of price levels to examine whether the US index and local index share a long-run equilibrium relationship.

5. Empirical Results and Discussion

This section reports the results in the order of the methodology.

5.1 Descriptive Statistics

Table I: Descriptive Statistics of Daily Log Returns

Market	Mean (%)	Std. dev. (%)	Min (%)	Max (%)	Skewness	Excess kurtosis	Jarque-Bera	Obs.
US	0.045	1.094	-12.766	9.089	-0.615	13.573	31051.11	4023
IND	0.041	1.038	-13.904	8.400	-0.921	13.852	32195.12	3968
TUR	0.076	1.554	-11.063	9.422	-0.620	4.792	4088.47	4016
ARG	0.183	2.523	-47.692	20.575	-1.843	37.143	226551.01	3913
PAK	0.073	1.049	-7.102	9.026	-0.278	5.311	4697.25	3966
EGY	0.049	1.432	-11.117	7.314	-0.572	5.411	4904.37	3860
QAT	0.028	0.932	-10.083	9.815	-0.649	16.478	45275.23	3988

Note: Returns are continuously compounded and scaled by 100. Excess kurtosis is reported relative to the normal benchmark.

Source: Author's calculations.

Table I shows that Argentina has the highest average daily return and the largest standard deviation . It also show sharpest single-day fall. India records a mean daily return of 0.041 percent and a standard deviation of 1.038 percent, placing it closer to the US and Pakistan in daily volatility All markets have negative skewness and high excess kurtosis, which suggests that large negative observations and fat tails are common in the sample.

5.2 Unit-Root Test Results

Table II: Augmented Dickey-Fuller Unit-Root Test Results

Market	ADF statistic	p-value	Lags	Obs.	1% CV	5% CV	Decision
US	-13.734	<0.0001	26	3996	-3.961	-3.412	Stationary I(0)
IND	-17.822	<0.0001	11	3956	-3.961	-3.412	Stationary I(0)
TUR	-43.431	<0.0001	1	4014	-3.961	-3.412	Stationary I(0)
ARG	-59.614	<0.0001	0	3912	-3.961	-3.412	Stationary I(0)
PAK	-29.603	<0.0001	3	3962	-3.961	-3.412	Stationary I(0)
EGY	-32.246	<0.0001	2	3857	-3.961	-3.412	Stationary I(0)
QAT	-23.273	<0.0001	7	3980	-3.961	-3.412	Stationary I(0)

Note: The ADF test is applied to daily log-return series with a constant and linear trend. The null hypothesis is a unit root.

Source: Author's calculations.

The ADF results reject the null for all the return series. The return data are therefore stationary and suitable for the short-run tests. This is important because correlation and Granger causality should be estimated on stationary return series only.

5.3 Correlation Evidence

Table III: Correlation of Each Market with the US Market

Market	US correlation	p-value	N
ARG	0.389	<0.0001	3808
IND	0.277	<0.0001	3833
TUR	0.268	<0.0001	3881
QAT	0.112	<0.0001	3094
EGY	0.092	<0.0001	2994
PAK	0.043	0.0082	3832

Note: The table reports Pearson correlations between S&P 500 returns and each receiving-market return series over the overlapping pair-wise sample.

Source: Author's calculations.

Table III shows that Argentina has the highest contemporaneous correlation with the US, followed by India and then Turkey. India's correlation of 0.277 indicates a moderate association with the USA. Pakistan, Egypt and Qatar show weaker correlations. The result suggests that India is not detached from US equity movements, but correlation alone cannot identify direction or timing of transmission.

5.4 Granger Causality Results

Table IV: Pair-wise Granger Causality Between US and Receiving Markets

Cause	Effect	F-statistic	p-value	Lags	N	Inference
US	IND	151.091	<0.0001	2	3833	Significant
IND	US	5.938	0.0027	2	3833	Significant
US	TUR	11.504	<0.0001	2	3881	Significant
TUR	US	2.302	0.1001	2	3881	Not significant
US	ARG	4.397	0.0123	2	3808	Significant
ARG	US	0.755	0.4702	2	3808	Not significant
US	PAK	29.296	<0.0001	2	3832	Significant
PAK	US	0.142	0.8672	2	3832	Not significant
US	EGY	31.406	<0.0001	2	2994	Significant
EGY	US	0.860	0.4234	2	2994	Not significant
US	QAT	47.598	<0.0001	2	3094	Significant
QAT	US	1.428	0.2398	2	3094	Not significant

Note: The null hypothesis is that the cause variable does not Granger-cause the effect variable. A two-lag specification is used for comparability.

Source: Author's calculations.

Table IV provides clear evidence of short-run predictive transmission from the US market. US returns significantly Granger-cause the returns of India and all selected emerging markets. The US-to-India relationship records the largest F-statistic in the table, suggesting that lagged US returns carry strong predictive information for the NIFTY 50. Reverse causality is much weaker: India Granger-causes the US at the 5 percent level, but Turkey, Argentina, Pakistan, Egypt and Qatar do not.

5.5 Johansen Cointegration Results

Table V: Johansen Cointegration Between US and Local Market Price Levels

Pair	N	Trace stat r=0	Trace 5% CV	Trace decision	Max-eigen r=0	Max-eigen 5% CV	Max-eigen decision
US-IND	3834	13.953	15.494	No	13.952	14.264	No
US-TUR	3882	4.954	15.494	No	4.236	14.264	No

US-ARG	3809	7.753	15.494	No	5.570	14.264	No
US-PAK	3833	3.575	15.494	No	3.376	14.264	No
US-EGY	2995	5.139	15.494	No	4.973	14.264	No
US-QAT	3095	10.241	15.494	No	10.240	14.264	No

Note: The table reports trace and maximum-eigenvalue statistics for the null of no cointegration between the S&P 500 and each local market log price-level series.

Source: Author's calculations.

Table V shows no evidence of a long-run cointegrating relationship between the US index and any selected local market index at the 5 percent level. Both the trace and maximum-eigenvalue statistics fall below their respective critical values. This means that the linkage identified in the Granger results is mainly short-run and predictive rather than a stable long-run price-level relation.

5.6 Hypothesis-wise Summary

Table VI: Hypothesis-wise Summary of Results

Hypothesis	Null statement	Verdict	Basis of verdict
H01	There is no significant contemporaneous correlation between US returns and local-market returns.	Rejected for all markets	All pair-wise US correlations are positive and statistically significant, although their magnitudes differ across markets.
H02	US returns do not significantly Granger-cause Indian and selected emerging-market returns.	Rejected	US returns significantly predict India and all selected markets at the 5 percent level.
H03	There is no long-run cointegrating relationship between US and local equity price indices.	Not rejected	Johansen trace and maximum-eigenvalue tests do not indicate cointegration for any US-local pair.

Source: Author's interpretation based on reported estimates.

The hypothesis summary that the US market has a measurable short-run linkage with India and the other emerging markets as per correlation and Granger causality. However, the absence of cointegration indicates that this linkage does not translate into a stable long-run price relationship. For investors, the implication is that US-market information matters for short-run, but all the markets do not simply share the same long-run price path with the S&P 500.

6. Conclusion

The focus of this study was on how the US equity market, India, and selected emerging equity markets are interconnected and used daily data from January 2010 to December 2024. This study employed basic empirical tools including but not limited to: descriptive statistics, ADF unit-root testing, Pearson correlation, Granger causality, and Johansen cointegration. The objective of this study was to understand whether Indian market diversification was impacted more by international market exposure or more by inter-market connections.

It was found that India has a moderate connection to the US market. It was also found that in the India-Argentina-Turkey correlation, India has a better correlation than Turkey, but a lower correlation than Argentina. Granger causality results found that US market returns and emerging markets' returns are lagged and that the US-India relationship was the strongest of the four India emerging market pairs.

The Johansen results present a different, but complementary story. No pair of US-emerging markets showed a significant long-run cointegrating relationship. The study found that there was a short-run market linkage without a long-run price-level integration. This shows that even though there may not be a long-run equilibrium relationship, market investors may be impacted by short-run price-level transmission from the US markets.

Indian investors and portfolio managers should be aware of US equity movements. This study found that US equity movements have the potential to impact the Indian equity market in the short-run. At the same time, the absence of long-run cointegration suggests that the linkage is not a permanent price-level relation. The paper therefore supports a cautious and evidence-based view of international diversification.

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