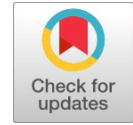




# Stock Market Integration Between Developed and Emerging Markets: Evidence from the EURO STOXX 50 and NIFTY 50



Deepak, Amit Kumar Nandal

**Abstract:** In today's era, every country is aligning itself with a regional bloc to increase its trade. India, with 1.4 billion people, offers a lucrative market for other countries. Everyone wants to make trade ties with India. Recently, in January 2026, a mother of all trade deals was signed between India and the EU. In light of all these developments, this paper sought to explore the interlinkages between the Indian and EU stock markets. Here, we tried to identify the interlinkages in terms of the return generated by these two blocs of the stock market over the period. The present study examines the interdependence between the NIFTY 50 and the EURO STOXX 50 using daily data from January 2000 to December 2025. To ascertain the basic characteristics of the data, descriptive statistics and graphical analysis have been conducted. These tests serve as a torchlight for further analysis. The study employs the Augmented Dickey–Fuller and Phillips–Perron unit root tests to check the stationarity of the data. The unit root tests reveal that the logarithmic price series for both indices are nonstationary in level but stationary after differencing, indicating that the variables are integrated of order one. This is completely in line with the descriptive statistics and graphical analysis. Johansen cointegration analysis and Granger causality testing is performed to understand the long-run and short-run behaviour of the two indices. The Johansen cointegration test found that the two markets do not move together. At the same time, Granger causality indicated unidirectional causality from India to the EU. We found that only the EU has a significant influence on the Indian stock market.

**Keywords:** Stock Market Integration, Financial Interlinkages, NIFTY 50, EURO STOXX 50, Cointegration, Granger Causality.

## Nomenclature:

FII: Foreign Institutional Investor;

FPI: Foreign Portfolio Investor;

NSDL: National Securities Depository Limited,

RBI: Reserve Bank of India,

EU: European Union

## I. INTRODUCTION

Many researchers have studied how stock markets interact across countries, particularly following the rise in cross-border financial activity. International financial studies examine stock market interconnectedness from many angles,

such as return co-movements, volatility spillovers, information transmission, financial contagion, and market integration.

Market integration has received much attention because it shows how segmented markets can operate as a single investment environment. In integrated markets, stock prices in different countries respond to common macroeconomic factors and global financial conditions. This leads to lasting links between market indices. The degree of market integration strongly influences international portfolio diversification. As markets become more integrated, the advantages of diversification decrease [1].

The European equity market is an important part of the global financial system and a key capital market in the region. European countries have further economically integrated with the formation of a monetary union, which has strengthened the financial links in the area. Consequently, the significance of European financial markets in global investment strategies has significantly risen. The top blue-chip companies of the main eurozone economies are found in the EURO STOXX 50 index [2]. The Euro Stoxx 50 index is a major benchmark for European stock markets. The total size of publicly traded companies in the euro area has surpassed €9 trillion in recent years. This Index includes large multinational corporations across different Industries. In 2004, Kearney and Lucey state that it is a useful benchmark for the broader European equities market. It is often employed in empirical studies on international financial integration.

Since liberalisation in the early 1990s, India has become a player in global financial markets. After these reforms, domestic capital markets opened to foreign investors, financial institutions modernised, and regulatory frameworks improved. In 2023, NSE reports show that the exchange's market capitalisation crossed US\$3.5 trillion. This made India one of the largest stock markets in emerging markets. The NIFTY 50 index tracks the 50 largest Indian companies, especially those on the National Stock Exchange.

The rising influence of FIIs (Foreign institutional investors) may be substantially responsible for the integration of the Indian stock market with global markets. In the past, it wasn't always so. The policy changes in the early 1990s formally allowed FII participation in Indian equity markets, and only after this did the market begin to expand. Their involvement has increased ever since then.

Analysis of RBI and NSDL data highlights a clear trend. The overall Foreign Portfolio Investment (FPI) inflows into Indian equity markets have crossed US\$300 billion from 1993 to 2024. That is not a small number. It instead

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shows that global investors have expressed long-term confidence in the Indian market over an extended period. Simultaneously, institutional ownership has become quite significant in terms of its share. According to estimates, nearly 17-20 per cent of total institutional holdings in listed Indian companies are held by FPIs. The degree of participation allows them to influence both liquidity and prices. Thanks to this rising dominance, the Indian economy cannot remain unaffected by global developments. Actually, it reacts quite visibly. Changes often influence the domestic market's perceptions of global risk or international portfolio allocation. Movements in Indian stock prices have direct or indirect effects on movements in global markets.

Despite constant volatility in global financial markets, India and Europe's economic ties have grown stronger with each passing day. It didn't happen in a blink. On the other hand, it took a while to form. The establishment of growing trade and investment links characterised it. The European Union remains one of India's important trade partners. It is also an important source of investment. In 2023, India's total merchandise trade with the EU stood at over €120 billion, according to the European Commission's report. It accounts for nearly 10 to 11 per cent of India's total external trade. Such a scenario shows the increasing significance of Europe in India's external sector. Simultaneously, financial linkages have also become more visible. European institutional investors are active in global capital markets. They do not limit themselves to developed markets only. Instead, they are allocating an increasing share of their portfolios to emerging economies such as India. Given these developments, the Indian stock market cannot be examined in isolation. The phenomenon, at least in part, responds to developments in European financial markets. Often, these effects are transmitted through changes in investor sentiment, portfolio adjustments, and cross-border capital flows. Given this, one can expect fluctuations in European markets to affect the price behaviour in the Indian equity market.

Economic and financial connections between India and Europe have increased over the years. The changes made in existing empirical literature are inadequate. The relationship between emerging markets and the US has been the focus of studies. India and Europe's relationship has been less explored because of this. While considering the recent developments, this gap appears. Trade between India and Europe is on the rise. The financial links have also deepened. Yet these changes are not studied in enough detail. In this circumstance, a meaningful exploration becomes necessary. Analysing information gives helpful industrial insight. In what ways is financial integration evolving? It also brings clarity to a relatively unexplored area.

## II. LITERATURE REVIEW

Research and early studies show gains from global portfolio diversification. The return benefits stemmed from low correlations among national equity markets. Investors may mitigate risk by diversifying internationally. In 1952, Markowitz made one of the earliest contributions showing that diversification reduces portfolio risk. This became the cornerstone of modern portfolio theory. Solnik examined international capital markets next. He came to the same

conclusion. Global diversification helps investors to reduce the variance of their portfolio [3]. This is mainly due to the lack of a consistent relationship across countries' returns.

Subsequent studies shifted focus to the long-run relationships among stock markets. In the beginning, researchers began testing whether markets moved together over time. The concept of equilibrium became relevant in this context. In 1992, Kasa included cointegration techniques in the major developed markets. Results showed a common stochastic trend. Consequently, these markets move together over time [4]. This suggests that global factors affect many other markets. This analysis was extended to the emerging markets. Financial liberalisation means relaxing restrictions. This process was affirmed as useful for integrating with the market. Markets welcome foreign investors to accelerate integration. This is particularly evident when international capital flows become more flexible [5].

Baele (2005) has looked into this issue. The study revealed the crucial importance of macroeconomic fundamentals [6]. In addition, global risk factors play a role. The degree of equity market integration is affected by both. Market segmentation is reduced by financial liberalisation. Consequently, American capital markets have become more connected. It results in stronger global financial connections. Recent studies have implemented the same approach. According to Youssef et al. (2021), global economic disturbances affect interactions between nations [7]. Similar findings were reported by Vatsa et al (2022). They had noticed financial interconnections, rising. This is linked to growing cross-border investment flows [8]. More recent evidence shows changing patterns of integration. Ben Ammar and Hellara researched uncertainty in their 2021 works. Global financial uncertainty affects market linkages. Macroeconomic shocks also play an important part. The publication focuses on how volatility spreads affect high-frequency traders. There are substantial spillovers among markets [9]. The effect was prominent during the troubled economic scenario. The evidence suggests that international markets are more closely connected than they used to be.

## III. DEVELOPED AND EMERGING MARKET LINKAGES

The correlation between developed and emerging market stock markets has been empirically studied in finance. Researchers have been working for a long time to understand how shocks move across markets.

The shocks generally originate in advanced economies and then spill over to emerging markets. Maurice Obstfeld and Alan M. Taylor spoke about this issue. Financial liberalisation plays a key role, they argued. Money from outside nations helps, too. These factors allow emerging markets to connect with developed markets. Market behaviour during crises is another important observation. According to Longin & Solnik (2001), correlations rise in falling markets. This minimises the benefits of diversification [10].

In such cases, investors cannot fully hedge their portfolios. The Asian financial crisis is studied by Forbes & Rigobon (2002). Shocks in major



markets have strengthened cross-market linkages, say analysts. The findings affirm that, under stress, the link between the two countries is stronger [11]. Recent works have attempted to improve the detection of shock transmission. A spillover index approach has been developed by Diebold & Yilmaz (2023). The results show there's strong volatility spillover across these markets. This proves that financial systems are closely linked [12]. Global Financial Shocks by Raddant & Kenett (2021) found that economic uncertainty affects both developed and emerging markets. The stock markets show signs of these effects and relationships [13]. Findings have been similarly reported by others [14]. Volatility spillovers were observed to increase. The increasing involvement of international institutional investors is causing this trend. The COVID-19 epidemic gave a fresh understanding. As per Zhang et al. 2020), the uncertainty flared up greatly during this time. The correlation between stock markets became strong across nations [15,16]. The study shows that the pandemic amplified financial contagion. Impact was more pronounced between developed and emerging countries. This lends more credence to the idea of greater global financial integration.

#### A. Integration of the Indian Stock Market with Global Markets

Following the economic reforms of the early 1990s, the Indian stock market began to attract more attention. Researchers have begun studying its integration into global markets. The market opened to foreign investors due to financial liberalisation. This caused higher capital flows across borders.

It also strengthened financial connections worldwide. Kotha & Mukhopadhyay (2007) examined the correlation between the Indian stock market and major global markets. Methods of Cointegration were employed [17]. The relationship holds in both the short and long terms. After capital account liberalisation, the Indian market became sensitive to global developments as well. Multiple studies have also examined the role of foreign institutional investors. According to Floros (2011), the presence of foreign investors influences market liquidity. They also impact the movement of market prices. It was suggested that investors' portfolio adjustments could transmit global shocks to the domestic market. Evidence shows increasing levels of integration. The Indian market and the major global markets are increasingly co-moving [18]. Similarly, Sarwar & Khan (2016) stated that the integration of capitalism and markets is further supported by globalisation and capital flows [19]. Rahman & Shahari (2021) observed strong volatility spillovers during financial crises. Growing uncertainty leads to more intense market linkages with the economy [20]. Similarly (Victor et al. (2021) find out the impact of global economic uncertainty on other emerging markets like India. The results imply that these markets are highly responsive to external events [21]. In addition, Singh (2024) has noted that global uncertainty has a significant influence on returns across emerging markets [22].

#### B. European Market Linkages with Global Equity Markets

Scholars have studied European equity markets extensively in relation to international financial integration. One reason

for this is their economic importance and high market value. The creation of the European Monetary Union was a significant event. Financial linkages within the region were strengthened with the introduction of a common currency. The acceptance of the euro significantly heightened integration in the European market.

Another branch of research examines the interactions between these markets and global financial markets. European markets are often considered transmission channels, as Demian (2011) pointed out. Financial shocks originating from developed economies pass through these markets in time. Consequently, during global crises, emerging economies may be affected fairly quickly. There is evidence which is based on volatility behaviour. Panda and Nanda (2017) think that there are strong spillover effects between European and global equity markets [23]. Conveying is not so simple. It goes through several channels. In support of this view, Dewandaru et al. (2018) argue that markets worldwide are related not only through direct channels but also through sophisticated volatility mechanisms. Recent studies pay more attention to uncertainty. During unstable periods, links tend to strengthen. According to Trivedi et al. (2021), there is a closer association between European markets and global markets during high levels of uncertainty [24]. The crises involve macroeconomic shocks and greater market correlation. Despite the large body of literature, some gaps remain. There is a serious paucity of work on India and the European economy in general. As the economic ties grow and global investment flows rise, a sharp empirical investigation becomes important. Investigating the relationship between the NIFTY 50 and the EURO STOXX 50 could potentially offer useful insight into financial integration.

#### IV. RESEARCH GAP

There is a significant amount of literature regarding the integration of global stock markets. Most empirical work has continued to focus on a narrow set of issues. Academicians have mainly reviewed the relationship between the emerging markets and major financial centres, notably the US and Japan. In many of these studies, the goal has been to understand how financial shocks transmit and whether international diversification remains effective. This same pattern can be observed in the Indian context. Most of the national literary work relates to the U.S.-India market strategic relationship. It is not surprising because the United States is engaged in the financial world and is dominating. Nonetheless, this method excludes other significant areas. The European Union is one such example. The eurozone, comprising Germany, France, Italy, and other countries, is a large economic bloc. According to World Bank estimates, the EU accounts for approximately 14-15 per cent of global GDP. It shows the clear economic importance. India and Europe are closely linked, but that linkage has not been explored in sufficient detail, even then. Some research is accessible.



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Nonetheless, the focus is usually on individual European states. A broader view of the region is missing. There is a gap in understanding. An option is to use a representative index to resolve the issue.

The Euro Stoxx 50 includes leading firms from the eurozone. The overall regional movement is captured better than single-country indices. A clearer picture can emerge when this is studied alongside the NIFTY 50. It offers a more balanced perspective on financial linkages between India and Europe. Consequently, it necessitates a systematic empirical analysis. One must check both short-run and long-run relationships. An approach such as this can reveal how these two markets are connected.

## A. Objectives of the Study

The study proposes examining the relationship between the Indian and European stock markets using appropriate benchmark indices, given the research gap identified above. The specific objectives of the current study are as follows.

- i. To explore statistical properties of the NIFTY 50 and EURO STOXX 50 index series.
- ii. To analyse the long-run equilibrium relationship between the Indian and European stock markets using cointegration techniques.
- iii. To examine the short-run dynamic interactions between the two markets through vector autoregression and causality analysis.

## B. Data Description and Sources

The two markets are taken to be represented by standard benchmark indices. The NIFTY 50 captures the Indian market. It comprises 50 large, actively traded companies on the National Stock Exchange of India. The EURO STOXX 50 is used as the representative index for Europe. The index reflects the performance of major blue-chip companies across key eurozone economies. Researchers frequently utilise these indices to represent aggregated market fluctuations in practice.

The data is described using a different approach. Both indices take into account daily closing values. The period runs from January 2000 to December 2025. The timeframe is important because it spans different periods of global finance. Global financial crisis, globalisation, the European sovereign debt crisis, and the COVID-19 pandemic fall within this period. These episodes help monitor market behaviour under different conditions. The resource from which the dataset has been compiled is reliable. All price series are obtained from the Bloomberg database. It ensures data consistency and the robustness of empirical results.

## C. Hypotheses of the Study

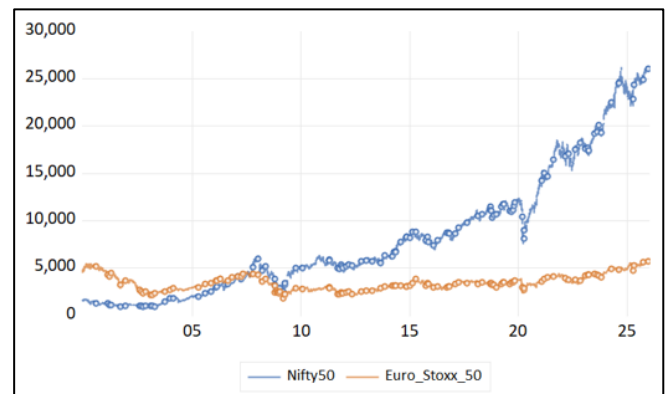
The present study formulates the following hypotheses to examine the relationship between the Indian and European equity markets.

**H<sub>01</sub>:** There is no long-run equilibrium relationship between the Indian stock market and the European stock market.

**H<sub>02</sub>:** There is no causal relationship between the Indian stock market and the European stock market.

## D. Graphical Analysis of Stock Market Indices

A visual overview provides key knowledge about market behaviour. It aids in the study of the development of Indian and European stock markets over time. A glance can reveal the patterns. Price series indicate trends. Logarithmic values provide a clearer perspective. It is easier to make comparisons over time. One can identify long-term price movements and volatility changes through such plots. The detection of certain data properties also becomes possible. At this stage, non-stationarity can often be observed.



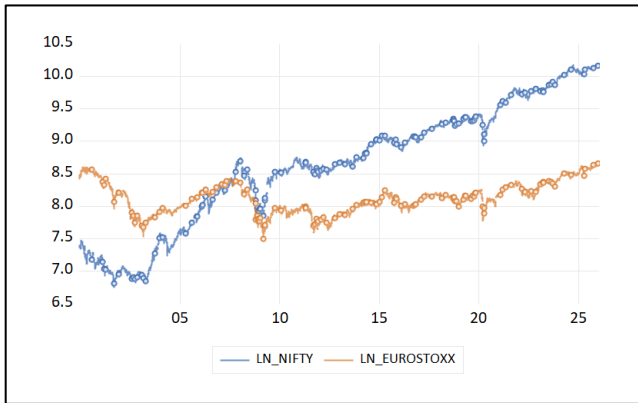
[Fig.1: Graphical Representation of Nifty50 & EuroStoxx50]

Source: Author's Calculation Generated by E-Views

A plot of the raw index levels shows a clear uptrend in both markets. Growth is evident throughout the sample period. The degree of growth in this area varies. NIFTY 50 shows a very strong spike. In the early part of the sample, it was close to 1000 points. It grew rapidly over time. By the end of the period, the index reached 25000. This shows that the Indian stock market has been expanding rapidly. The main factor was strong economic growth. Foreign portfolio inflows further aided the rise.

The European market appears to have a new pattern. The EURO STOXX 50 is barely growing in value. It increased from about 4500 points to almost 5000 points. The rise is there, but it is not too steep. This may be due to the European market's maturity. The Eurozone's economic difficulties also affected it. The performance was affected by events, such as the sovereign debt crisis and slower growth phases. The graphs also indicate disruption at certain times. In the years 2008 and again in 2020, there was a major drop. Uncertainty was created due to the financial crisis and the COVID-19 pandemic. During these phases, market reactions were quite strong. We observe recovery after every down action. The two markets recovered subsequently. Each country is recovering at its own pace. The Indian market recovery is stronger. The European market has also recovered, but more slowly. You can clearly see this variation in the later part of the sampled duration.

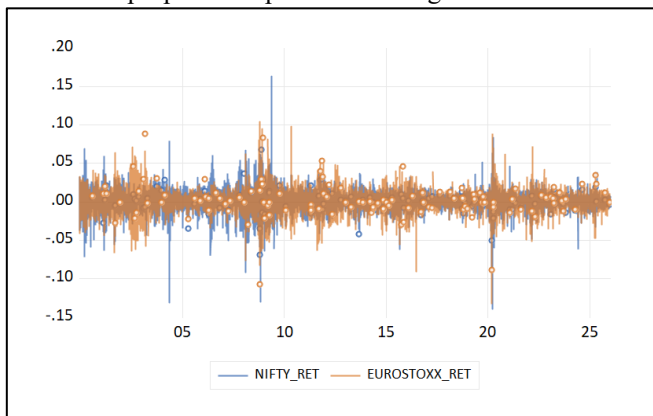




[Fig.2: Graphical Representation of Nifty50 & Euro Stoxx50 on a Logarithmic Scale]

Source: Author's Calculation Generated by E-Views

The log form of the index series was also investigated. This change is beneficial. The variance of the data can be stabilised using the method. Comparing data over a long period becomes easier. The plotted log series indicates a clear upward movement in both indices. The pattern remains constant even after data transformation. This indicates that the series averages are non-constant. Rather, these qualities tend to move in a certain direction over time. Such behaviour indicates possible non-stationarity in the level data. Financial time series commonly exhibit this phenomenon. Prices tend to trend rather than remain stable. Consequently, an important implication would follow. Shocks to the series may not fade quickly. The impact lasts longer than expected. It becomes essential to test for unit roots for this reason. Confirmation of time-series properties is performed using these tests.



[Fig.3: Graphical Representation of Nifty50 & EuroStoxx50 Return]

Source: Author's Calculation Generated by E-Views

In the end, the graphical behaviour of the daily return series for the NIFTY 50 and EURO STOXX 50 indices was studied. In contrast to the price series, the return series oscillate around a constant mean close to zero. The chart also shows clusters of volatility, where subsequent high-volatility events follow a period of high-volatility. During the global financial crisis around 2008-2009 and during the COVID-19 phase around 2020, there were sharp spikes in return volatility. This kind of behaviour conforms to the well-known stylised facts of financial return series, which have been well-documented in earlier empirical studies.

### E. Descriptive Statistics of Stock Market Returns

Daily returns of both indices are calculated using descriptive statistics. Such measures provide insight into the primary features of data. They also offer insight into return behaviour and volatility. The NIFTY 50 records an average daily return of 0.000433. The EURO STOXX 50 figure is 0.000276. Both values are above zero. This indicates that, on average, the two markets recorded profits during the sampling timeframe. Indian Market Return Is Higher. It is easy to differentiate. In addition, the median is helpful. NIFTY50's median is 0.000859. The median value of the Euro Stoxx 50 stood at a low 0.000153 in 2002. These values are not equal to their means. The distribution indicates some degree of asymmetry. The mean-median difference implies that returns are not perfectly symmetric. Although small, the deviation is present. The return series of financial variables exhibits this characteristic.

Table 1: Descriptive Statistics

Description	NIFTY	EUROSTOXX
Mean	0.000433	2.76E-05
Median	0.000859	0.000153
Maximum	0.163343	0.104376
Minimum	-0.139038	-0.132405
Std. Dev.	0.013659	0.014186
Skewness	-0.493113	-0.192818
Kurtosis	14.23988	9.609638
Jarque-Bera	34288.14	11806.50
Probability	0.000000	0.000000
Sum	2.797952	0.178388
Sum Sq. Dev.	1.205784	1.300621
Observations	6464	6464

Source: Author's Calculation Generated by E-Views

Extreme values indicate sharp movements happening in the market, which is quite evident. The maximum daily return of NIFTY 50 is 0.163343. The maximum of the EURO STOXX 50 is 0.104376. The minimum values on the downside are -0.139038 and -0.132405, respectively. These figures indicate that both markets are volatile. This kind of movement occurs during periods of market stress. Standard deviation helps us to understand volatility. The NIFTY 50 is at 0.013659. The value of the EURO STOXX 50 is 0.014186. This indicates that the European market experienced marginally higher variability in returns. Even a small difference becomes important in financial analysis. It reflects sensitivity to external factors. The shape of the distribution is also important. Both series show negative skewness. The value for the NIFTY 50 is -0.493113. For the EURO STOXX 50, it is -0.192818. This suggests that large negative returns occur more frequently than large positive ones. Downward movements tend to be sharper. This pattern is often seen in equity markets. Kurtosis values provide another perspective. The NIFTY 50 is at 14.23988. The EURO STOXX 50 is at 9.609638. Both are much higher than 3. This confirms that the distributions are leptokurtic. Extreme events occur more often than in a normal distribution. Financial markets typically show such behaviour. Finally, the Jarque-Bera test is applied. The statistics are 34288.14 for the NIFTY 50 and 11806.50 for the EURO STOXX 50. The probability values are 0.000000 in both cases. This leads to rejection of the null hypothesis of normality. The



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presence of skewness and excess kurtosis supports this result.

## V. CORRELATION

The correlation between the NIFTY 50 and EURO STOXX 50 return series is 0.357171. This value is positive. It indicates that both markets tend to move in the same direction. The relationship is not very strong. It is moderate in nature. This means the markets are connected but not perfectly aligned. There are periods when they move together. There are also times when they behave differently. A rise in the European market often follows, leading to a rise in the Indian market. The reverse can also be observed. However, this movement is not exact in all cases. Other domestic and global factors also influence returns. Overall, the correlation suggests a moderate level of integration. It reflects partial co-movement between the two markets rather than complete dependence.

## A. Unit Root Test Results

Before examining the long-run relationship between the Indian and European markets, the time-series properties of the variables must be checked. Without it, the results may be misleading. In many cases, regression results appear significant due to trending behaviour. This leads to spurious relationships. Such outcomes do not reflect true economic linkage. Therefore, testing for stationarity becomes important. For this purpose, the Augmented Dickey Fuller test and the Phillips-Perron test are applied. Both tests are used on the logarithmic price series of the NIFTY 50 and the EURO STOXX 50. These tests help in identifying whether the series contains a unit root. Two model forms are considered. One includes only an intercept. The other includes both intercept and trend. This allows a more comprehensive assessment of the data. In each case, the null hypothesis assumes the presence of a unit root. This implies that the series is non-stationary. The results of these tests guide the next stage of analysis.

**Table II: Unit Root Test Results of Stock Market Indices**

	ADF Level (C)	ADF Level (C+T)	PP Level (C)	PP Level (C+T)	ADF First Diff (C)	PP First Diff (C)
NIFTY_RET	-0.2268 (0.9327)	-2.9569 (0.1447)	-0.2641 (0.9277)	-2.9436 (0.1487)	-76.3645*** (0.0001)	-76.3843*** (0.0001)
EUROSTOXX_RET	-2.1452 (0.2270)	-2.6797 (0.2451)	-1.8716 (0.3461)	-2.4299 (0.3638)	-82.2247*** (0.0001)	-82.7971*** (0.0001)

Source: Author's Calculation Generated by E-Views

The results in Table 2 show that both indices are non-stationary at the level. For the NIFTY 50, the ADF value with intercept is  $-0.2268$ . The probability is 0.9327. When the trend is taken into account, the statistic becomes  $-2.9569$  with probability 0.1447. The PP test also gives similar values. The statistics are  $-0.2641$  and  $-2.9436$  under the two specifications. These values are not sufficient to reject the null hypothesis. Hence, the series remains nonstationary at the level. A similar outcome is seen for the EURO STOXX 50. The ADF values are  $-2.1452$  with intercept and  $-2.6797$  with trend. The PP results are  $-1.8716$  and  $-2.4299$ . These values again fail to reject the null hypothesis. This indicates that the logarithmic price series is non-stationary in level form. Since both series are nonstationary, the analysis proceeds to first differences. This step changes the data's behaviour. The results become very strong after differencing. For the NIFTY 50, the ADF statistic is  $-76.3645$ . The PP value is  $-76.3843$ . Both are significant at the 1 per cent level. The EURO STOXX 50 also shows similar results. The ADF value is  $-82.2247$ . The PP value is  $-82.7971$ . These values

are highly significant. The magnitude of these statistics is very large. It clearly rejects the unit root hypothesis. This confirms that the differenced series is stationary. Overall, both indices are integrated of order one. This is written as  $I(1)$ . This result is important. It allows further analysis using cointegration methods. The Johansen approach can now be applied to examine the long-run relationship between the two markets.

## B. Johansen Cointegration Test Results

The earlier results show that both indices are integrated of order one. This forms the basis for the next step. It becomes necessary to check whether a long-run relationship exists between the two markets. To examine this, the Johansen cointegration test is applied. This method works within a vector autoregressive framework. It allows testing for the presence of a long-run equilibrium. Two statistics are used in this approach. The trace statistic is one. The other is the maximum eigenvalue statistic. Both help determine the number of cointegrating vectors in the system.

**Table III: Johansen Cointegration Test Results**

Null Hypothesis	Trace Statistic	5% Critical Value	p-value	Max-Eigen Statistic	5% Critical Value	p-value
$r=0$	8.8000	15.4947	0.3842	7.1835	14.2646	0.4677
$r \leq 1$	1.6165	3.8414	0.2036	1.6166	3.8414	0.2036

Source: Author's Calculation Generated by E-Views

The trace test is considered first. It examines the null hypothesis of no cointegration. The reported trace statistic is 8.8000. This value is lower than the critical value of 15.4947 at the 5 per cent level. The probability value is 0.3842. This is quite high. Hence, the null hypothesis cannot be rejected. The second case is also checked. It tests whether at most one cointegrating vector exists. The trace statistic is 1.6166. The

critical value is 3.8414. Again, the test fails to reject the null hypothesis. This suggests the absence of cointegration under the trace framework. The maximum eigenvalue test gives similar evidence. The statistic for the no cointegration case is 7.1835. This is below the critical value of 14.2646. The

probability value is 0.4677. It clearly indicates the null is not rejected. The next case is also examined. The value is 1.6165. It remains below the critical threshold of 3.8414. Thus, no cointegrating vector is found. Both tests lead to the same conclusion. There is no long-run equilibrium relationship between the NIFTY 50 and the EURO STOXX 50. Even though both series are non-stationary, they do not move together in the long run. This result has an important implication. Shocks in one market may not create permanent effects in the other. The adjustment mechanism between the two markets appears weak in the long run.

### C. Granger Causality Test Results

No long-run link was found in the earlier step. So, the focus shifts. Attention is now given to short-run movements. Markets may still influence each other in the short term. This happens even when no stable equilibrium exists. The idea is to see whether past values carry some information. Prediction becomes the key here. One market may react with a delay. The other may move first. Such lead-lag patterns are quite common in financial data. To capture this effect, a causality approach is applied. It checks whether one series helps in forecasting the other. The direction of influence also becomes important. A lag length of 3, as suggested by the AIC method, has been used. This allows flexibility in capturing short-term adjustments. Some effects appear quickly. Others take time.

Table IV: Granger Causality

Description	F-Statistic	Df	p-value	Granger Causality
EUROSTOXX goesXX→ NIFTY	58.2392* **	2	4.E-37	Yes
NIFTY goesTY→ EUROSTOXX	0.03347	2	0.9918	No

Source: Author's Calculation Generated by E-Views

The first hypothesis focuses on the influence of the European market. It checks whether movements in the EURO STOXX 50 help in predicting the NIFTY 50. The F statistic is 58.2392. The probability value is extremely low at 4.0E-37. This is far below the 5 percent level. The null hypothesis is therefore rejected. It indicates that changes in the European market have a short-run impact on the Indian market. The direction of influence is quite clear in this case. A different picture emerges in the second test. Here, the role of the Indian market is examined. The F statistic is only 0.03347. The probability value is 0.9918. This is very high. The null hypothesis cannot be rejected. It suggests that movements in the NIFTY 50 do not help in predicting the EURO STOXX 50. This creates an asymmetric relationship. The influence runs in one direction. The Indian market responds to developments in Europe. However, the reverse effect is not visible. Such a pattern is often observed in global finance. Developed markets tend to transmit information. Emerging markets tend to absorb it.

## VI. CONCLUSION AND IMPLICATIONS

This study explores the linkage between the NIFTY 50 and the EURO STOXX 50. The objective is to understand how the Indian and European markets interact. Such analysis becomes relevant in the context of financial globalisation. The growing role of foreign investors also makes this issue important. Both long-run and short-run dynamics are

examined using standard econometric tools. The analysis begins with the basic time-series properties. Stationarity is checked first. The ADF and PP tests are applied. Results show that both series are non-stationary at the level. After first differencing, the series becomes stationary. This confirms that both variables are integrated of order one. This step is necessary before testing long-run relationships. The Johansen test is then applied. Both trace and maximum eigenvalue statistics are considered. The results do not support the presence of cointegration. No long-run equilibrium relationship is found between the two indices. It suggests that, even as global linkages increase, the two markets do not move together in the long term. The short-run results provide a different insight. Granger causality is tested. Evidence of causality is found from the European market to the Indian market. The reverse direction is not supported. This indicates a one-way flow of information. The Indian market responds to developments in Europe. However, the European market remains unaffected by Indian movements. These findings have useful implications. The absence of long-run integration suggests that domestic and regional factors still matter. Markets are not fully tied in equilibrium. At the same time, the short-run influence highlights the role of global signals. Emerging markets appear sensitive to developments in advanced economies. From an investment perspective, some diversification benefit may still exist. Since long-run integration is absent, risk can be reduced by spreading investments across regions. However, short-run linkages should not be ignored. Investors and policymakers need to track global market movements while analysing Indian market behaviour.

### DECLARATION STATEMENT

Some of the references cited are outdated, noted explicitly as [1], [9] and [18]. However, these works remain significant for the current study, as they are pioneering in their fields.

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