

Arbitrage Opportunities: Evidence from Indian Capital Market

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Abstract:

This study examines potential arbitrage opportunities between the Bombay Stock Exchange (BSE) and the National Stock Exchange of India (NSE) using a comparative analysis of 50 common-listed companies. Considered daily stock prices for the study period from 2021 to 2025 and these are evaluated by using 14 parameters which explains about comprehensive statistical and comparative analysis to evaluate the return behavior, risk characteristics, market relationship, price alignment and potential cross-exchange arbitrage opportunities between BSE and NSE. The Result shows that there is high market integration with a strong 0.812618 mean correlation. NSE showed higher average returns in 31 companies, while BSE exhibited greater volatility in 28. Potential Buy BSE/Sell NSE opportunities were identified in 40 companies, and the reverse in 10. Overall, the results confirm high market integration and efficiency, with limited cross-exchange differences reflecting market microstructure conditions and also provides useful implications for Broker, institutional traders, exchanges and securities-market regulators.

Keywords: Arbitrage, Market Efficiency, Risk, Return and stock exchanges.

1. Introduction

The Indian securities market has two major stock exchanges, the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). A considerable number of companies are listed on both BSE and NSE. and the same security is traded on two different stock exchanges; its quoted price may differ slightly at a given point in time. Such differences may be of interest to investors because, in theory, a trader may buy the security on the exchange offering the lower price and sell it on the exchange where the price is higher. This forms the basic principle of cross-exchange arbitrage. However, a difference in the quoted prices does not, by itself, confirm the existence of a practical arbitrage opportunity. Price differences between BSE and NSE may arise for many reasons which are related to market conditions. Liquidity, order flow, bid-ask spreads, transaction costs, settlement procedures, timing of trades, and differences in the reporting of closing prices can all contribute to temporary variations in prices. Hence, such differences need to be examined carefully before they are interpreted as economically relevant arbitrage signals. Market efficiency gave an important theoretical base for comparing prices across the two exchanges. Fama (1970) proposed that security prices incorporate the information available to market participants. When the same security is traded efficiently across two markets, large and persistent price differences would generally be difficult to sustain. Whenever a difference occurs, traders may attempt to purchase the security in the lower-priced market and sell it in the higher-priced market. Such transactions can put pressure on the prices and may contribute to reducing the difference between the two markets. Price discovery is also relevant when the same security is traded on multiple stock exchanges. Hasbrouck (1995) said that different trading venues may contribute differently to the process through which market prices incorporate information. Variations in trading activity, liquidity and the speed of information adjustment may therefore affect the manner in which prices move across exchanges. In this context, the present study examines 50 common-listed companies on BSE and NSE for the period 2021–2025. 14 statistical parameters are considered to compare return behavior, volatility, distribution characteristics, systematic risk, correlation and price levels across the two exchanges. instead of depending on a single statistical measure, the study uses a combination of measures to obtain a broader understanding of the similarities and differences between BSE and NSE. The study gives particular attention to distinguishing an observed statistical difference in prices from a potential arbitrage opportunity. A price difference may indicate a

trading signal, but its practical significance depends on market frictions such as transaction costs, liquidity, bid–ask spreads and settlement-related factors. Therefore, the observed differences are interpreted cautiously rather than being treated as evidence of guaranteed trading gains. The study provides stock-level evidence on the relationship between BSE and NSE and offers a comparative assessment of their return and risk characteristics. At the same time, it examines whether differences in quoted prices across the two exchanges indicate potential cross-exchange trading opportunities after considering the practical conditions of the market.

2. Literature Review

The study of financial market behavior has developed around the ideas of market efficiency, price discovery, market microstructure and arbitrage. Mandelbrot (1963) drew attention to the fact that financial returns do not always follow a normal distribution. Large price movements and extreme observations are common features of financial data, making the study of volatility and distributional characteristics important in financial-market research. Fama (1970) proposed the Efficient Market Hypothesis (EMH), according to which security prices reflect available information. From the perspective of securities traded on more than one exchange, the theory suggests that persistent and significant price differences should be difficult to maintain because market participants can respond to such differences. Black (1986) discussed the effect of market noise and noise traders on security prices. His work suggests that prices can move away from their fundamental values for short periods because of trading behaviour and differences in information. Such temporary deviations are relevant when studying price differences between exchanges. Hasbrouck (1995) examined price discovery when the same security is traded in different markets. The study showed that the contribution of individual trading venues can differ depending on trading activity and the flow of information. This provides a useful basis for comparing BSE and NSE because both exchanges trade many of the same securities. Market microstructure also helps explain why prices may not be exactly identical across trading venues. Harris (2003) highlighted the importance of factors such as market liquidity, bid–ask spreads, order execution and market depth. These factors can result in short-lived price differences and therefore need to be considered when studying practical arbitrage. Ghadhab and Hellara (2015) examined price deviations in cross-listed securities and reported that differences between markets can occur even when the underlying security is the same. Their work also stressed that transaction costs should be taken into account before considering such differences to be genuine arbitrage opportunities. Ghadhab (2018) further showed that liquidity conditions can change around arbitrage events, suggesting that the size and persistence of price differences may depend on market conditions. Research on the Indian securities market has also considered the development of electronic trading and the changing structure of Indian exchanges. Thomas (1998) discussed the development of the Indian securities market and the increasing importance of electronic trading. Shah and Thomas (2000) compared the trading structures of the BSE and NSE and noted the rapid development of the NSE's automated order-driven system and the increasing concentration of liquidity on the exchange. Chander and Mehta (2007) studied market anomalies in India and found that some arbitrage-related opportunities changed following the introduction of rolling settlement. Their findings indicate that institutional and settlement changes can influence the nature of arbitrage opportunities. Ghosh, Ghosh and Bhatnagar (2010) examined differences in the valuation of securities across markets and highlighted the possibility of arbitrage when the same underlying asset is valued differently. Kumar and Malhotra (2012) specifically examined BSE and NSE stocks and identified price differences between the two exchanges. They also pointed out that transaction costs and other market frictions affect the practical significance of these differences. Sinha, Ghosh and Chatterjee (2013) examined BSE and NSE securities using trading information and considered the role of informed and noise traders in price formation. Nath and Verma (2003) reported a strong long-term relationship between the BSE Sensex and NSE Nifty, indicating close integration between the two major Indian markets. More recent studies have continued to examine efficiency and statistical arbitrage in Indian financial markets. Jain et al. (2020) investigated weak-form efficiency using BSE and NSE index data and reported evidence of inefficiency in some aspects of the market. Aggarwal and Aggarwal (2021) investigated statistical arbitrage opportunities in Indian stock futures using pairs-trading techniques. Their findings show how statistical methods can be used to identify relative price movements. Yadav and Hegde (2021) examined arbitrage pricing theory and its relevance in modelling the market. Their study considered the role of asset pricing theory in explaining stock returns. Jugu and

Amodu (2024) compared the Capital Asset Pricing Model and Arbitrage Pricing Theory for explaining stock returns. Their findings suggested that the assumptions of the standard model may not always represent actual market conditions and that Arbitrage Pricing Theory can provide an alternative approach to explaining stock returns. Mwange, Noombo and Kapulu (2024) reviewed the relevance of the arbitrage pricing model in identifying potentially mispriced securities and assessing risk. Their work also pointed to the importance of selecting appropriate factors when applying the model. Overall, previous studies provide evidence concerning market efficiency, liquidity, price discovery and arbitrage. However, many studies have focused on a particular measure, such as price spreads, cointegration or market efficiency. The present study takes a broader approach by comparing fifty common-listed companies using fourteen statistical parameters covering return, risk, distribution characteristics, systematic risk, correlation and direct price differences. This approach provides a wider picture of the relationship between BSE and NSE and the potential arbitrage signals arising from differences in their prices.

3. Methodology

A quantitative, descriptive and comparative research design was used to examine the same fifty common-listed securities across BSE and NSE. The study uses secondary market data and compares the two Exchanges on an identical company basis.

3.1 Data Source and Sample Selection

The sample comprises fifty companies traded on both BSE and NSE. The analysis uses daily observations for the five-year period 2021–2025. The same observation framework is applied to both exchanges so that the resulting differences represent cross-exchange differences rather than differences in sample composition.

3.2 Statistical Measures or Tools

Table 2: Statistical Parameters and Their Measurement

Parameter	Measurement	Formula / Calculation
Average Return	Arithmetic mean of the periodic return series.	$\bar{R} = \frac{\sum_{i=1}^n R_i}{n}$
Log Return	Natural logarithm of the ratio of successive prices.	$LR_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$
Standard Deviation	Measures dispersion or volatility of returns.	$SD = \sqrt{\frac{\sum (R_i - \bar{R})^2}{n - 1}}$
Variance	Square of standard deviation; measures return dispersion.	$Variance = \frac{\sum (R_i - \bar{R})^2}{n - 1}$ $= SD^2$
Beta	Measures systematic sensitivity relative to the benchmark.	$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)}$
Kurtosis	Measures the degree of tail thickness of the return distribution.	$K = \frac{\frac{1}{n} \sum (R_i - \bar{R})^4}{\left[\frac{1}{n} \sum (R_i - \bar{R})^2\right]^2}$
Skewness	Measures asymmetry of the return distribution.	$S = \frac{\frac{1}{n} \sum (R_i - \bar{R})^3}{\left[\frac{1}{n} \sum (R_i - \bar{R})^2\right]^{3/2}}$
Median	Middle value of the ordered return observations.	Median = middle observation after arra

Range	Difference between maximum and minimum return.	$\text{Range} = R_{\max} - R_{\min}$
Q1 / Q3	25th and 75th percentile return thresholds.	$Q1 = P_{25}; Q3 = P_{75}$
Correlation	Measures linear co-movement between BSE and NSE return series.	$r_{BN} = \frac{\text{Cov}(R_B, R_N)}{\sigma_B \sigma_N}$
Coefficient of Variation	Measures standard deviation relative to mean return.	$(CV = \frac{\text{SD}}{\text{Mean}})$
Price Arbitrage Opportunity	BSE–NSE price difference used to identify the lower-price venue and potential buy/sell direction.	$\text{Price Difference} = P_{\text{BSE}} - P_{\text{NSE}}$
Price Spread (%)	Measures the BSE–NSE price difference as a percentage of the reference price.	$(\text{Spread}\% = \frac{\text{Price Difference}}{\text{Reference Price}} \times 100)$

3.4. Analytical Framework

The analysis proceeds from descriptive statistics to direct cross-exchange comparison. Aggregate means and company counts are used to identify the direction of differences. The correlation measure is used to assess overall co-movement. Price differences are then examined separately because a return or volatility difference does not itself constitute arbitrage.

For data analyses Software Used ← Advance Excel + SPSS

4. Results

The empirical results demonstrate close alignment between BSE and NSE across the sampled companies. The aggregate results are summarized below

Table 1: Overall Summary of the Fourteen Parameters

Parameter	BSE Mean	NSE Mean	Mean Difference	BSE>N SE	NSE>B SE	Equal	Insight
Average Return	-0.000441	-0.000440	-0.000001	19.0	31.0	0.0	NSE exhibits marginally higher average returns in 62% of sample firms.
Log Return	-0.000707	-0.000706	-0.000001	17.0	33.0	0.0	Continuous returns confirm slight NSE return efficiency advantage.

Standard Deviation (σ)	0.023575	0.023564	0.000011	28.0	22.0	0.0	BSE displays marginally higher daily volatility in 56% of companies.
Variance (σ^2)	0.000789	0.000789	0.000001	28.0	22.0	0.0	Consistent variance alignment with standard deviation trends.
Beta (β)	0.812768	1.000000	-0.187232	11.0	39.0	0.0	NSE baseline at $\beta = 1.00$; BSE shows lower systemic elasticity.
Kurtosis (κ)	171.470200	171.439200	0.031049	28.0	22.0	0.0	Extreme leptokurtic structure ($\kappa \gg 3.0$) highlighting major tail risks.
Skewness (γ_1)	5.400813	5.404702	-0.003889	15.0	35.0	0.0	Strongly right-skewed return distributions across both trading platforms.
Median Return	-0.000473	-0.000474	0.000000	25.0	25.0	0.0	Perfect 50/50 split in central median values across execution venues.
Range	0.510086	0.510008	0.000078	25.0	25.0	0.0	Symmetric return range

							distribution (0.5101 return spread average).
Quartile 1 (Q1)	- 0.009411	- 0.009393	- 0.000018	24.0	26.0	0.0	Downside 25th percentile threshold slightly lower on BSE platform.
Quartile 3 (Q3)	0.008193	0.008198	- 0.000005	23.0	27.0	0.0	Upside 75th percentile threshold slightly higher on NSE platform.
Coeff. of Correlation (COC)	0.812618	0.812618	0.000000	0.0	0.0	50.0	Perfect uniform co-integration ($r = 0.812618$) across all 50 securities.
Coeff. of Variation (CV)	249.400600	228.707900	20.692700	21.0	29.0	0.0	BSE exhibits higher volatility per unit return, reflecting lower liquidity.
Price Arbitrage (PAO ₹)	₹2544.61	₹2544.35	+₹0.2636	10.0	40.0	0.0	Mean price premium of ₹0.26 on BSE; 40 stocks favor 'Buy BSE / Sell NSE'.

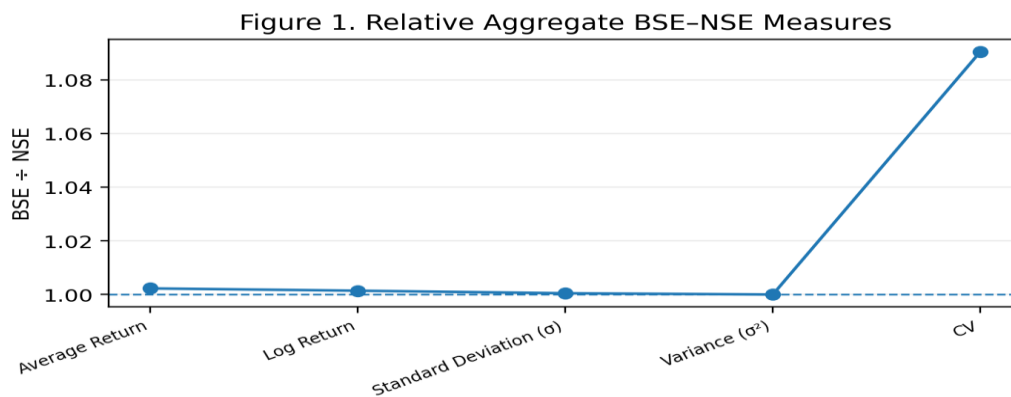


Figure 1: Relative Aggregate BSE–NSE Measures

5. Discussion of Results

The results show that BSE and NSE are closely connected and behave similarly for the selected companies. The high correlation indicates that there is a significant movement between the two exchanges, and returns, median pr5. 5. quartiles, and price ranges are generally comparable. This suggests that information is quickly reflected in prices, leaving limited scope for price differences. Although NSE confirms slightly higher average returns in 31 companies and higher log returns in 33 companies, these differences are very less and cannot be considered a regular source of higher returns. After considering transaction costs and trading expenses, such differences may have little practical value. BSE shows slightly higher volatility and variance in many companies, indicating that there is a somewhat greater price fluctuation. The high kurtosis and skewness also suggest that returns are not normally distributed and that unusual price movements or extreme returns may occur. The price comparison finds 40 companies are potential to at Buy BSE/Sell at NSE direction. However, it indicates that there is Arbitrage Opportunity between the exchanges but this does not mean that risk-free profit can be earned.

6. Conclusion

This study provides a multi-parameter comparison of 50 common-listed companies across BSE and NSE. The evidence indicates that the two exchanges are strongly integrated at the return level, with slight differences in central tendency and dispersion and a mean correlation of 0.812618. At the same time, comparable price differences exist and the dataset identifies more potential to Buy at BSE/Sell at NSE and the vice - versa. The central conclusion is that market integration and small price differences can coexist.

7. Implications

The results give the importance of transparent price discovery, efficient trading infrastructure, investor education and cross-venue monitoring to capital market stakeholders. For researchers, the study provides a foundation for future work using intraday executable prices and formal econometric tests of price discovery and cointegration. For institutional traders, the results suggest that cross-exchange signals may be useful for screening, but the signal should be combined with liquidity, bid–ask and transaction-cost filters before execution. For exchanges and regulators, close price alignment is consistent with effective competition, while persistent outliers can be monitored as potential market-quality indicators.

8. Future Scope

The 14-parameter structure can be extended to sector-wise analysis, market-regime comparisons, intraday price discovery, liquidity-adjusted arbitrage and transaction-cost-adjusted net returns. Such extensions would improve the distinction between statistical arbitrage signals and economically realizable trading profits.

9. References

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