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Examining the Impact of Ex-Dividend on Cash and Carry Spread Dynamics in Nifty 50 Stocks: An Event Study

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Abstract

The study analyses the impact of ex-dividend date on cash and carry spread for the Nifty-50 companies in India for the period spanning 2009 to 2024. The event study is applied to appraise the statistical significance of dividend arbitrage for equity and futures spread for the same underlying of Nifty-50 companies. The study analyzes the impact of ex-dividend dates on cash-and-carry spread using a 10-day pre-event window and 05-day pre-event window to anticipate significant price changes in both equity and futures segment. The results indicate that early spotting of the spread allows retail investors to create the spot-futures spread position to capitalize on the short-term price differential and exit the spread position, as the ex-dividend date approaches. The study provides actionable insights for Portfolio managers, investors and arbitrageurs to optimize trading strategies and applied finance knowledge in emerging markets. This study extends existing research on ex-dividend effects by examining their influence on cash-and-carry spread dynamics and arbitrage opportunities in the Indian spot-futures market.

JEL Classification: J16, J31, O17

Keywords: Ex-Dividend, Event Study, Cash and Carry, Arbitrage, Nifty-50

Análisis del impacto del ex dividendo en la dinámica del diferencial de *cash and carry* en las acciones del índice Nifty 50: un estudio de eventos

Resumen

Este estudio analiza el efecto de las fechas ex dividendo sobre los diferenciales de efectivo y carry de las empresas que integran el índice Nifty-50 de India durante el período 2009–2024. Mediante una metodología de estudio de eventos, se evalúan las oportunidades de arbitraje entre los mercados al contado y de futuros utilizando ventanas de análisis de 10 y 5 días previas a la fecha ex dividendo. Los resultados muestran que la identificación temprana de cambios en los diferenciales permite aprovechar oportunidades de arbitraje de corto plazo antes de la fecha ex dividendo. Los hallazgos aportan evidencia útil para inversionistas, gestores de cartera y arbitrajistas interesados en optimizar sus estrategias de negociación en mercados emergentes. Asimismo, el estudio amplía la literatura sobre los efectos ex dividendo al examinar su impacto en la dinámica de los diferenciales entre los mercados al contado y de futuros.

Clasificación JEL: J16, J31, O17.

Palabras clave: Ex dividendo, Estudio de eventos, Cash and Carry, Arbitraje, Nifty-50.

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1. Introduction

The Indian stock market is showing consistent and gradual growth due to adoption of innovative market practices and robust regulatory frameworks (Sharma & Gupta, 2025). Enhanced transparency and liquidity within Indian equity markets have stimulated increased participation from both retail and institutional investors. In today's rapidly evolving financial landscape, investors are looking for transformative strategies that can maximize the portfolio returns with minimal risk. Event-driven strategies can help the investors to innovate strategies for attaining short term riskless returns. Among such crucial events, ex-dividend date plays a prominent role, influencing the equity as well as futures prices of the same underlying (Yang et al., 2024).

Ex-dividend date (ex-date) is the date when the stock price trades without the value of its next declared dividend. The spot price of the company drops by the declared amount of the dividend on the ex-dividend date, but futures prices may fail to fully adjust the corresponding drop in spot prices of underlying shares leading to short-term price discrepancies (Chanachaivorakorn, 2021). As the investors are not entitled to the amount of the dividend after the ex-date, the ex-date is crucial in understanding about the impact of the dividend on the spot and futures prices (Dhika & Dewi, 2024).

The advent of quantum computing and machine learning in capital markets has further intensified the market reactions, speed and investors' perception, necessitated the need to shift from traditional direction-based trades to innovative and sophisticated strategies such as cash and carry arbitrage (Zhou, 2025). The cash and carry spread, defined by the price differential between the futures prices and spot prices of the same underlying, often exhibits observable price fluctuations from the dividend announcement date to the ex-dividend date. Such price fluctuations are exploited by arbitrageurs through cash and carry arbitrage to enhance portfolio yields, as spreads gradually contract toward theoretical parity (Tran, 2024).

Recent academic research repeatedly validates that ex-dividend events induce price volatility leading to abnormal returns and enhanced yield, as measured using event study methodologies across various event windows. Price discovery process, price adjustments and market microstructure attributed to heightened volatility, which in turn generates short term abnormal returns that help in appraising potential arbitrage opportunities (Karam, 2025). Building on this supporting evidence of heightened ex-dividend volatility and potential arbitrage opportunities, the present study intends to study the impact of ex-dividend on arbitrage and portfolio returns with special reference to Indian stock market.

The Indian stock market is represented by the Nifty-50 index, that serves as a benchmark for the Indian economy and provides a comprehensive insight into ex-dividend analysis. It reflects economic stability through its selection of the 50 largest, most liquid companies by free-float market capitalization, representing diverse sectors and offering an exhaustive view of the overall stock market's health and prevailing investor sentiment (Sharma, 2025).

The existing literature highlights two primary gaps in understanding the impact of ex-dividend events on cash and carry spread dynamics in Nifty-50 stocks. First, while the existing research has thoroughly analyzed the spot price volatility and cumulative abnormal spot returns on and around ex-dividend dates, the impact of price fluctuations on the spot-futures spread arbitrage is not studied and remains unexplored across different constituents within a major index like the

Nifty-50. Second, the impact of different pre-event windows on spread behavior has not been sufficiently examined to divulge comprehensive arbitrage dynamics.

Based on the above gaps, this study is being done to primarily answer two questions:

1) To examine the impact of ex-dividend on cash and carry spread in Indian stock market.

2) To investigate how different pre-event windows influence the cash and carry spread for enhanced portfolio returns.

This study extends the prior work by addressing the complex relationship between spot prices, futures prices and ex-dividend dates to analyze the impact of different pre-event windows on cash and carry spread. Institutional investors as well as retail investors can deploy different spread strategies to attain enhanced returns because of fair price discovery between spot and futures prices.

2. Literature Review

The literature on ex- dividend and the effects of volatility on market responses to dividend announcements and payments has been studied at international level and it is very much sporadic at the Indian level. The previous studies seldom talk about the impact of ex-dividend on cash and carry spread. The existing literature has not been able to cater to the actionable arbitrage strategies arising out of the ex-dividend price differential in equity and derivates segment of the same underlying. As the price differential in the stocks and futures segment on the ex-dividend day does not fully reflect the price drop and such price discrepancies are being captured by the trader to earn higher investment returns (Tran, 2024), there is an urgent need to study the impact of ex-dividend day volatility on the cash futures spread dynamics. The current study seeks to analyze the previous foundations from prior research, organizing the ex-dividend into three themes: volatility, price discover and arbitrage.

2.1. Ex-dividend and Price Volatility

Rawat & Jessica (2016) examines the abnormal equity returns on and around ex-dividend date for Nifty-50 constituents and thereby focusses on capturing abnormal returns (AR) and cumulative abnormal returns (CAAR) to infer the impact of dividend announcements on shareholder wealth. The present study extends this line of research by simultaneously examining the spot and futures markets to investigate how ex-dividend dates affect cash and carry arbitrage opportunities in Nifty-50 stocks. As ex-dividend dates are shown to generate volatility in both spot prices and derivative prices Woolridge (1983), underscoring the need to study the spot and derivatives markets simultaneously rather than spot prices alone.

Barclay (1987) emphasized that the cost of carry model attributes both the stock price volatility and the corresponding spread contraction to the announced dividend on the ex-date (Booth & Johnston, 1984; Brown & Walter, 1986). The cost of carry model experiences certain deviations from the stated model known as anomaly, especially in emerging markets and researchers have used different models like advanced event studies proposed by Borusyak et al. (2024), to overcome these anomalies and ultimately check for biases in the calculated returns. Anomalies are also being observed by the different studies that challenged the pre-existing tax-clientele model, validating the fact that the size of the dividend impact volatility and ex-day returns

(Jakob & Ma, 2007). Kumari et al. (2024) and Masha (2025) employed the event study methodology to exhibit the price volatility in the stocks and futures segment on the ex-dividend day, leading to market inefficiencies, volatile prices and price adjustments surrounding the pre-event window. The Indian market is associated with volatility (Ramírez-Silva et al., 2018) and estimation window is of utmost importance in event studies to measure the accuracy of the results (Miller, 2023). The expectancy of regular income in the form of dividends by the investors can lead to price surge and in turn high volatility and the investor sentiment also have an impact on ex-day dividend returns (Paudel et al., 2022).

Empirical observation, as observed by Chivukula & Babu (2019) shows investors optimism about dividend expectancy, price volatility and short-term abnormal returns following dividend declarations to dividend going ex. The similar kind of significant abnormal returns driven by price volatility are observed in other emerging markets like Chile, reflecting investors behavior patterns that enhance portfolio returns (Gregoire & Marcet, 2014). Distinctive ex-day price behavior in Japan, observed by positive abnormal returns, arises partly from uncertain dividend amounts and delayed ex-dividend dates (Hayashi & Jagannathan, 1990). The duration of settlement days and retail penetration level in China impacted the investor speculation, leading to smaller price drops in relation to dividend amount (Chen et al., 2009).

2.2. Ex-dividend and Price Discovery

The ex-dividend day behavior of stock prices has been extensively studied across global markets, with research focusing on spot price adjustments, governance practices, market microstructure, and investor behavior (Mongrut Montalvan et al., 2023). The present study shifts the lens from dividend information to pricing efficiency within the integrated cash–futures market, examining how expected dividends contribute to the contraction of the spot–futures spread as the ex-dividend date approaches. The investor expectancy of returns due to the dividend announcement has seen a mark wide shift after the abolition of DDT (Dividend Distribution Tax), optimizing dividend spread strategies (Rantapuska, 2008) and getting higher short-term returns through efficient price discovery around ex-dividend dates (Blau et al., 2011).

The smaller ticks between the bid-ask prices as observed in Oman's market can lead to reduced price drop deviations, paving the way for informed market efficiency and higher trading volumes (Al-Yahyaee, 2013). Higher trading volumes on exchanges have an impact on liquidity Cox et al. (2024), whereas machine learning model predictions on price movements on the ex-dividend day creates price disequilibrium for the short-term. Spot and futures price discovery is crucial for efficient corporate action adjustments and price equilibrium, enabling investors to achieve higher annualized yields (Theissen, 2016). Efficient price discovery between the spot and futures markets is commonly observed in developed economies, where well-functioning financial systems replicate ex-day price adjustments within specific event windows (Saha et al., 2021). The integration of advanced tools with localized market behavior can further enhance the evolution of the financial landscape, leading to efficient price discovery and improved cash and carry arbitrage (Borusyak et al., 2024).

2.3. Ex-dividend and Arbitrage

The use of advanced tools such as algorithmic trading (Saha et al., 2021), cross-border comparisons for developing economies (Kadapakkam, 2000), and the impact of regulatory maneuvering on ex-dividend day stock price behavior create opportunities for innovative intraday and short-term arbitrage strategies (Cox et al., 2024). The speculative behavior of investors can lead to surge in prices post ex day due to higher short selling on the pretext of dividend payment expectancy (Tran, 2017). Blau et al. (2011) observed that the price surge on ex-dividend day can be attributed to short selling, making arbitrageurs more active to exploit price discrepancies. The speculation around ex-dividend dates and gap between dividend announcements and payment dates drive ex-day returns, creating prolonged arbitrage windows (Liu et al., 2016).

As the event draws closer, heightened volatility and increased trading volumes contribute to the narrowing of spreads, enabling investors to capitalize on mispricing between equities and futures and rapidly secure available arbitrage profits for enhanced portfolio performance (Basak & Pavlova, 2013). Sasikumar & Sundaram (2024) emphasized the gradual and advanced use of event studies to analyze the impact of corporate actions on equity prices and arbitrage opportunities but it falls short as far as the emerging markets are concerned. The ex-dividend stock adjustments and cash-and-carry spread exhibit a negative relationship amongst equity and derivative prices of the same underlying, as the ex-date approaches (Gao et al., 2024). The low liquidity and sound arbitrage practices can be attributed to negative ex-day returns on the ex-dividend date as observed in Mexico (Kadapakkam & Martinez, 2008).

The regulatory reforms and transformative post-pandemic transparency has made Indian market more robust, enabling effective cash-and-carry spread arbitrage opportunities (Fattouh et al., 2021). The Indian market witnessed the shortened returns window with India's shift to T+1 settlement in 2023 and that ultimately lead to compressed equity derivative spread arbitrage, echoing the similar compressed returns in Oman with tick size reductions in bid-ask spread (Al-Yahyaee, 2013). The similar shortened ex-dividend day arbitrage window due to decimalization is experienced in United States by Graham et al. (2003), validating the fact that dividend impact on prices got over after the post ex-dividend event. Strong corporate governance practices and exigencies like pandemic necessitated the need for timely dividend disclosures, enabling advanced and adaptive arbitrage models to conquer the complex cash-and -carry spread (Paudel et al., 2022). Efficient corporate governance practices as exhibited in Peruvian markets mitigate agency costs from concentrated ownership, stabilize dividend payouts and thereby gradually enhance short-term returns on and around the event days for reliable arbitrage opportunities (Mongrut Montalvan et al., 2017).

Drawing on the prior conclusions of heightened ex-dividend price volatility and extending the event study methodology to study the cash and carry spread dynamics, the study contributes to evaluate the spot-futures price volatility and arbitrage feasibility in the Indian stock markets. This research is not only an extension of the previous studies on dividend-related stock price volatility but adds substantially to the existing literature by analyzing the impact of event driven strategies on cash and carry arbitrage in the respective constituents of liquid and representative index such as Nifty-50. The literature attempts to analyze the stock market reaction to ex-dividend arbitrage for enhanced portfolio returns.

3. Theoretical Framework

The cash and carry arbitrage exploits the deviations from the cost of carry model, where fair futures price equals the spot price adjusted for financing costs and dividends: $F_t = (S_t - PV(D))e^{rT}$ with cash and carry spread $S_0 e^{rT} - F_0$ theoretically becomes zero in frictionless conditions (Hull & Basu, 2016). Here, S_t is the spot price, $PV(D) = De^{-r\tau}$ is the present value of the discrete dividend D (with τ as days to ex-date), r is the risk-free rate, and T is time to futures expiry. Ex-dividend dates create friction and disrupt parity, as spot prices drop by the dividend amount while futures prices cannot replicate this adjustment instantaneously, thereby theoretically widening the spread $F_t - S_t$ (Marais, 2016). Such spread widening creates arbitrage opportunities for investors to exploit deviations and, in turn, attain enhanced portfolio yields (Shleifer & Vishny, 1997).

3.1. Research Methodology

To examine the impact of ex-dividend dates on the cash and carry spread of Nifty-50 companies, this study analyzes the daily cash and carry spreads of the constituent stocks of the Nifty-50 index. The data used in this study comprises equity closing prices and futures closing prices for constituent stocks of the Nifty-50 index, collected from the National Stock Exchange of India (NSE) website for the period spanning 2009 to 2024. There are two major and oldest indexes, namely NIFTY-50 from National Stock Exchange of India (NSE) and Sensex from Bombay Stock Exchange of India (BSE), which are to be considered for this study (Mishra & Gupta, 2022).

Since the study considers the impact of ex-date on cash and carry spread, the Nifty-50 index is selected because the National Stock Exchange of India (NSE) Futures and Options (F&O) segment is more technologically advanced compared to the Bombay Stock Exchange of India (BSE) Sensex (Jecinth & Ghosh, n.d.). The study selects the Nifty-50 index, given its significantly higher daily turnover compared to the Sensex, to effectively capture the complexities involved in both equities and futures trading of the same underlying assets within a single index (Paientko & Pundir, 2024). It represents approximately 65% of the free float market capitalization of the stocks listed on the National Stock Exchange of India (NSE), making it a comprehensive representation of the Indian equity market (Das & Epi, 2022). This approach allows for a more comprehensive analysis of the dynamics between spot and derivative markets in a highly liquid environment.

As the Nifty-50 index adopted free-float market capitalization methodology from June 26, 2009, the study's time frame was defined post June 2009. The time period from 2009 to 2024 covers the major economic transitions like global financial meltdown aftermaths, multiple recessionary instances and external exigencies like Covid-19, inherently captures the market turmoil, multiple shocks and recovery phases to assess the impact of corporate actions, especially ex-dividend on cash and carry spread dynamics.

Descriptive statistics are calculated for the 05-day and 10-day cash and carry spread data to encapsulate their central tendency, dispersion and distributional shape (mean, median, standard deviation, skewness, kurtosis and sample size). These summary statistics provide an initial premise of spread behavior around ex dividend dates and pave the way for the application of event study analysis to examine pre-event spread dynamics.

Event study framework has been widely employed by the researchers to appraise the impact of arbitrage opportunities and macroeconomic events on stock markets, yielding empirical novel insights that facilitate further analysis (Rochimah & Yuliana, 2025). Consistent with existing literature, the 10-day and 05-day pre-event windows surrounding the ex-dividend date are analyzed to examine changes in the cash-and-carry spread.

3.2. Event Study Approach

The event study methodology is applied, which is widely accepted in financial research for analyzing the impact of specific events on market variables (MacKinlay, 1997). Following the established event study methodology in finance literature (Campbell et al., 1998), the event window is defined of 11 days and 06 days surrounding the ex-dividend date: 10 days prior to the ex-dividend date (t = -10 to t = -1), the ex-dividend date itself (t = 0) as well as 05 days prior to the ex-dividend date (t = -05 to t = -1), the ex-dividend date itself (t = 0) respectively. The pre-event window captures any anticipatory adjustments in the cash and carry spread as the market prepares for the dividend payment. The post-event is not considered as the event itself got over on the ex-dividend date. The study examined the abnormal cash and carry spreads (ACCS) around the ex-dividend dates.

The cash and carry spread (CCS) known as Observed Spread quantifies the immediate difference between the futures price (F_t) and the spot price (S_t) at time t. It is calculated as:

$$Observed\ Spread = F_t - S_t$$

Where:

F_t is the futures price at time t

S_t is the spot price at time t

The Normal Spread establishes a baseline using historical data from a pre-event estimation period (e.g., 30 days before T_{-10}). It is computed as the average of daily spreads during this period:

$$\text{Normal Spread} = \frac{\sum_{t=-40}^{t=-11} \text{Spread}_t}{N}$$

Here, $N = 30$ days (from $t = -40$ to $t = -11$), ensuring the result represents typical market conditions unaffected by the event under study

The Abnormal Spread measures deviations from the Normal Spread during the event window. This metric isolates the impact of the event by filtering out inherent market trends captured in the Normal Spread. For each day t in the window:

$$\text{Abnormal Spread} = \text{Observed Spread} - \text{Normal Spread}$$

The Average Abnormal Spread (AAS) aggregates results across all days in the event window to identify systematic patterns:

$$AAS_t = \frac{1}{N}\sum_{i=1}^{N} (\text{Abnormal Spread}_{i,t})$$

Where N is the number of days of the event window.

Statistical Testing

To test whether the abnormal spreads are statistically significant, the standard deviation of abnormal spreads (SD_{AS}) is calculated and a t-test is used to check if AAS_t is significantly different from zero:

$$t = \frac{\overline{\text{Average Abnormal Spread}}}{SD_{AS}/\sqrt{N}}$$

The t-values are compared with critical values (e.g., ±1.96 for a 5% significance level) to determine statistical significance.

Given the theoretical relationship between dividends and futures pricing, it is expected that cash and carry spread to exhibit significant changes around the ex-dividend dates. The expected dividends are pre-empted by the futures market due to its forward-looking nature, leading to a gradual decline in futures pricing until the ex-date, whereas the adjustment in prices happens abruptly and all at once in the equity market on the ex-date (Hansson, 2021). Hence, the following null hypotheses is proposed:

H_0: Ex-dividend dates do not have a significant impact on the cash and carry spread of Nifty 50 stocks.

4. Methodology

4.1. Data Collection

Data on ex-dividend dates, spot prices, and futures prices were sourced from the National Stock Exchange (NSE) of India. The Nifty-50 equity spot and futures closing prices with respect to the dividend declaration and dividend ex-date were collected from nseindia.com. The cash and carry spread, also known as the basis or the futures premium, is the difference between the futures price and the spot price of the underlying asset. Microsoft Excel was employed for optimal data handling and statistical calculations through organized data entry, cleaning, alignment, and computation of spot-futures spread. The obtained spot-futures spread serves as a major component for the application of event study methodology to identify the effect of ex-dividend on cash and carry spread dynamics.

Arbitrage opportunities in financial markets are also influenced by the tax structure and other constraints such as leverage, trading fees, and short-selling, which have a significant impact on cash-and-carry spreads and reduce potential profits (Zhao, 2025). Trading fees and taxes, including brokerage commissions and Security Transaction Tax (STT), were excluded from the primary analysis to isolate pure price dynamics and theoretical cash and carry arbitrage spreads around ex-dividend events. These transaction costs are unique to retail and institutional traders, respectively, and vary across brokers and time periods, excluding from the standardized empirical observations over the 2009–2024 sample period.

5. Results and Discussion

The descriptive statistics were computed in Table 1 for the 05-day and 10-day cash and carry spread series to summarize their central tendency, dispersion and distributional properties. It indicates that cash and carry spreads are negative and highly volatile, with heavy tails and slight left skewness in both the 5 day and 10 day spread series.

Table 1. Descriptive Statistics of 05-day and 10-day cash and carry spreads around ex-dividend dates

Descriptive Statistics	05 Days	10 Days
Mean	-6.78492	-5.27083
Median	-2.9	-2.2
Mode	-0.25	-1.75
Standard Deviation	18.69375	18.2328
Sample Variance	349.4564	332.4349
Kurtosis	62.28192	53.67679
Skewness	-0.46947	-0.3413
Count	4585	9170

Source: Author's own elaboration

For the 05 day spreads, the mean is about −6.78 with a standard deviation of roughly 18.69 and very high kurtosis (≈62), while the 10 day spreads have a mean of about −5.27, a similar standard deviation (≈18.23) and still elevated kurtosis (≈54), but a larger sample size because each 10 day window produces more daily observations.

As the observation window moves closer to the ex-dividend date, the spreads exhibit lower means and medians and higher kurtosis, implying that spreads are relatively wider in the longer horizon (10 day) window and become more negative and more peaked in the shorter horizon (05 day) window.

These patterns suggest that cash and carry spreads tend to decline gradually as the ex-dividend date approaches. Building on these summary statistics of spread behavior, an event study framework was then employed to examine how cash and carry spreads evolve on and around ex-dividend dates.

The data is analyzed for a total of 1,247 ex-dividend events across the Nifty-50 constituents over the study period. The industry-wise breakup of the said ex-date events is provided in Table 2.

Table 2: Number of ex-date events by industry (2009-2024)

Sectors/Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Automobile and Auto Components	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	1
Chemicals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Construction													1	1	1	
Construction Materials	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
Consumer Durables	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Fast Moving Consumer Goods	3	3	3	3	3	3	4	4	5	5	5	5	5	5	5	3

Financial Services	1	5	6	6	6	6	7	7	8	7	8	3	9	10	10	2
Healthcare	2	4	4	4	4	5	5	5	5	4	4	4	5	5	5	1
Information Technology	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	3
Metals & Mining	3	4	4	4	4	4	3	4	3	3	3	3	3	3	4	
Oil Gas & Consumable Fuels	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	2
Power	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Services		1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Telecommunication		1	1	1	1	1	1	1	1	1		1		1	1	
Total	29	39	41	41	41	42	44	45	46	44	44	40	47	48	48	15

Source: Author's own elaboration

The substantial price adjustments observed in these pre-event windows are consistent with dividend-capture strategies (Girish, 2019). Table 3 suggests stronger effects are more pronounced in the longer pre-event period as compared to shorter pre-event period.

Table 3. P-value significance proportion for 10 days event Window and 05 days event Window

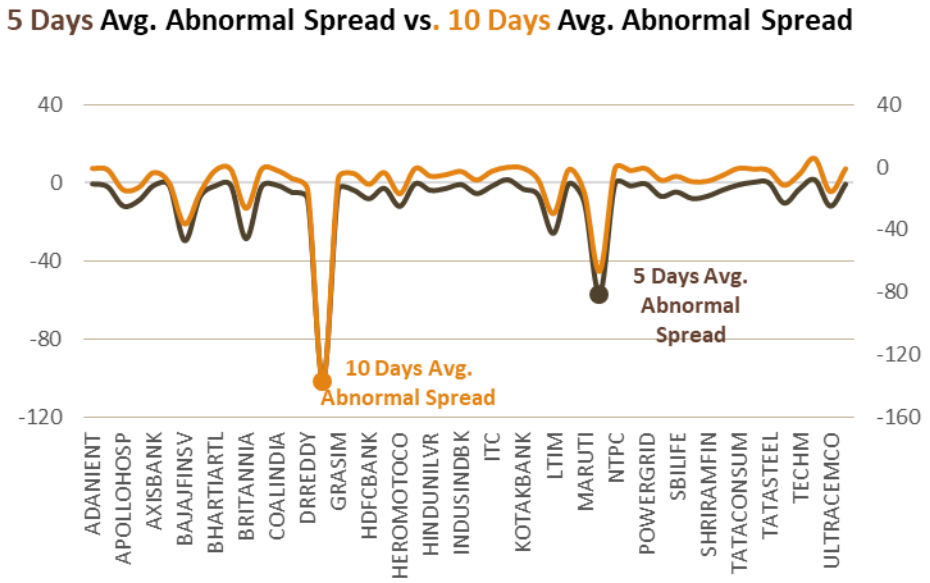
Pre-Event Window	Significant p-values ($p < 0.05$)	Proportion
10-day	794	85.1%
05-day	536	57.4%

Source: Author's own elaboration

The hypothesis is tested using pooled t-test at 95% confidence level. As the focus of the current study is on time durations (05-day and 10-day pre-event windows), the pooled t-test provides a robust framework for analyzing cross-sectional inferences from numerous ex-dividend events among Nifty-50 constituents.

With alternative event window specifications (-05/-10 days) and the corresponding OLS regression output (as presented in Table 4), the results confirm a gradual decline in spreads as the ex-date approaches. It has been observed that the high proportion (85.1%) of significant p-values lead to rejection of the null hypothesis (H_0) in the pre-event period. In the 10-day pre-event period, 794 of 933 observations (85.1%) resulted in statistically significant rejection of the null hypothesis ($p < 0.05$).

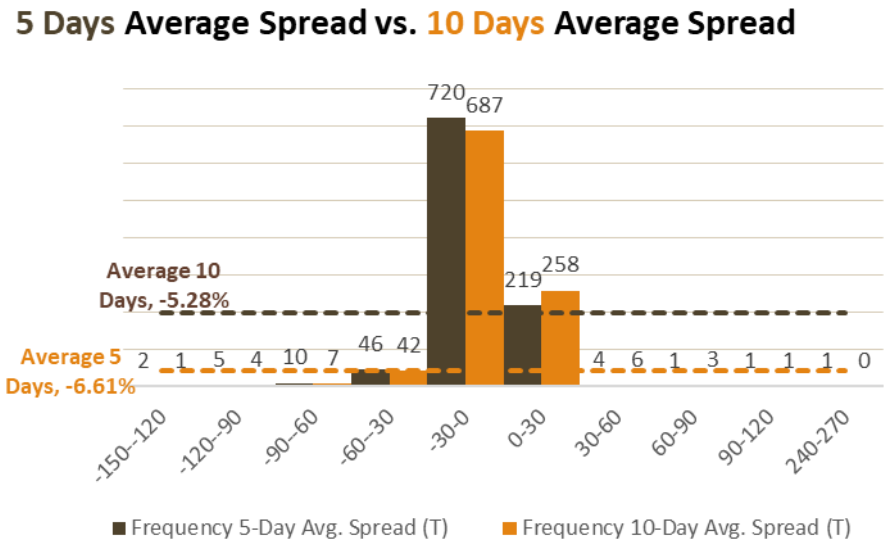
Figure 1. Abnormal Average Spread over the 05-Days and 10-Days Event Window



Source: Author's own elaboration

Figure 1 provides visual analysis of Average Abnormal Spreads (AAS) values that reveals spread compression from the 10-days to the 05-days estimation window. 96% of Nifty-50 firms exhibit negative AAS, confirming the gradual descent of the spread on and around ex-dividend dates. 86% of constituents demonstrate substantially greater compression over the 10-days versus 05-days pre-event windows, conforming to persistent arbitrage opportunity erosion.

Figure 2. Average Spread over the 05-Days and 10-Days Event Window



Source: Author's own elaboration

Figure 2 presents the distribution of 5-days and 10-days average spreads across Nifty-50 constituents, confirming the negative skewness for both windows (05-day mean=-6.61%; 10-day mean=-5.28%). The left-skewed histograms, peaking around -5% to -10%, reveal systematic spread compression, with the more negative 5-day mean indicating concentrated dividend capture trading closest to ex-dividend dates.

Table 4. Regression Results for Pre-Ex-Dividend Cash-Futures Spreads

Variable	Coefficient	SE	T-Stat
Intercept (5-day)	3.609***	0.324	11.15
Category (10-day)	1.110**	0.458	2.43
R^2 (Adj.) / N	0.0029 (0.0025) / 2,010		F=83.83***

Dependent variable: Cash-futures spread (Nifty 50). Category dummy = 1 (10-day pre-event), 0 (5-day). ***p<0.01, **p<0.05.

Source: Author's own elaboration

The OLS regression analysis supports the event study findings, indicating a wider spread in the longer pre-event window compared to the shorter pre-event window relative to the ex-dividend date (Kumar et al., 2024). Due to the pooled cross-sectional structure across discrete event windows, temporal anticipation effects on spreads were tested using a categorical dummy variable (1 = 10-day pre-event window, 0 = 5-day window). The regression results show a statistically significant positive effect of the categorical dummy variable on cash and carry spreads (β = 1.110, SE = 0.458, t = 2.426, p = 0.015). Early arbitrage positions are anticipated in the longer day pre-event window with highly significant F-statistic (83.83, df=1/2008), confirming the predictor's relevance across the 2010 observations. The results on early arbitrage buildup in the 10-day pre-event window are consistent with empirical findings in behavioral finance, particularly those related to pre-emptive trading and enhanced arbitrage activity (Ederington et al., 2017).

As investors begin creating positions by shorting futures and buying spot assets to benefit from wider spreads, the spread loses value due to embedded dividends as the ex-dividend date approaches (Usvajärvi, 2025). This dynamism is evident in the 10-day event window, where investors lock in wider spreads by establishing spot-futures positions, anticipating spread narrowing as the ex-date nears. These results align with the semi-strong form of market efficiency, where prices adjust to dividend information, enabling arbitrageurs to profit from pre-event spread anomalies (Lu & Xu, 2024). The results of the 10-day pooled t-test are listed in Table 6 in appendix.

The analysis has been done for the 05-day pre-event window (days -05 to 0) to understand the impact of spread deviations from 10-day pre-event window (days -10 to 0). It has been observed that the proportion (57.4%) of significant p-values lead to rejection of the null hypothesis (H_0) in the pre-event period. The decline in significant results from 85.1% (10-day) to 57.4% (05-day) aligns with theories of event-driven anticipation, to take the market positions well in advance to capture

the higher cash and carry spread in the longer duration period and subsequently make enhanced profit with the gradual decline of the cash and carry spread as the event draws nearer to the event day. The observed decline in the proportion of significant cash-and-carry spreads follows the pattern established in academic research, where arbitrageurs and investors exploit price anomalies in equities and their corresponding futures prior to price convergence, thereby earning riskless profits and improving portfolio returns (Fung & Tse, 2008). The results of the 05-day pooled t-test are listed in Table 7 in appendix.

The longer pre-event window, characterized by pre-emptive trading and persistent spread widening, fails to incorporate the immediate impact of dividend announcements into prices, leading to semi-strong form market inefficiencies in Nifty-50 cash-futures integration (Krishnan & Periasamy, 2022). This aligns with the limits-to-arbitrage theory, wherein security mispricing and irrational trading dominate, creating price discovery anomalies despite theoretical efficiency (Shleifer & Vishny, 1997). As stock markets attempt to achieve efficient price discovery between spot and futures prices near the ex-date, early arbitrage buildup disrupts the cash-and-carry equilibrium, confirming the significant impact of ex-dividend events on cash-and-carry spreads.

5.2. Comparative Analysis for Ex-Dividend cash and carry spread across developed and emerging markets

Table 5. Ex-dividend cash and carry spread convergence and diversion across the world

Market Type	Markets (Example)	Settlement Cycle	Spread Convergence	Market Size for Ex-Dividend Arbitrage	Spread Deviation (%)
Developed	US (NYSE/CME), Europe (Eurex)	T+1 (US since 2024), T+2 (EU to T+1 by 2027)	Instant (1-2 days)	Enhanced spread arbitrage opportunities with higher volumes and higher liquidity.	<1
Emerging (India)	NSE India	T+1 (full since 2023), optional T+0	Gradual (5-10 days)	Diverse, evolving, inter arbitrage and intra arbitrage opportunities available within India.	1-3
Emerging Peers	Brazil (B3), China (SSE/SZSE)	T+2 (Brazil), T+0/T+1 (China bonds/equity)	Slow (10+ days)	Complex regulations with respect to machine and algo trading, restricting arbitrage opportunities with smaller size of the market.	2-4

Source: Author's own elaboration

Table 5 provides a comparative analysis of rolling settlement cycles, market size, and spread convergence and divergence for ex-dividend arbitrage across developed and emerging markets.

India's regulatory reforms in terms of rolling settlement cycles and surging derivatives volumes have enhanced arbitrage opportunities. Although regulatory taxes have risen, developed markets exhibit smaller spreads due to higher trading volumes and market penetration (Ansotegui et al., 2013). Semi-strong efficiency in emerging markets like India create arbitrage opportunities, unlike strong-form efficient developed markets (US/Europe). Tighter SEBI (Securities Exchange Board of India) regulations and improved price discovery have relatively contracted Indian cash-and-carry spreads compared to emerging peers like Brazil and China. (Gupta & Singh, 2009). Indian findings of persistent cash and carry spreads around ex-dividend dates mirror limits-to-arbitrage patterns in emerging peers like Brazil and China, where higher frictions (taxes, capital controls) yield larger deviations (1-3%) than developed markets (US/Europe: <1%, rapid convergence via liquid futures) (Pradhan & Bhat, 2018).

6. Conclusions

The study concludes that ex-dividend events have a substantial significant impact on cash-and-carry spread dynamics for Nifty 50 constituents. The cash and carry arbitrage exploit the short lived but observable differential between equity and associated derivatives of dividend paying stocks. By effectively applying the event study methodology to spot-futures spread, the analysis illustrates that the spread tends to shorten and adjust gradually, as the ex-dividend date approaches. The descriptive statistics and the event study analysis jointly indicate that cash and carry spreads are on average negative and become increasingly compressed as the ex-dividend date approaches. The findings suggest that investors benefit from initiating simultaneous positions in equity and futures early for stocks expected to go ex-dividend during the current futures expiry, optimizing cash and carry spread for enhanced returns. The results show that cash and carry spread starts declining gradually as the ex-date approaches and can enhance portfolio returns for the investors. The study uncovers distinct time-based spot-futures spread patterns arises due to market inefficiencies, contributing novel empirical evidence from the Indian equity derivatives market context. The research is helpful for every investor, be it institutional or retail, to get the benefit of achieving enhanced returns by anticipating ex-dividend dates and creating early positions to capture higher cash and carry spread.

6.1. Limitations

This study was limited to only NIFTY-50 companies and further research can examine the impact of ex-dividend on cash and carry spread for other broader indices to know about the market reaction and validate the results of this research. The empirical study did not explicitly account for regulatory and time-varying factors such as changes in transaction costs, margin requirements and tax considerations, which may influence cash and carry spread dynamics.

6.2. Future Research

Future studies should expand to different global indices or sector specific indices to track

dividend driven cash and carry arbitrage across different markets. Future research could explore the impact of transaction costs, taxes on cash and carry arbitrage around ex-dividend events. A comparative investigation between developed and emerging markets could also uncover the impact of different tax structures as well as regulatory reforms on spot-futures spread arbitrage.

7. Author Declarations

The authors declare that any use of artificial intelligence (AI) tools in the preparation of this manuscript was conducted under their sole responsibility. The authors assume full responsibility for the accuracy, originality, content, citations, references, and bibliographic information included in the work. Any errors or inaccuracies in citations, references, source attribution, or AI-generated content are the sole responsibility of the authors. The authors expressly release the Revista Mexicana de Economía y Finanzas (REMEF), its editors, reviewers, and publisher from any liability arising from the use of AI tools or from any errors in the citations, references, or attribution of sources contained in this manuscript.

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Appendix

Table 6. P-value analysis and t-Statistic Interpretation for 10 days event Window

10 days Event Window						
		P-Value				
Company	**Symbol**	**Significant**	**Not Significant**	**Total**	**Significance Percentage**	**Average t-Statistic**
Adani Ports & Special Economic Zone Ltd.	ADANIPORTS	15	1	16	94%	-5.38
Adani Enterprises Ltd.	ADANIENT	13	1	14	93%	-5.41
Apollo Hospitals Enterprise Ltd.	APOLLOHOSP	12	1	13	92%	-9.87
Asian Paints Ltd.	ASIANPAINT	28	2	30	93%	-8.81
Axis Bank Ltd.	AXISBANK	7	4	11	64%	-4.55
Bajaj Auto Ltd.	BAJAJ-AUTO	12	4	16	75%	-1.31
Bajaj Finance Ltd.	BAJFINANCE	8	1	9	89%	-11.39
Bajaj Finserv Ltd.	BAJAJFINSV	7	0	7	100%	-10.68
Bharti Airtel Ltd.	BHARTIARTL	13	1	14	93%	-8.11
Bharat Petroleum Corpn. Ltd.	BPCL	15	11	26	58%	-1.42
Britannia Industries Ltd.	BRITANNIA	11	0	11	100%	-4.48
Cipla Ltd.	CIPLA	14	2	16	88%	-2.98
Coal India Ltd.	COALINDIA	19	4	23	83%	-3.79
Divi'S Laboratories Ltd.	DIVISLAB	12	2	14	86%	-2.65
Dr. Reddy'S Laboratories Ltd.	DRREDDY	14	1	15	93%	-6.80
Eicher Motors Ltd.	EICHERMOT	9	0	9	100%	-10.51
Grasim Industries Ltd.	GRASIM	13	2	15	87%	-5.30
H C L Technologies Ltd.	HCLTECH	49	7	56	88%	-6.25
H D F C Bank Ltd.	HDFCBANK	14	0	14	100%	-9.69
H D F C Life Insurance Co. Ltd.	HDFCLIFE	3	0	3	100%	-14.04
Hero Motocorp Ltd.	HEROMOTOCO	18	9	27	67%	-3.40

Hindalco Industries Ltd.	HINDALCO	14	1	15	93%	-5.62
Hindustan Unilever Ltd.	HINDUNILVR	25	5	30	83%	-5.21
I C I C I Bank Ltd.	ICICIBANK	10	3	13	77%	-5.02
Indusind Bank Ltd.	INDUSINDBK	9	3	12	75%	-4.78
Infosys Ltd.	INFY	26	4	30	87%	-4.99
I T C Ltd.	ITC	18	1	19	95%	-4.68
J S W Steel Ltd.	JSWSTEEL	15	0	15	100%	-2.37
Kotak Mahindra Bank Ltd.	KOTAKBANK	13	1	14	93%	0.73
Larsen & Toubro Ltd.	LT	14	3	17	82%	-5.05
Ltimindtree Ltd.	LTIM	7	0	7	100%	-8.80
Mahindra & Mahindra Ltd.	M&M	14	1	15	93%	-0.91
Maruti Suzuki India Ltd.	MARUTI	11	4	15	73%	-1.35
Nestle India Ltd.	NESTLEIND	17	1	18	94%	-12.14
N T P C Ltd.	NTPC	21	10	31	68%	-3.06
Oil & Natural Gas Corpn. Ltd.	ONGC	36	4	40	90%	-4.91
Power Grid Corpn. Of India Ltd.	POWERGRID	26	8	34	76%	-4.91
Reliance Industries Ltd.	RELIANCE	15	0	15	100%	-11.24
S B I Life Insurance Co. Ltd.	SBILIFE	4	0	4	100%	-11.02
State Bank Of India	SBIN	13	0	13	100%	-6.78
Shriram Finance Ltd.	SHRIRAMFIN	26	2	28	93%	-12.74
Sun Pharmaceutical Inds. Ltd.	SUNPHARMA	18	2	20	90%	-8.66
Tata Motors Ltd.	TATAMOTORS	5	3	8	63%	-4.62
Tata Steel Ltd.	TATASTEEL	7	8	15	47%	-2.08
Tata Consumer Products Ltd.	TATACONSUM	12	3	15	80%	-1.13
Tata Consultancy Services Ltd.	TCS	53	7	60	88%	-7.74
Tech Mahindra Ltd.	TECHM	13	6	19	68%	-4.15
Titan Company Ltd.	TITAN	13	2	15	87%	3.47
Ultratech Cement Ltd.	ULTRACEMCO	10	4	14	71%	-4.00

Wipro Ltd.	WIPRO	23	0	23	100%	-5.34

Source: Author's own elaboration

Table 7. P-value analysis and t-Statistic Interpretation for 05 days event Window

5 days Event Window						
		P-Value				
Company	**Symbol**	**Significant**	**Not Significant**	**Total**	**Significance Percentage**	**Average t-Statistic**
Adani Ports & Special Economic Zone Ltd.	ADANIPORTS	14	2	16	88%	-11.98
Adani Enterprises Ltd.	ADANIENT	10	4	14	71%	-3.72
Apollo Hospitals Enterprise Ltd.	APOLLOHOSP	10	3	13	77%	-5.44
Asian Paints Ltd.	ASIANPAINT	22	8	30	73%	-5.50
Axis Bank Ltd.	AXISBANK	3	8	11	27%	-2.39
Bajaj Auto Ltd.	BAJAJ-AUTO	4	12	16	25%	0.41
Bajaj Finance Ltd.	BAJFINANCE	8	1	9	89%	-6.07
Bajaj Finserv Ltd.	BAJAJFINSV	7	0	7	100%	-7.16
Bharti Airtel Ltd.	BHARTIARTL	8	6	14	57%	-4.32
Bharat Petroleum Corpn. Ltd.	BPCL	9	17	26	35%	0.76
Britannia Industries Ltd.	BRITANNIA	8	3	11	73%	-3.45
Cipla Ltd.	CIPLA	12	4	16	75%	-6.36
Coal India Ltd.	COALINDIA	8	15	23	35%	-0.68
Divi'S Laboratories Ltd.	DIVISLAB	8	6	14	57%	-0.85
Dr. Reddy'S Laboratories Ltd.	DRREDDY	10	5	15	67%	-2.16
Eicher Motors Ltd.	EICHERMOT	5	4	9	56%	-4.48
Grasim Industries Ltd.	GRASIM	10	5	15	67%	-3.63
H C L Technologies Ltd.	HCLTECH	48	8	56	86%	-4.19
H D F C Bank Ltd.	HDFCBANK	11	3	14	79%	-4.68
H D F C Life Insurance Co. Ltd.	HDFCLIFE	3	0	3	100%	-6.84
Hero Motocorp Ltd.	HEROMOTOCO	10	17	27	37%	-0.41
Hindalco Industries Ltd.	HINDALCO	5	10	15	33%	-2.35

Hindustan Unilever Ltd.	HINDUNILVR	15	15	30	50%	-1.75
I C I C I Bank Ltd.	ICICIBANK	3	10	13	23%	-1.82
Indusind Bank Ltd.	INDUSINDBK	7	5	12	58%	0.05
Infosys Ltd.	INFY	9	21	30	30%	-2.08
I T C Ltd.	ITC	8	11	19	42%	-0.33
J S W Steel Ltd.	JSWSTEEL	6	9	15	40%	1.89
Kotak Mahindra Bank Ltd.	KOTAKBANK	11	3	14	79%	-1.78
Larsen & Toubro Ltd.	LT	7	10	17	41%	-2.29
Ltimindtree Ltd.	LTIM	6	1	7	86%	-5.24
Mahindra & Mahindra Ltd.	M&M	2	13	15	13%	0.54
Maruti Suzuki India Ltd.	MARUTI	5	10	15	33%	-0.41
Nestle India Ltd.	NESTLEIND	13	5	18	72%	-7.90
N T P C Ltd.	NTPC	12	19	31	39%	-0.11
Oil & Natural Gas Corpn. Ltd.	ONGC	19	21	40	48%	-1.87
Power Grid Corpn. Of India Ltd.	POWERGRID	14	20	34	41%	-1.64
Reliance Industries Ltd.	RELIANCE	14	1	15	93%	-6.47
S B I Life Insurance Co. Ltd.	SBILIFE	4	0	4	100%	-11.36
State Bank Of India	SBIN	9	4	13	69%	-3.44
Shriram Finance Ltd.	SHRIRAMFIN	24	4	28	86%	-8.74
Sun Pharmaceutical Inds. Ltd.	SUNPHARMA	16	4	20	80%	-5.91
Tata Motors Ltd.	TATAMOTORS	3	5	8	38%	-2.31
Tata Steel Ltd.	TATASTEEL	2	13	15	13%	-0.71
Tata Consumer Products Ltd.	TATACONSUM	3	12	15	20%	-1.68
Tata Consultancy Services Ltd.	TCS	50	10	60	83%	-6.39
Tech Mahindra Ltd.	TECHM	7	12	19	37%	-2.33
Titan Company Ltd.	TITAN	11	4	15	73%	2.17
Ultratech Cement Ltd.	ULTRACEMCO	9	5	14	64%	-2.69
Wipro Ltd.	WIPRO	14	9	23	61%	-2.80

Source: Author's own elaboration