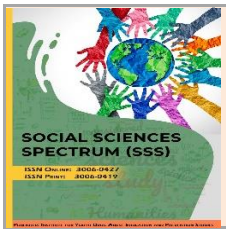

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Stock Market Reactions to Cryptocurrency Legalization: An Event Study Across Five Emerging Economies

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Abstract

The core focus of this study is assessing the stock markets' reactions by studying pre- and post-legalization stats. Utilizing the event window strategy, this study will analyze the stock market behavior by using three windows to capture multiple periods, namely ±90 days, ±30 days, and ±15 days surrounding the legalization event. Descriptive, paired t-test, fixed effects regression, and variance analysis are applied to analyze the changes in market reaction post-event. The results unveil that changes in AR are statistically insignificant, suggesting no or limited impact of regulatory shifts on prices. While volatility shows significant responses, in India, volatility surges after the announcement, while in Brazil and South Africa, it reduces in the long run. Turkey exhibits a short-term decrease in volatility, and only Mexico remains unaffected. The study concludes a significant impact on market risk perception rather than returns. Findings can be productive for policymakers, investors, portfolio managers, and regulators, highlighting the requirement for clear and transparent regulation formation, along with keeping the mutual interests of stakeholders aligned in order to avoid any negative impact of risk perception and increasing uncertainty.

Keywords: Legalization, Cryptocurrency, Stock Market, Tokenization, and Emerging Economies.

Introduction

Background of the study

Cryptocurrency, known as the digital currency gain its popularity globally, and becomes the center of attention for investors worldwide, a currency that run on a Blockchain, having attractive characteristic like being decentralized make it a distinct and more free approach of investing, Gradually it evolved from being niche innovation to mainstream globally acceptable financial instrument, that now required regulatory framework to ensure consumer protection, market integrity, and economic stability. (Xiong & Luo, 2024). With the scaling popularity and acceptability, emerging economies are regularizing cryptocurrency rapidly to harness fintech innovation, along with managing risk in the markets. In the short term, it increases the volatility that ensures the connected nature of assets.

Problem statement

Numerous studies cover the digital currency's volatility, adoption, and investors' behavioral aspects regarding them, but the impact of the decentralized nature of currency on traditional financial markets, which were previously seen as the most viable attraction for investors, still remains underexplored. Traditional capital markets play a vital role in the economy, and it considered the key indicator of economic health. Most studies investigate the adoption and investor behavior regarding cryptocurrency, while somehow capital market has not received enough attention in this context. The study (Umar, Rizvi, & Naqvi, 2021) Explores the volatility shifts but does not focus on macro-level regulatory decisions. As we focus on emerging markets that tend to have less stable markets and are highly sensitive to policy shifts are the best to further investigate the context to take productive steps to prevent any instability in the market near future. Moreover, limited cross-country studies in this context help us to explore the distinct economic environments' reactions to major policy shifts and the introduction of such high-tech assets in the markets. Institutional investors are diversifying their portfolios by adding digital currency along with traditional financial assets, which may mold the investor behavior and market risk structure significantly. In this context event study method will help to look in-depth at the traditional markets' sensitivity to such events and provide a clearer path for future policies.

Objectives

The core objective of the study is to uncover the short-term impact of cryptocurrency legalization on stock market behavior in five emerging economies, more specifically, the research is going to seek:

- Calculation of abnormal returns and cumulative abnormal returns of all three windows around the event by utilizing the well-known event study methodology.
- This study will analyze the reaction of stock market volatility pre- and post-legalization event.
- By analyzing multiple economic environments of emerging economies, the cross-country examination will help to understand the market response from distinct economic environments and resources.

Research questions

- What is the impact of cryptocurrency legalization on abnormal returns and cumulative abnormal returns of the stock market in emerging markets?
- Does the legalization of cryptocurrency increase stock market volatility?
- How do stock markets respond to cryptocurrency legalization events in different economic environments?

Significance of the study

The study will investigate the response of the equity market to the cryptocurrency legalization event, which is heat up trend nowadays and has great potential to mold the dynamics of financial markets for the future. Most studies focused on internal trends and shifts of the crypto market, but its impact on traditional capital markets remains underexplored. Traditional markets are highly sensitive to policy shifts and macroeconomic shocks. The Legalization of digital currency will change the investor behavior to risk and returns in a significant way that needs to be understood for the better development of market structure to create a stable and smooth economic environment. The study tends to investigate the outcomes for stock markets following the legalization of cryptocurrency, whether it's a threat, an opportunity, or imposes a neutral impact on traditional markets.

Emerging economies are highly sensitive to major policy shifts worldwide, and Pakistan is also one of them, and sooner planning to regularize cryptocurrency and change the dynamics of its financial markets forever. The potential outcome from emerging markets experiencing this process will help to form aligned policies in order to mitigate any financial misadventure. Pakistan is planning to regularize crypto soon as the government introduced the state institution to handle all the process named Pakistan Crypto Council or PCC in earlier this year March, 2025, along with the pace of this intuition, academic and legal debates are emerging for what will be the policies for investor protection, transparency of financial institutions, and promotion of innovative financial instruments in country. (Saeed & Sial, 2023). By exploring the reactions of other emerging economies, this study will try to get an empirical understanding of the possible outcomes of the legalization of digital currency.

Theoretical Framework

This study is based on the following theoretical perspectives that are interrelated to understand the response of traditional markets to crypto legalization.

Efficient Market Hypothesis (EMH), proposed by (Fama, 1970), that suggests financial markets are quite efficient in handling the latest information, which refers to the immediate impact on the market after events like legalization or shifts in regulatory frameworks, and it'll eventually reflect in the price. A significant reaction from markets will support the semi-strong form of EMH.

Signaling Theory; (Spence, 1973) Proposes that the institutional actions in the market have an informational value that has been passed in the form of signals to the participants, they are likely to receive the signals of increasing institutional legitimacy, economic transparency, and risk adjustments by the legalization of cryptocurrency, which tend to influence the sentiment of investors in the market and lead to portfolio adjustments.

Institutional Theory: Introduced by (DiMaggio & Powell, 1983) strongly suggests that organizational and market behaviors are likely to be molded or shaped by institutional pressures.

While it's frequent in emerging economies that such pressure molds the structure of the capital market and turns its direction significantly, specifically when there is any contrary legal standing present, as in the case of cryptocurrency

Literature Review

Summary of the relevant existing literature

Event Studies in Cryptocurrency Regulation

In the modern world, modern financial techniques have been used to investigate the response of markets against the regulatory policy reforms, and event study is one of those vital tools that capture the market sensitivity to such events with optimal accuracy. These techniques were initially formalized by (MacKinlay, 1997) And its wide-scale implications can be witnessed in the cryptocurrency context. The highly relevant prior study conducted by (Saggu, Ante, & Kopiec, 2024) Regarding the regulatory intervention by Security Exchange Commission (SEC) considering Bitcoin as a financial asset qualified for Exchange Traded Funds (ETFs), results in up to 12% abnormal returns and a significant increase in trading volumes just in a week, these finding indicates the growing sensitivity of cryptocurrency markets to institutional acceptability.

One more highly credible prior research (Luo, Xiong, Knottenbelt, & Liu, 2024) Conducted a study while using machine learning techniques and large language models to analyze the litigation documents publicly released by the SEC and extract themes that influence market behavior. Their findings suggest that the regulatory narrative is highly complex and assertive, and has significant predictive power over cryptocurrency market sentiments and price fluctuation.

Crypto Regulation and Market Reactions

Crypto valuation is not only influenced by direct enforcement in the markets after introducing a regulated status, but the broader framework and tax regulation does impact it. The research conducted by (Shukla, Misra, & Chaturvedi, 2022) Explored the decision of the Indian government to impose a 30% tax on crypto gains in the budget 2022. While this decision seemed like a constraint on innovation, and while conducting an analysis, the data showed declining interest of investors in markets

While studies conducted globally had confirmed the fact, like (Xiong & Luo, 2024) Explore 30 countries' regulatory frameworks and found that taxation has an inverse relation with crypto adoption and trading volumes, especially in emerging economies. They conduct cross-country analysis and their findings suggest that clarity in policy, even restrictive, does impact how investors perceive risk and inject capital in markets.

Crypto–Equity Market Interlinkages

In modern days, recent studies have shown that the linkage between crypto and traditional financial assets has been increasing at a fast pace, according to a study. (Bouri, Molnár, Azzi, Roubaud, & Hagfors, 2021) They explore how Bitcoin can act as a hedge during equity market downturns, although it provides investment protection in rough market conditions. They've used daily correlation data and found that Bitcoin absorbs macroeconomic shocks more effectively than traditional financial assets, which may be because it is decentralized.

More prior studies have endorsed the fact that (Uzonwanne, 2021) They've employed–AGARCH model to explore the volatility and returns spillovers between the most popular cryptocurrency, bitcoin, and five major stock indices globally, it also includes emerging markets. The results

showed bidirectional transmission of shocks, suggesting that uncertainty in the cryptocurrency market is instantly reflected in traditional stock indices, and vice versa. This correlation led to the fact that traditional capital markets and digital assets are interconnected; this correlation is strong in economies where crypto exposure is substantial. The European Union's Markets in Crypto-Assets (MiCA) regulation was passed in 2023 to address such systematic risk by standardizing the crypto regulator governance across the member states to enhance investor protection and financial institutions that are involved in dealing with digital assets within the union.

Gaps in existing research

Prior research has covered cryptocurrency policy framework and market behavior and shifts on a wide scale, but still, there is plenty of room to cover the under-explored angles in this regard, which are:

- Overseeing the equity markets; numerous studies are focusing on the impact of digital assets by crypto regulation announcements or reforms, but there is a gap in covering the traditional equity markets' response, especially in terms of volatility and returns in a specific context
- Emerging economies are under-studied; The regulatory influence on markets is widely studied in developed markets, which usually deviate less from expected response because of their stable nature, usually covering areas like the US, EU, and China. Emerging markets, instead of actively taking part in crypto adoption, are somehow overlooked, even when their response is expected to be fragile, and that is what makes it worthy of being focused on.
- Lack of multiple window analysis; regulatory framework amendments or introduction usually have multiple type of influence on markets in different time frame, being restrict with short-term or long-term windows only can led to overlook the specific nature of impact, this particular study is based on three windows to cover the short-, medium-, and long-term impact as the markets are adoptive and can't be studied with specific lens
- Unmatched theoretical grounding; there are numerous theories globally, and one can integrate them in the study by finding simple relevancy, but blending those theories in the whole research essence is what is required to understand the generative ability of the research finding that is widely overseen and under applied

How the study addresses these gaps?

This study is highly focused on adding value on both academic and theoretical grounds. To do so, along with empirical testing, it covers the angles of theoretical understanding by addressing the possible shortcomings in prior studies.

Focus of equity markets: This study is highly focused on the actual data from stock indices from five different emerging nations, which would help to unveil the investor sentiment in equity markets, not just crypto

Comparative perspective of economies; This study examines the five more vibrant emerging nations that uncover how different economies respond to the regulation shift

Wider window analysis; by using three windows such as (±90, ±30, ±15 days), the study tends to cover the wider time frame impact on return and volatility

Theoretical framework integration: The research incorporates EMH, Signaling Theory, and Institutional Theory to generate the hypothesis to get not just robust empirical results but a rigorous

theoretical understanding. All the theories are explained, incorporated with prior studies, and used as a foundation for the analytical part of the research.

Theoretical framework and prior studies

This study has incorporated three complementary theories, the Efficient Market Hypothesis (EMH), Signaling Theory, and Institutional Theory, to explain how crypto legalization impacts the stock market in emerging economies.

The Efficient Market Hypothesis (EMH) (Fama, 1970) Suggests that prices reflect all the available information, which indicates there should be abnormal returns in the stock market in response to crypto legalization. Prior studies suggest that crypto-linked and emerging market efficiency show improvement with time (Urquhart, 2016; Yi, Yang, Jeong, Sohn, & Ahn, 2023). Similarly, one more study posits that emerging markets show efficiency partially, especially during regulatory shifts like crypto legalization, which justifies the use of multiple windows (Irfan, Jabbar, & Warraich, 2022; Tiwari, Jana, Das, & Roubaud, 2018)

The second one is Signaling Theory. (Spence, 1973) That suggests, regulatory actions serve as signals, in this case, crypto legalization signals tech innovation, risk mitigation, and regulatory control by the government. Prior studies have shown that supported regulation leads to positive responses, while restrictive or unclear regulatory shifts influence markets negatively; these findings pave the way to understand different market reactions to similar news in different economies (Shukla, Misra, & Chaturvedi, 2022; Xiong & Luo, 2023).

Lastly, Institutional Theory (DiMaggio & Powell, 1983) Explains the impact of formal regulation on markets. Crypto legalization is a vibrant regulatory shift, can impact in both ways, reducing uncertainty or boosting the volatility, depending on regulatory clarity and market perception. The prior studies found that strong institutions with concrete regulatory frameworks stabilize the market, while weak decision-making and the ambiguous nature of regulation destabilize or increase uncertainty. (Uzonwanne, 2021)

Hypothesis development

As the core objective of this study is to examine the impact of cryptocurrency legalization on the stock market, particularly its performance and volatility in emerging economies following hypotheses are formulated. These hypotheses are based on the foundational understanding that vibrant events like major policy shifts at the macroeconomic level do impact the key economic indicator of the nation, the stock market, which is usually considered a vital element of the economy.

This study specifies a focus on how Abnormal Returns (AR), Cumulative Abnormal Returns (CAR), and market daily volatility respond to the legalization announcement of cryptocurrency across three windows (±90 days, ±30 days, and ±15 days) to cover the multiple lengths of responses.

Accordingly, the following hypotheses are formulated:

H1: Cryptocurrency legalization has a significant impact on abnormal returns (AR) in emerging stock markets.

H2: Cryptocurrency legalization has a significant impact on cumulative abnormal returns (CAR) in emerging stock markets.

H3: Cryptocurrency legalization has a significant impact on stock market volatility in emerging stock markets.

H4: There is a significant difference in the variance (volatility) of stock returns before and after cryptocurrency legalization.

Research Methodology

Research Design

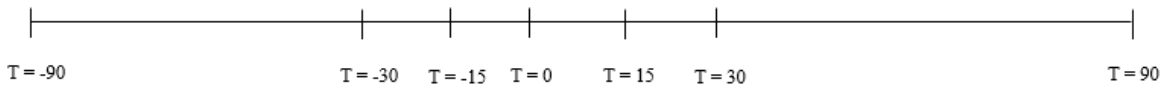
This study is based on quantitative, event study methodology to investigate the impact of the legalization of cryptocurrency on stock market indices in emerging economies. The method of event study is highly effective in capturing the response of the market against the policy amendments and outbreaks, by using the method of isolating the abnormal market responses in exclusive time windows surrounding the event. This is the popular methodology utilized by numerous researchers around the globe to study the impactful events and their influence on the markets. This method was pioneered by (Fama, Fisher, Jensen, & Roll, 1969), later on, it was refined by (MacKinlay, 1997) And is utilized by researchers all over the globe.

Sample and Country Selection

To conduct the analysis, five countries have been selected from emerging nations that have formally legalized or regularized cryptocurrency in their respective economies. These countries include: India, Brazil, Turkey, South Africa, and Mexico. The sampling has been conducted after ensuring the availability of reliable financial data. In past studies such as (Baur, Hong , & Lee, 2018) Have utilized an identical country-level framework to investigate cryptocurrency-related impact, ensuring the robustness of the sampling conducted for this study

Event Window Construction

This study tends to capture the impact of cryptocurrency legalization by constructing three symmetrical windows around the legalization announcement in all five countries taken as a sample; these windows are ±90 days, ±30 days, and ±15 days. These windows are designed to detect short-term, medium, and long-term impacts on the event. This method aligns with the standard event study design utilized in policy-based financial studies, specifically those that are highlighted by (Binder, 1969) Reviewed decades of implications of this particular methodology.



Data collection and variable construction

The study utilizes daily data from the benchmark indices of the five selected emerging countries and the MSCI index to calculate the expected returns by using the Market Model introduced by (Fama, Fisher, Jensen, & Roll, 1969)

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

Where:

- R_{it} = Return of stock index iii on day t
- R_{mt} = Market return on day t (benchmark index)
- α_i and β_i = Estimated parameters from the estimation window
- ϵ_{it} = Error term

The data has been collected according to the window size around the legalization date of countries, respectively, and three key variables are constructed

- Abnormal returns (AR): Calculated by deducting actual returns from expected returns, the following equation is used to calculate AR

$$AR_{it} = R_{it} - (\hat{\alpha_i} + \hat{\beta_i} R_{mt})$$

Where:

- AR_{it} = Abnormal return for index iii on day t
- $\hat{\alpha_i}$ and $\hat{\beta_i}$ = Parameters estimated from the market model during the estimation window
- Cumulative Abnormal Returns (CAR): The sum of abnormal returns around the windows is calculated to capture the overall impact of each window

$$CAR_i = \sum\_ (t = T1) \text{^}(T2) AR_{it}$$

Where:

- CAR_i = Cumulative abnormal return for index i over event window T1 to T2
- Volatility: Calculated by the deviation of daily returns, used as a proxy of market uncertainty

$$VOLt = (Ht - Lt) / Lt$$

Where:

- VOLt = Daily volatility for day t
- Ht = Highest price on day t
- Lt = Lowest price on day t

The construction of the variables, such as AR and CAR, aligns with the methods discussed in (MacKinlay, 1997). Volatility calculation through deviation in returns is widely practiced in high-frequency finance, also particularly applied by (Barndorff-Nielsen & Shephard, 2002) and (Kamstra, Kramer, & Levi, 2003) Investigated behavioral and seasonal impact on market volatility

Statistical Analysis

Descriptive Statistics

The analysis of this study includes the calculation of the mean and standard deviation of abnormal returns and volatility for both pre- and post-event windows for all five countries included in the study. It summarizes the empirical market conditions before and after the event date, and serves as a foundational component to capture the market shift around the event date.

Paired Difference-in-Means Tests

This test captures the significance of the changes in abnormal returns and volatility after the event date compared to pre-event dates. This is the popular approach used in prior studies to capture both

dependent sample pre- and post-event across the event date. This method is formalized in empirical finance research by (Brown & Warner, 1985)

Levene's Test for Equality of Variances

This test is conducted to examine the market uncertainty impacted by the legalization event. Levene's test is highly recommended and implied for the comparison of variance in volatility pre- and post-event. The test helps to evaluate the significance of differences in standard deviation and volatility shifts.

Fixed Effects Panel Regression

This test is used to capture the unobserved heterogeneity among countries selected for the study, where fixed effects models have been utilized. These models control for time-invariant and particular characteristics, country-wise as financial structure or investment behavior. This technique is widely used in multi-country panels and is considered a robust method for policy event studies. It is outlined by (Baltagi, 2008)

The statistical analysis of the study was conducted by using the well-known software named Stata. Stata is highly suitable for handling panel data regressions, event window studies, and robust variance estimations. Paired t-test, Levene's test for variance equality, and fixed effects panel regression were conducted by using Stata. This software is popular for supporting heteroskedasticity-robust estimators and is flexible in handling panel data structures, ensuring high accuracy in inference and model estimation in best efficient way possible.

Robustness and Validity

During the analysis, robustness has been ensured by conducting tests repeatedly for all three windows separately, that is, (±15, ±30, ±90 days), volatility, and Cumulative Abnormal Returns (CAR) estimation re-analyzed across the three windows to ensure consistency. For further rigor in the process, robust standard errors are applied to correct for heteroskedasticity. The multi-method validation, followed by thoroughly studying (Baur, Bui, & Dathe, 2020), conducted cross-country financial response studies to policy shocks

Ethical Considerations

This study is based on data that is entirely publicly available and doesn't involve human subjects at all; no confidential nature of information has been used that required individual or group consent. All data sources involved in the collection were reported in detail to ensure academic integrity and reusability in future studies in future.

Data Analysis and Results

Table 1: *Descriptive*

Country	Window	AR Mean (Pre)	AR Mean (Post)	AR Std. Dev. (Pre)	AR Std. Dev. (Post)	Vol Mean (Pre)	Vol Mean (Post)	Vol Std. Dev. (Pre)	Vol Std. Dev. (Post)
India	±90	-0.000106	0.000108	0.008643	0.028940	0.009588	0.029061	0.005220	0.024088
	±30	0.001487	-0.001547	0.012016	0.044732	0.012487	0.049357	0.007121	0.032040
	±15	0.002781	-0.002973	0.013622	0.052619	0.013237	0.063500	0.007806	0.038821
Brazil	±90	0.000717	-0.000688	0.011533	0.009477	0.016559	0.013746	0.006356	0.003922
	±30	0.001790	-0.001857	0.008848	0.009820	0.014626	0.014193	0.004778	0.004301
	±15	-0.009850	-0.015300	0.010899	0.009402	0.014413	0.014387	0.005664	0.004611
Turkey	±90	0.001555	-0.001568	0.014123	0.015598	0.018824	0.019522	0.007105	0.007737
	±30	0.001600	-0.001657	0.013491	0.014490	0.019413	0.016487	0.007527	0.007256
	±15	-0.000475	0.000493	0.013921	0.011735	0.018531	0.013007	0.008252	0.003502
South Africa	±90	-0.000029	0.000032	0.013479	0.009946	0.018284	0.014729	0.007098	0.006180
	±30	0.000494	-0.000520	0.014509	0.008928	0.018113	0.014913	0.010078	0.004455
	±15	-0.001837	0.001960	0.011627	0.010814	0.017644	0.016653	0.006706	0.005267
Mexico	±90	-0.000045	0.000048	0.007163	0.008017	0.011124	0.012067	0.004117	0.004882
	±30	-0.000519	0.000540	0.007978	0.008586	0.013203	0.012500	0.004621	0.005583
	±15	0.000306	-0.000327	0.006752	0.010428	0.012044	0.014793	0.002836	0.006342

Source: *Author's Compilation*

Table 1, descriptive analysis, represents the detailed insights into the behavior of market statistics such as abnormal returns and volatility surrounding the event of cryptocurrency legalization across all five emerging economies involved in the study, this table include India, Brazil, Turkey, South Africa, and Mexico. The analysis represents the insights from three windows: ±90 days, ±30 days, and ±15 days.

Abnormal returns insights: The descriptive results have shown that abnormal returns continuously deteriorate after the legalization of crypto in most countries. If we look at the stats of India, the number sharply shifts from positive 0.00278 pre-event to negative -0.00297 post-event in a ±15-day window, indicating to negative market reaction in a short window. While, similar response has been observed in a ±30-day window, AR shift from 0.00149 (pre-event) to -0.00155 (post-event), but there is a slight improvement in the 90-day window is that from -0.00011(Pre-event) to 0.00011 (post-event), which suggests fading reaction of the market in a longer window. Results have shown that regulatory events cause sensitive market response in short and medium windows, but like other policy shifts, this regulation gets blended into the economic environment in the long run.

In Brazil, AR has shifted to a significant negative number after the event (from -0.00985 to 0.01530) in a ±15-day window and (from 0.00179 to 0.00186) in a ±30-day window, which

indicates towards short-term negative impact on the market after legalization. The longer window shows a shift (from 0.000717 to -0.000688) in ±90-day that suggests the market's negative response as well.

While Turkey and South Africa have modest impacts compared to other countries, like Brazil, specifically. Turkey's markets have shown a shift from negative to positive in a shorter window, but catch up the acting inversely in ±30-day and ±90-day windows. South Africa's stats shift positively in longer and shorter windows, but show mixed effects; it has a negative shift in the medium window.

Mexico didn't show notable turns; its AR value pre- and post-event remains near zero, suggesting no significant response recorded, and the market remains neutral compared to others.

Volatility insights: We can witness a clear and consistent pattern in volatility data across all countries and windows that shows an increase in volatility numbers post-legalization of cryptocurrency, suggesting increasing uncertainty in markets over the policy shift

The most dramatic surge has been recorded in the case of the Indian equity market, which shows a shift from 0.00959 to 0.02906 in a ±90-day window, the shorter window that is ±15-day showing an even steeper rise from 0.01324 to 0.06350, suggesting sudden uncertainty in the market right after the announcement.

In Brazil, results are stable comparatively, showing a decrease in volatility in 90- and 30-day windows but remain stable in 15-day windows, suggesting that the market has absorbed the impact effectively than others.

In Turkey, volatility remains stable in 90- and 30-day pre and post periods but declines in 15 15-day window from 0.01853 to 0.01301, suggesting that the announcement of legalization helps the market to stabilize in the short run.

South Africa shows a decline in volatility numbers in 90- and 30-day windows, but a slight increase in the 15-day window from 0.01764 to 0.01665, which shows short-term distress in the market.

Mexico shows an increase in volatility number across all windows, but notably in the 15-day window from 0.01204 to 0.01479, suggesting an instant market reaction after the announcement.

As an overall impact concern, a general pattern of decline in AR across almost all countries and windows indicates the short-term negative sentiment of investors in respective economies.

Volatility is the element that seems to be increasing overall. In most cases, post-legalization uncertainty is observed, while returns were affected mildly, the market perceives the legalization event as the reason for the surge in risk.

India and Brazil are two economies that showed the most vibrant negative shifts in AR and volatility both while Turkey, South Africa, and Mexico showed muted reactions with relatively stable or mild fluctuations in AR and volatility.

Table 2: *T-Test = India*

Variable	Window	Pre-Mean	Post Mean	Mean Diff	T-Stat	P-Value
AR	±90 Days	-0.000106	0.000108	-0.000213	-0.067	0.9464
	±30 Days	0.001487	-0.001547	0.003034	0.364	0.7169
	±15 Days	0.002781	-0.002973	0.005754	0.423	0.6754
Volatility	±90 Days	0.009588	0.029061	-0.019473	-7.535***	0.0000***
	±30 Days	0.012487	0.049357	-0.036870	-6.251***	0.0000***
	±15 Days	0.013238	0.063500	-0.050263	-5.076***	0.0000***

Source: *Author's Compilation*

The T-statistics of India have shown a significant increase in volatility across all the windows, but Abnormal Return remains insignificant across all windows, with the p-value remaining less than 0.01 for volatility. This suggests that the legalization pod crypto has significantly increased the uncertainty in the market and surged risk perception. Investors vibrantly reacted to the legalization policy in both the short term and long term, but AR remains stable compared to volatility, indicating that there is no valuation impact on equity observed.

Table 3: *T-Test Brazil*

Variable	Window	Pre-Mean	Post Mean	Mean Diff	T-Stat	P-Value
AR	±90 Days	0.000717	-0.000689	0.001404	0.895	0.3721
	±30 Days	0.001790	-0.001857	0.003647	1.5249	0.1326
	±15 Days	-0.009855	-0.0153	0.005455	1.4862	0.1480
Volatility	±90 Days	0.016559	0.013746	0.002813	3.5794***	0.0004***
	±30 Days	0.014625	0.014193	0.000432	0.3712	0.7118
	±15 Days	0.014142	0.014387	0.0000258	0.0138	0.9891

Source: *Author's Compilation*

In Brazil, the t-test showed a significant decrease in volatility in a 90-day window, as p-values are less than 0.01, indicating that the equity market observed long-term stability following crypto legalization. This suggests that the regulatory framework was well conveyed, has clarity, reduced uncertainty, and assists investors in fitting in more efficiently.

Well, volatility in the 30- and 15-day windows isn't significant, indicating the long-term stability perception from the market; stabilization doesn't occur immediately. The AR doesn't show any statistically significant changes, which suggests there are no visible shifts in the return of the market.

Table 4: *T-Test Turkey*

Variable	Window	Pre-Mean	Post Mean	Mean Diff	T-Stat	P-Value
AR	±90 Days	-0.001554	-0.001567	0.000132	1.4122	0.1596
	±30 Days	0.001600	-0.001657	0.003257	0.9089	0.3671
	±15 Days	-0.000475	0.000493	-0.000968	-0.2087	0.8362
Volatility	±90 Days	0.018842	0.019522	-0.000680	-0.6323	0.5280
	±30 Days	0.019429	0.016487	0.002962	1.5450	0.1277
	±15 Days	0.018531	0.013007	0.005524	2.3965**	0.0232**

Source: *Author's Compilation*

In Turkey, the significant decrease in volatility observed in a 15-day window p = 0.0232, suggesting short-term stability in the market after the crypto legalization announcement, suggests betterment of investor risk perception.

However, there is no significant change in the 30- and 90-day period after legalization, indicating the short-term impact. Abnormal Returns remain statistically insignificant across all windows.

Table 5: *T-Test South Africa*

Variable	Window	Pre-Mean	Post Mean	Mean Diff	T-Stat	P-Value
AR	±90 Days	-0.000287	0.0000316	-0.000318	-0.0673	0.9464
	±30 Days	0.0004935	-0.000052	0.0010135	0.3273	0.7446
	±15 Days	-0.001837	0.00196	-0.004040	-0.9399	0.3550
Volatility	±90 Days	0.0182835	0.0147289	0.0035546	3.3479***	0.0010***
	±30 Days	0.0181129	0.0149133	0.0031996	1.5944	0.1162
	±15 Days	0.0176438	0.0166533	0.0009904	0.4552	0.6524

Source: *Author's Compilation*

In South Africa t-test has shown a significant reduction in volatility in a 90- 90-day window after legalization, stating p = 0.0010, stating the stabilization of the market in the long run post legalization. The non-significance in 30- and 15-day windows suggests that the stability has been developed over time.

As in other emerging economies, no significant AR has been observed in South Africa, which suggests that legalization stabilizes the market in the long run but does not impact returns.

Table 6: *T-Test Mexico*

Variable	Window	Pre-Mean	Post Mean	Mean Diff	T-Stat	P-Value
AR	±90 Days	-0.000054	0.000478	-0.0000928	-0.0822	0.9346
	±30 Days	-0.000519	0.00054	-0.001059	-0.4994	0.6193
	±15 Days	0.0003063	-0.0003267	0.0006329	0.2035	0.8401
Volatility	±90 Days	0.011124	0.012067	-0.0009425	-1.4047	0.1618
	±30 Days	0.013203	0.0125	0.0007032	0.5367	0.5935
	±15 Days	0.012047	0.014793	-0.0027496	-1.5755	0.1260

Source: *Author's Compilation*

The Mexican stock market showed a neutral response to the legalization announcement of cryptocurrency, a t-test showed statistically insignificant changes in both Abnormal Returns and volatility across all event windows studied (±90, ±30, ±15 days). Overall, it suggests the equity market of Mexico responds more stably and investor behavior is mature compared to other markets in the emerging bloc observed.

Table 7: *Levene's Test*

Country	Window	Pre SD	Post SD	W0	W50	W10
India	±90d	0.0052	0.0241	43.65***	22.87***	27.65***
	±30d	0.0071	0.0320	17.57***	16.19***	16.32***
	±15d	0.0078	0.0388	10.45***	8.70***	9.87***
Brazil	±90d	0.0064	0.0039	9.00***	7.44***	7.78***
	±30d	0.0048	0.0043	0.71	0.31	0.51
	±15d	0.0057	0.0046	1.28	0.26	1.00
Turkey	±90d	0.0071	0.0077	1.39	1.42	1.45
	±30d	0.0075	0.0073	0.06	0.02	0.05
	±15d	0.0083	0.0035	1.00	1.00	0.83
South Africa	±90d	0.0080	0.0062	5.36**	4.54**	4.78**
	±30d	0.0101	0.0045	7.94***	4.38**	5.66**
	±15d	0.0067	0.0053	0.53	0.56	0.54
Mexico	±90d	0.0041	0.0049	0.89	0.92	0.94
	±30d	0.0046	0.0056	2.48	2.22	2.42
	±15d	0.0028	0.0063	11.45***	11.14***	11.68***

Source: *Author's Compilation*

Table 7: Levene's test helps to reinforce the findings of the t-test and explains the impact of cryptocurrency legalization on equity market returns and volatility (Variance). Its impact is non-uniform and uses dynamic techniques to calculate impacts.

In India, Levene's test observed an extremely significant increase in volatility, which aligns with the t-test and suggests India's market witnesses the most significant shift in volatility post-legalization. Brazil showed a significant decrease in volatility post-legalization in a long window, suggesting stabilization in the long run. Turkey shows no significant changes in volatility variance in any window studies, while South Africa observed a decrease in volatility in 90- and 300-day windows, suggesting gradual stabilization in market sentiments; shorter windows remain insignificant. Lastly, Mexico's short-term window is that 15-day period after the event showed volatility, suggesting short-term nervousness in the market, while 30- and 90-day windows suggest no significant volatility changes, indicating long-term stability.

Table 8: *Paired T-Test for CAR*

Window	Pre-Mean	Post-Mean	Mean Diff	T-Stat	P-Value
±90 Days	0.01946	-0.04061	0.06008	14.89***	0.0000***
±30 Days	0.02141	-0.03409	0.05549	12.64***	0.0000***
±15 Days	-0.01238	-0.03135	0.01897	1.92*	0.0573

Source: *Author's Compilation*

The paired t-test for cumulative abnormal return shows some statistically significant findings post-legalization across windows. While a ±90 days' window shows the pre-mean 0.01946 and post-mean dropped to -0.04061the mean difference is highly significant and p = less than 0.01, suggesting a significant decline in CAR by equity market in the long run after legalization, which indicates markets don't overall absorb the policy shift in terms of valuation and react negatively

±30 days' window experienced a negative shift as well, from 0.02141 pre-event to -0.03409 post-event, p = less than 0.01, indicating a strong negative reaction of equity markets in the middle window. Negative impact was recorded in the first month of legalization, along with the longer window

Shorter window (±15 days) recorded CAR shifting from -0.01238 to -0.03135, the mean difference recorded 0.01897, with the p value = 0.0573, significant at 10% level, suggesting that the immediate short-term reaction was weaker compared to longer windows

Table 8: *Fixed Effect Regression for CAR*

Dependent Variable	Window (Days)	Coefficient	Std. Error	t-Stat	p-Value
CAR	±90	-0.0300	0.0136	-2.22	0.091*
	±30	-0.0277	0.0078	-3.55	0.024**
	±15	-0.0095	0.0099	-0.96	0.391

Source: *Author's Compilation*

Table 9: fixed effect regression for CAR tests the post-legalization response of the market by controlling country country-specific effects. In the 90-day window, the coefficient is -0.0300, indicating post-legalization CAR decreases by 3% on average; the results showed marginal significance at 10%. Negative sign suggests a decline in returns over a 90-day window, but the evidence isn't highly robust.

In a 30-day window -0.0277 coefficient is recorded, which is statistically significant at 5%. Suggesting a decline of CAR in the medium window on average of 2.77%, the results show stronger impact compared to the 90-day window. Investors' reaction was sharper in the first month after legalization.

Finally, the 15-day window showed the coefficient of -0.0095, not statistically significant, where $p = 0.391$; the market doesn't show a significant response in terms of AR, suggesting that the immediate investors' reaction had faded or was overshadowed by other short-term dynamics of the market.

The 30-day period showed a statistically significant impact compared to both the 90- and 15-day window post legalization, suggesting a more pronounced market reaction in the first month of the announcement.

Discussion

What the results imply

The study implies that cryptocurrency legalization announcements have a vibrant impact on market volatility across emerging economies, but no significant effect on Abnormal Returns while examining. The non-significant impact on returns suggests that there are no changes in returns post-legalization, suggesting investors don't see legalization affecting the fundamental value of the firms listed.

On the contrary, volatility shows notable shifts, highlighting changes in market risk and uncertainty, with the sharp increase in volatility across all windows suggesting uncertainty in market behavior. Brazil and South Africa witnessed a significant reduction in volatility numbers over a longer window. Indicates market stabilizes by clarity in regulatory shifts, Turkey shows instant decline in volatility, while Mexico has no significant response, probably due to stable investor behavior in the market.

Comparison with past studies

The findings of the study align with the prior research, suggesting significant changes in volatility rather than returns post-legalization of cryptocurrency, resulting in an increase in uncertainty in markets, but returns remain usual. The financial market does react to policy shifts, but in terms of volatility and risk perception, not price and valuation. Although the legalization impact isn't uniform in all markets, even if related to similar economic standing, that's why studies on a wider scale help to get the diverse results in different economic environments and resistance to regulatory changes. Overall, the comparison direction and magnitude of market reaction to legalization events are highly contextual, shaped by clarity in conveying regulatory elements, market maturity, investor behavior, and sentiment in each country in the sample.

Theoretical and practical implications

Efficient Market Hypothesis (EMH) suggests that markets are informationally efficient, and the legalization of cryptocurrency announcement should be reflected in market prices. The results incorporate theory in the sense that across all countries and window markets do not show the shift in AR, which indicates investors perceive regulation has no impact on fundamental valuation of the assets in the market, while an increase in volatility in India and a decline in Brazil and South Africa suggest information sensitivity of the market regarding risk and uncertainty.

Signaling theory refers to conveying signals to market actors from regulatory authorities and how those actors respond in this regard, which can be positive, negative, or ambiguous. The results explain the implications of the theory effectively. Observations suggest that all forms of reactions from market actors, such as in Brazil and South Africa, market response was positive regarding volatility against regulations, but long-run volatility was recorded in Turkey's case. In India, the reaction was negative, where an extreme hike in volatility was witnessed. If we look closely, in some ways the market gives an ambiguous response as well, which might to due to weak and ineffective signals from regulatory bodies.

Institutional theory explains how the market is shaped by regulatory policies, laws, norms, and social expectations in the environment. It suggests that markets seek legitimacy with rules established under institutional regard. The sharp increase in volatility in the Indian market suggests a lack of normative and cognitive environment, while in Brazil and South Africa, the market's effective absorption of regulatory changes indicates clear legitimacy and stability that reduces ambiguity in market sentiments. In the case of Turkey, the short-term effective blending of market sentiment with regulation announcement shows initial explanation aligned with normative expectations, but in the long run, it lacks synchronization. Lastly, Mexican market analysis is aligned with theory and effectively consistent with market sentiments.

Conclusion and Recommendations

Summary of the key findings

The research examines the impact of cryptocurrency legalization announcement on the traditional stock market returns and volatility across three windows to cover multiple periods, namely ±90, ±30, and ±15-day event windows, and five emerging economies. The key finding of empirical testing suggests that the AR remains consistently insignificant in all countries, indicating no impact on returns and firm valuation in response to regulatory shifts. While there are significant shifts in volatility stats both in positive and negative, suggesting changes in risk perception and return adjustments as a reaction. In India, volatility surged significantly, while in Brazil and South Africa, it decreased in the long run and showed a short-term decline in Turkey. The Mexican market is the only one that absorbs the impact of the announcement effectively and doesn't show any significant shift.

Conclusion drawn

Findings suggest that the crypto legalization does impact market stability but not performance in emerging markets, while the impact of regulations on volatility is influenced by the maturity of the market and investors' behavior; moreover, market readiness regarding the policy shifts plays a vital role in response. We can draw the perception that effective conveyance of regulatory policy and clarity in investors' understanding, along with long-term alignment with market nature, play a vibrant role in shaping market dynamics.

Policy and practical recommendations

For policymakers, the research suggests that the requirement of clear, transparent, and comprehensive regulatory frameworks for better compatibility with market sentiments, ambiguous policies, and poor clarity results hike in risk perception, like in India's case. Secondly, regulatory bodies are required to loop all stakeholders to form policies that work effectively in the long run and suit mutual interests. Lastly, investors and portfolio managers are advised that effective management of regulatory risk and volatility can result in managing risk effectively, since such

policy shifts don’t impact returns; the risk management could be challenging and needs to be addressed.

Suggestion for future research

Future studies could incorporate the long-term windows to explore the volatility adjustments with time; moreover, a comparative study of market response in developed vs emerging markets will help to understand multiple economic environments and market sentiments against regulatory shifts. Furthermore, one can study the sector-specific response to regulatory shifts with the highly sensitive sectors in this regard, like in the crypto case, financial services and technology will play a front-and-center role in incorporation, and may receive an unusual impact.

Conflict of Interest

The authors showed no conflict of interest.

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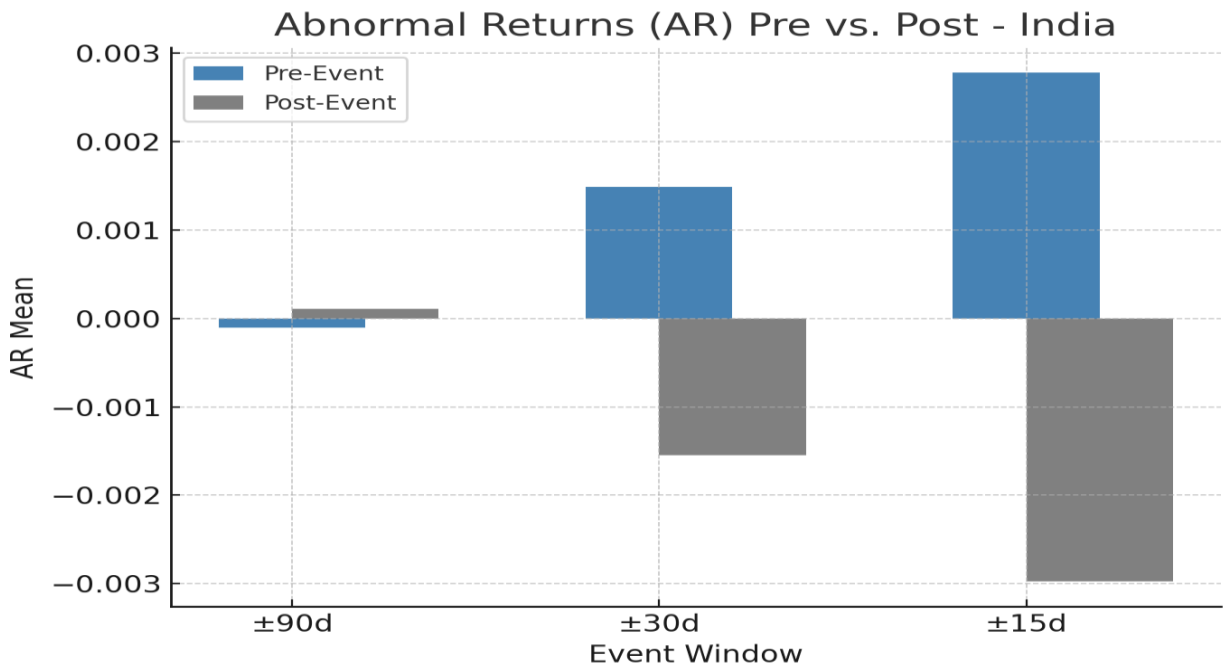
Appendix A: Event Window Specification

Country	Legalization Date	Short Window (-15, +15)	Medium Window (-30, +30)	Long Window (-90, +90)
India	March 9, 2023	Feb 22–Mar 24, 2023	Feb 7–Apr 8, 2023	Dec 9, 2022–June 7, 2023
Brazil	June 20, 2023	June 5–July 5, 2023	May 21–July 20, 2023	Dec 21, 2022–Dec 17, 2023
Turkey	Feb 28, 2024	Feb 13–Mar 14, 2024	Jan 29–Mar 29, 2024	Dec 1, 2023–Aug 26, 2024
South Africa	April 15, 2023	Mar 31–Apr 30, 2023	Mar 16–May 15, 2023	Oct 16, 2022–Oct 11, 2023
Mexico	May 10, 2023	Apr 25–May 25, 2023	Apr 10–June 9, 2023	Nov 11, 2022–Nov 6, 2023

Source: *Author's Compilation*

Appendix B: Graph- pre and post AR country-wise



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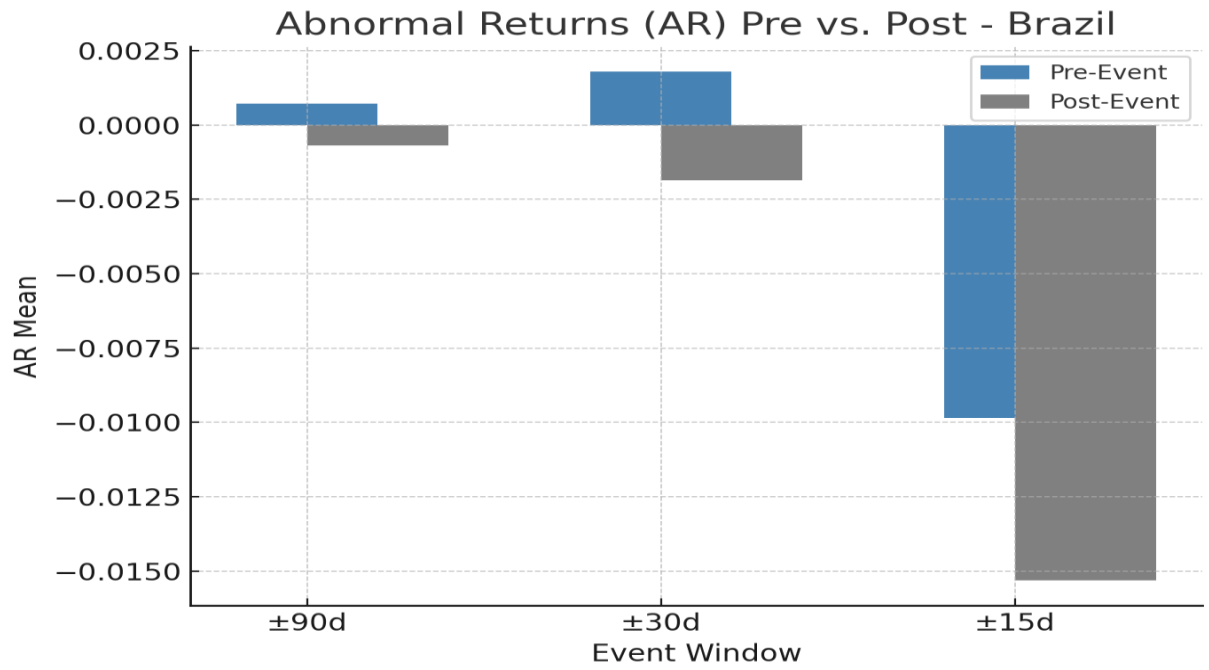

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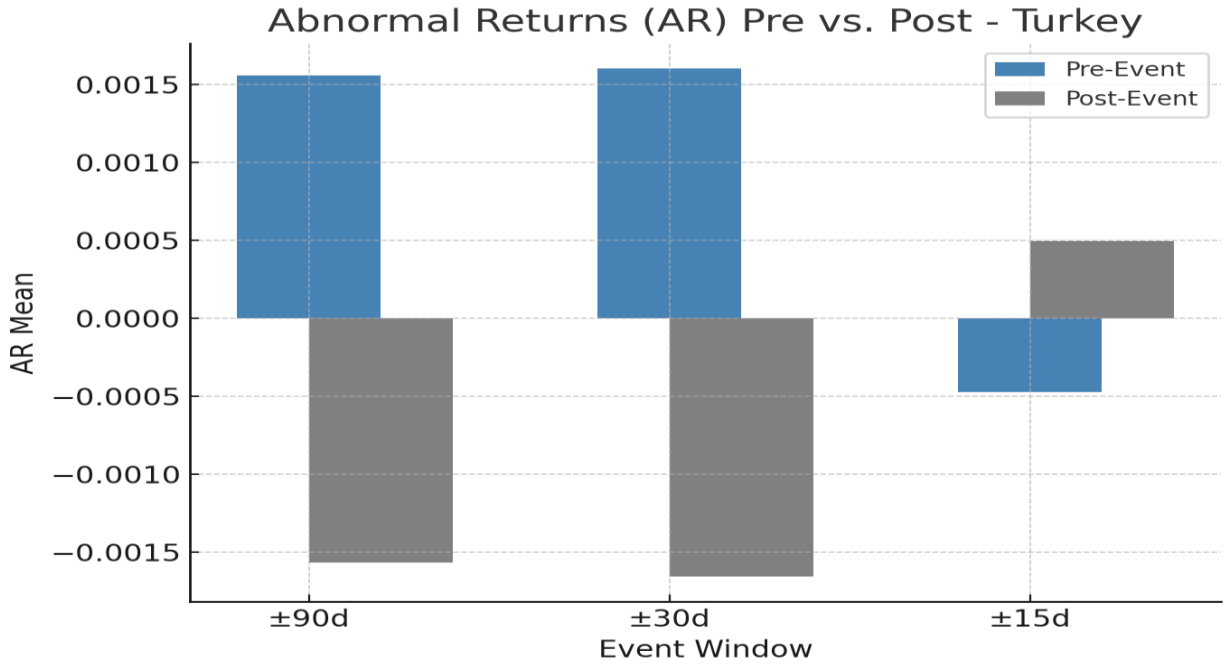

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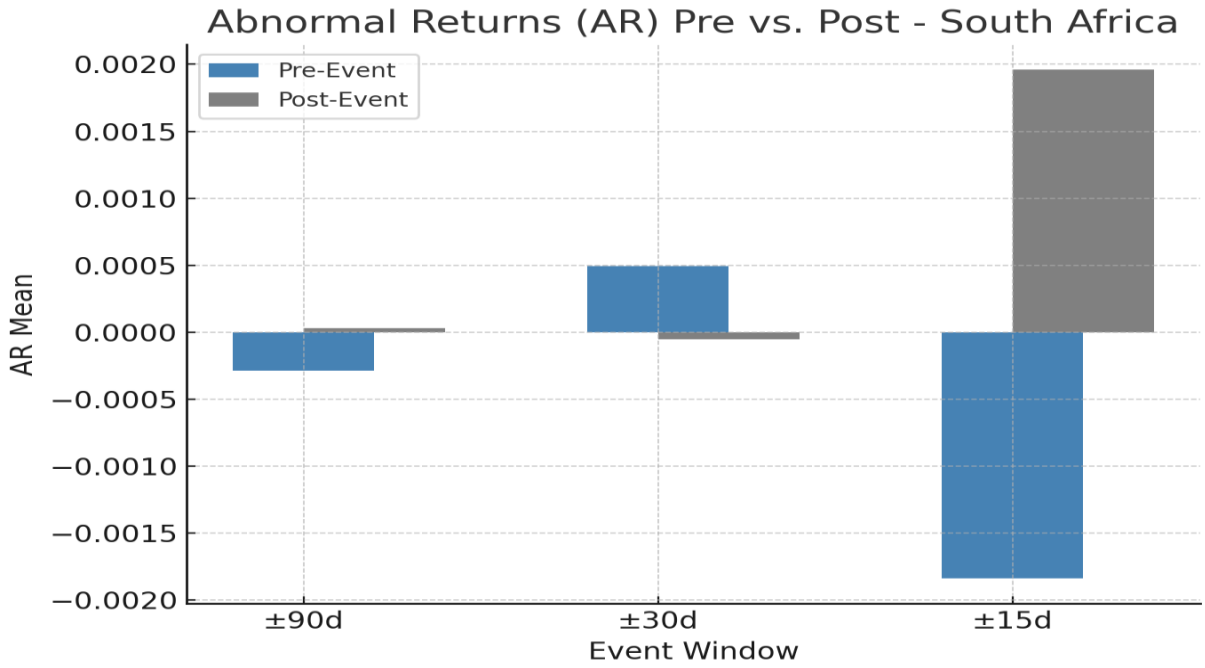

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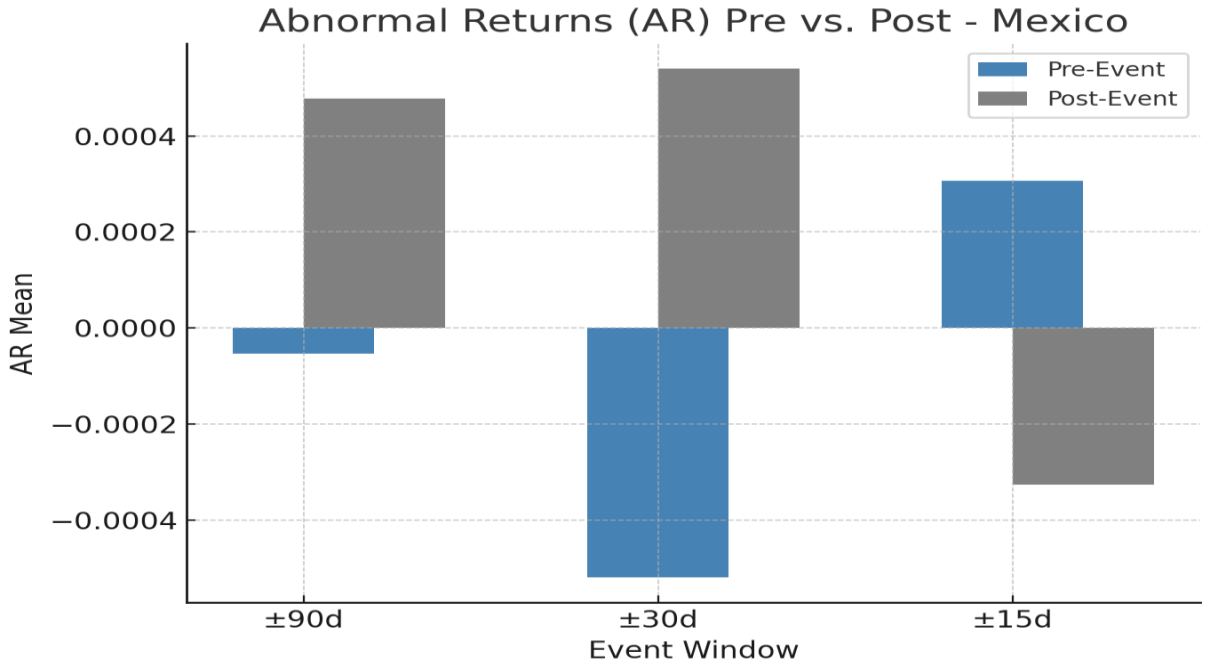

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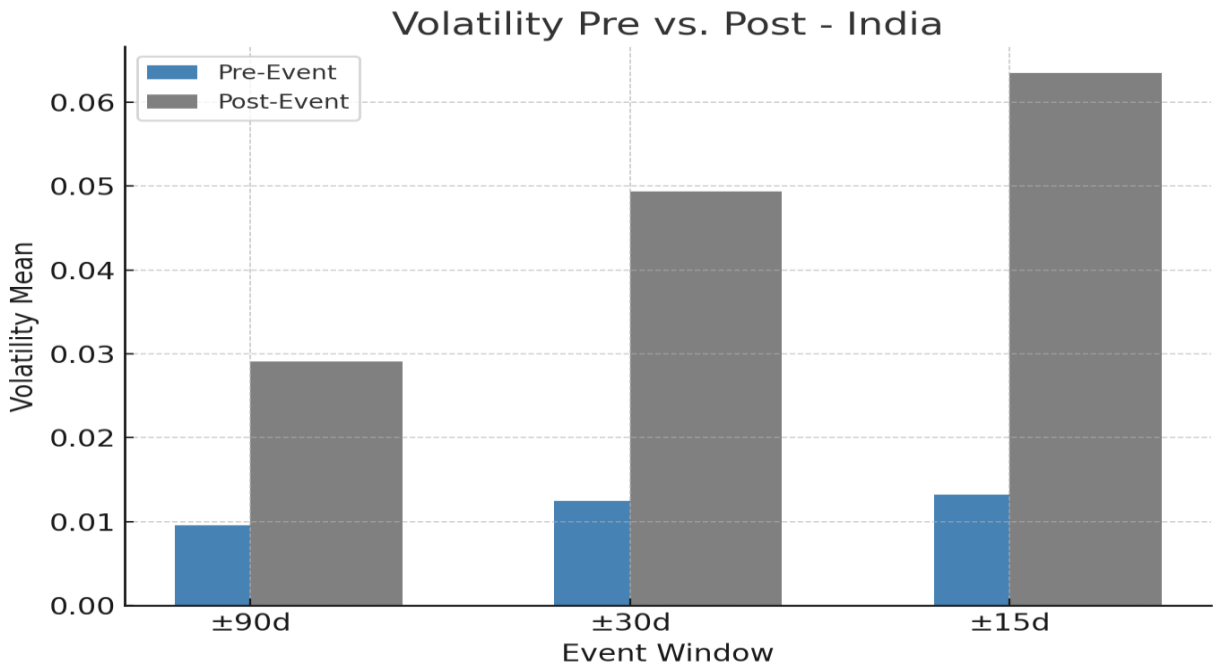
Appendix C: Graph- pre and post Volatility country-wise



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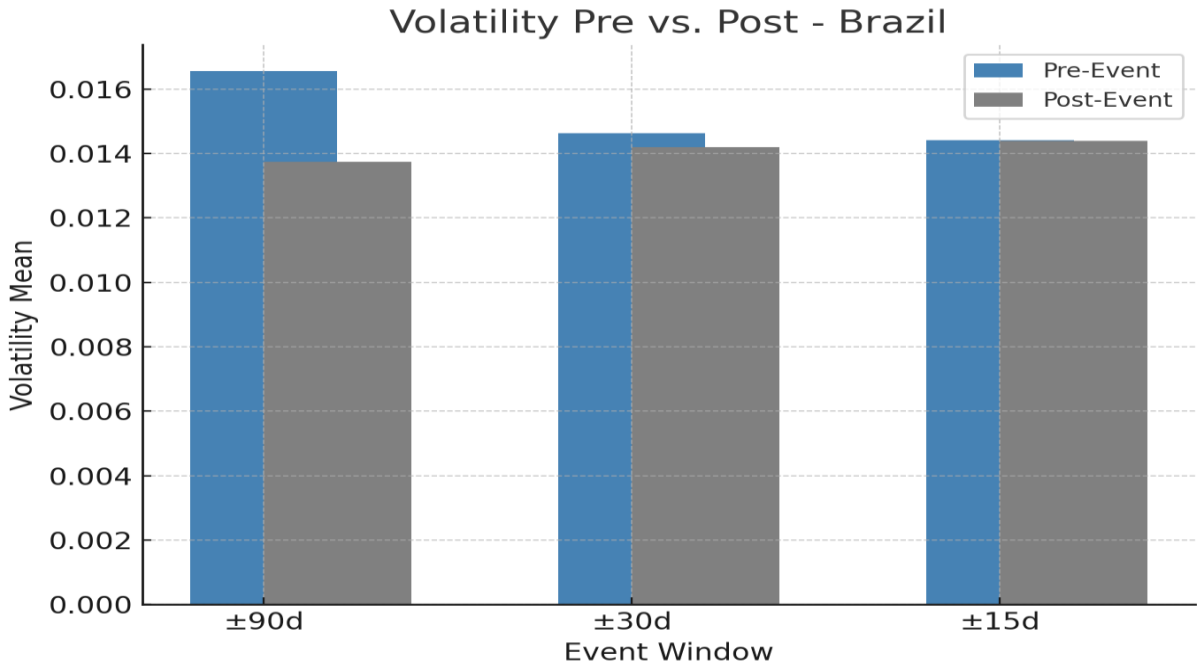

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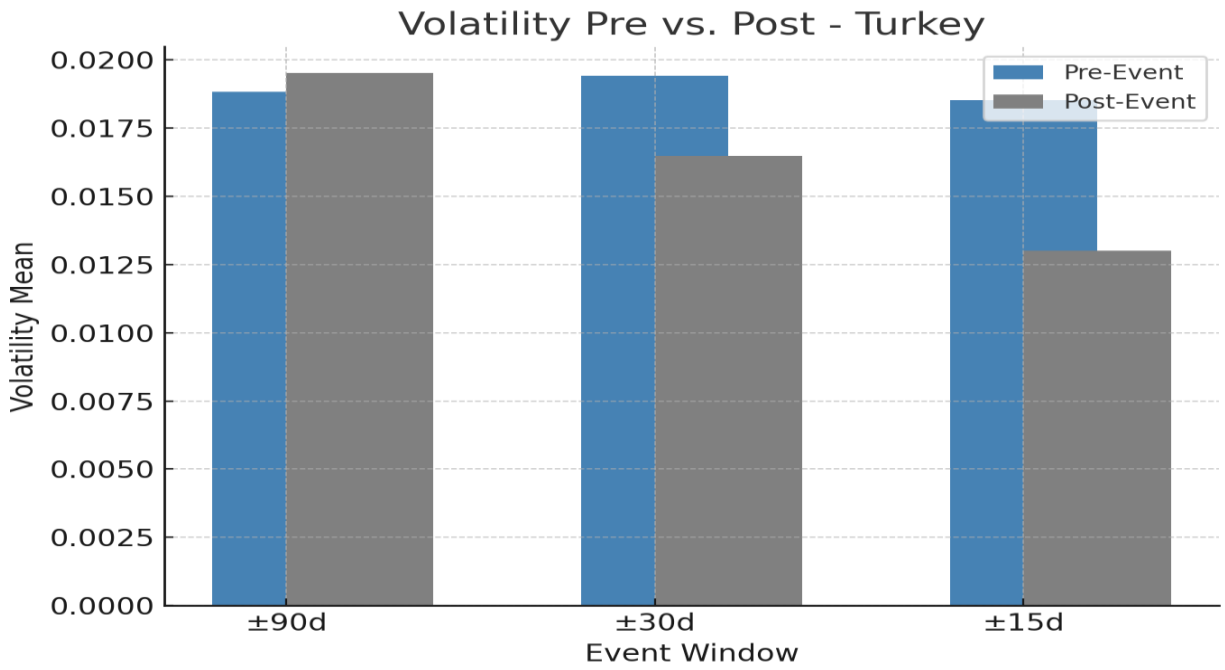

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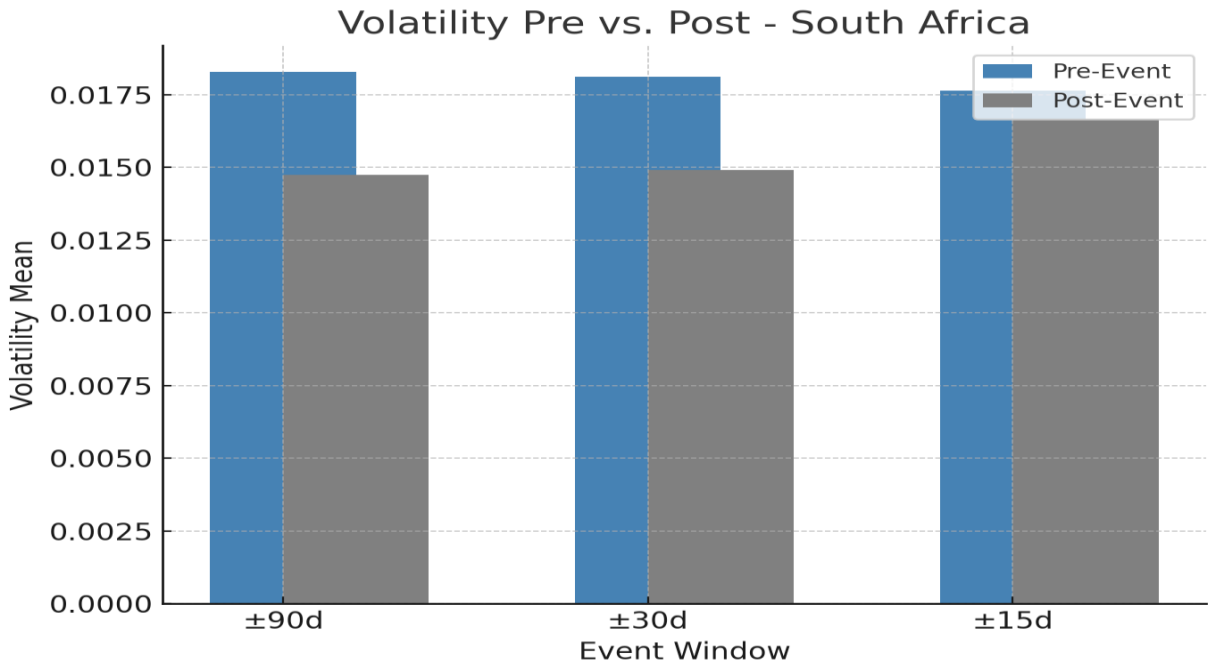

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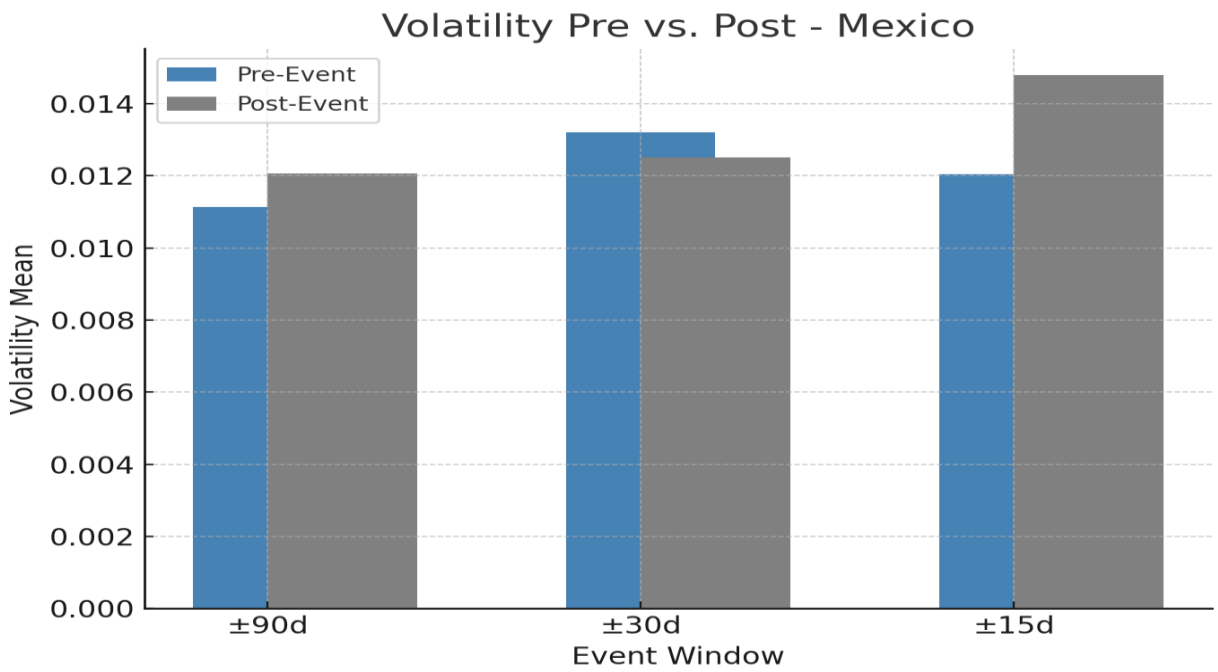

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