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Store of value or speculative investment? Market reaction to corporate announcements of cryptocurrency acquisition

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Abstract

In this study, we analyze the stock market reaction to 35 events associated with 32 publicly traded companies from six countries that have announced cryptocurrency acquisitions, selling, or acceptance as a means of payment. Our analysis focuses on traditional firms whose core business is unrelated to blockchain or cryptocurrency. We find that the aggregate market reaction around these events is slightly positive but statistically insignificant for most event windows. However, when we perform heterogeneity analyses, we observe significant differences in market reaction between events with high (larger CARs) and low cryptocurrency exposure (lower CARs). Multivariate regressions show that the level of exposure to cryptocurrency ("skin in the game") is a critical factor underlying abnormal returns around the event. Further analyses reveal that economically meaningful acquisitions of BTC or ETH (relative to firm's total assets) drive the observed effect. Our findings have important implications for managers, investors, and analysts as they shed light on the relationship between cryptocurrency adoption and firm value.

Keywords: Corporate cryptocurrency acquisition, Bitcoin, Cryptocurrency, Blockchain, Market reaction

JEL Classification: G31, G32, G14, G11

Introduction

> *In January 2021, we updated our investment policy to provide us with more flexibility to further diversify and maximize returns on our cash that is not required to maintain adequate operating liquidity. As part of the policy, we may invest a portion of such cash in certain specified alternative reserve assets. Thereafter, we invested an aggregate $1.50 billion in bitcoin under this policy.*
> *Tesla, Inc. (2021) Form 10-K, Part II, Item 7, management's discussion and analysis of financial condition and results of operations.*

The rise of disruptive technologies has often led to corporate value creation and wealth generation. Recently, the adoption of cryptocurrency and other digital assets by institutional investors has brought the crypto space closer to the mainstream (Hamlin 2021).

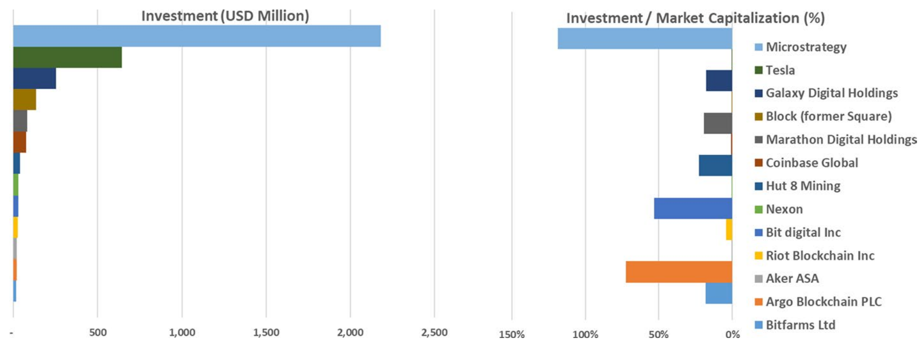

Fig. 1 Publicly traded companies with the most prominent positions in bitcoin. Source: Authors' elaboration, based on data from cryptotreasuries.org and Bloomberg (Dec./2022)

However, companies have only recently started investing in cryptocurrency to manage excess cash and increase exposition to digital assets. The net present value of such corporate decisions is ex-ante unclear; while they can hedge against inflationary risks (Dyhrberg 2016; Blau et al. 2021; Choi and Shin 2021) and provide higher returns on excess cash than traditional fiat currencies (Umar et al. 2021), they are also more volatile and subject to regulatory and cyber risks (Caporale et al. 2021). Therefore, assessing the market reaction to corporate announcements of cryptocurrency investments and divestments is crucial for understanding the relationship between crypto adoption and firm value.

Corporate investments in cryptocurrency have become a recent trend in many countries, especially since Tesla announced in early 2021 that it had invested $1.5 billion in bitcoin (BTC) as part of a new policy to manage excess cash.[1] As shown in Fig. 1, which displays the publicly traded companies with the most prominent bitcoin positions as of December 2022, we observe a significant cross-sectional variability in the exposure to cryptocurrency among these companies. On the left side of the figure, we show the amount invested in millions of dollars, while the right side displays the ratio between the investment's value and each company's market capitalization. MicroStrategy, the company with the largest BTC position, also has the most substantial investment in relative terms. In contrast, despite being the second-largest company regarding announced investments in cryptocurrency, Tesla has a relatively low investment compared to its market value. We will explore this feature further in this paper.

Several studies have explored the relationship between companies and blockchain technology by examining market reactions to announcements of investment projects related to decentralized networks (Adhami et al. 2018; Giudici and Rossi-Lamastra 2018). Some studies including Autore et al. (2021) have separately classified companies with investment plans in early or advanced stages and found a positive market reaction around the event date. However, the effect is only permanent for credible, advanced-stage projects. Other studies have attempted to quantify price fluctuations around corporate news related to changes in the company's name, exploring associations with blockchain technology (Jain and Jain 2019; Cahill et al. 2020). Jain and Jain (2019)

[1] Source: https://www.wsj.com/articles/tesla-buys-1-5-billion-in-bitcoin-11612791688.

analyzed companies that added Bitcoin or blockchain to their name and found positive abnormal returns in the short term and negative abnormal returns in the long term. Additionally, Akyildirim et al. (2020) used the event study technique and discovered positive, persistent cumulative abnormal returns (CARs) for companies that changed their name to a blockchain-related denomination.

Specifically concerning cryptocurrencies, one of the many Blockchain applications, the literature presents research evaluating the adoption of crypto assets by institutional (see, e.g., Bialkowski 2020) and retail investors (see, e.g., Platanakis and Urquhart 2020; Colombo et al. 2021). These studies suggest that cryptocurrencies offer significant diversification benefits due to their high average historical returns and low correlation with traditional assets (Bouri et al. 2017; Zend et al. 2020; Aharon and Demir 2021; Yousaf et al. 2022). However, it is worth noting that the hedge and safe-haven properties of cryptocurrencies have been called into question both before (Klein et al. 2018) and after the COVID-19 pandemic (Conlon and McGee 2020; Caferra and Vidal-Tomás, 2021). Therefore, whether corporate acquisition of cryptocurrencies creates value or not is an empirical question due to inconclusive findings.

While there is extensive empirical evidence on crypto-asset adoption by retail and institutional investors, there is currently no research that examines the effects of such adoption from the perspective of corporate investors. There could be several reasons for the lack of studies in this area. Firstly, corporate investment in cryptocurrencies is a relatively new phenomenon. Secondly, publicly traded companies may be hesitant to invest in Bitcoin and other cryptocurrencies owing to increased scrutiny by auditors and regulators. Despite the potential reasons, the adoption of cryptocurrencies by corporations is of practical importance, and there is a gap in academic research that needs to be filled.

To fill the literature gap mentioned earlier, we have conducted an event study analysis to examine the response of publicly traded companies to cryptocurrency-related announcements. Our dataset includes 35 events associated with 32 listed companies from major stock markets, such as New York, London, Toronto, Oslo, Hong Kong, Tokyo, and São Paulo, spanning from 2014 to 2022. We have classified the corporate cryptocurrency announcements into three groups: acquisition/investment, selling/divestment, and acceptance as a means of payment. Our empirical approach involves estimating the abnormal returns around each event using the market model approach. We then test the statistical significance of cumulative average abnormal returns (CAARs) around the events and analyze whether firm, industry, and market-level factors determine the CARs. Finally, we explore cross-sectional variation in the degree of exposure to cryptocurrency to analyze heterogeneous market responses.

The results of our study reveal that the cumulative abnormal returns around cryptocurrency-related corporate events are generally slightly positive but statistically indistinguishable from zero. Thus, at the aggregate level, our findings suggest that corporate announcements of cryptocurrency adoption are, on average, neither value-increasing nor value-decreasing. Using the CARs as dependent variables in linear regression models, we discovered that tech firms experience more significant abnormal returns than non-tech firms, mainly in the financial or retail sectors.

We also analyzed potential heterogeneity in market reaction across different levels of cryptocurrency exposure. To do this, we classified events into low, medium, or high degrees of exposure to cryptocurrency using the USD amount of BTC or ETH acquisition/divestment relative to the total assets of the firm and a qualitative assessment of the news content for indirect crypto investments (such as the acquisition of a crypto firm) and acceptance as a means of payment (intention vs. effective acceptance of cryptocurrency). We found a remarkable difference in CARs for high (ranging from 3.63 to 7.97 percentage points [p.p.]) and low-cryptocurrency exposure events (ranging from −1.57 to −5.15 p.p.). Multivariate regressions confirmed that the high (low) degree of cryptocurrency exposure dummy is a positive (negative) and statistically significant regressor that explains the CARs. Robustness analyses revealed that such a result stems from the subset of events where we have an objective, market-based metric of "skin in the game." Moreover, further analyses revealed that the results are not driven by extreme, tail CARs. Although limited by the sample size (N = 35), our evidence suggests that the extent to which a firm is exposed to cryptocurrency is critical to understanding how the market reacts to the announcement. Such a pattern corroborates the findings of Autore et al. (2021), which demonstrated that the market reaction differs significantly between credible and non-credible corporate blockchain investments.

Our research contributes to a better understanding of the role of cryptocurrencies for corporations, which can help managers, analysts, and investors comprehend the consequences of crypto-related corporate announcements. Additionally, this study adds to a growing literature that deals with corporate association with blockchain (Cheng et al. 2019; Jain & Jain 2019; Akyildirim et al. 2020; Autore et al. 2021; Chen et al. 2022; Ali et al. 2023), a technology that has the potential to transform businesses (Cheg et al. 2021).

The rest of the paper is structured as follows: Sect. 2 describes the data and methodology used in this study, Sect. "Results and discussion" presents the results of our analysis, and Sect. 4 concludes with a summary of the findings and their implications.

Data and methodology

Data selection and event definition

Our analysis focuses on cryptocurrency-related events associated with public domestic and foreign companies listed on a stock exchange. To gauge the impact of cryptocurrency exposure on traditional firms, we limit our analysis to companies whose core business is unrelated to blockchain technology or the management of cryptocurrencies/digital assets (i.e., "traditional companies"). As a result, we exclude digital asset management firms, crypto mining companies, and crypto exchanges from the sample as these crypto-related firms could bias our analysis.[2] We identify cryptocurrency-related events in three categories of corporate announcements: investment (such as the acquisition of currency or crypto-related companies), acceptance as a form of payment, and divestment (such as selling cryptos or tokens or discontinuing the endorsement as a means of payment).

We obtained our dataset from various sources, including Bloomberg (for stock prices, volumes, and market capitalization), Thomson Reuters, and specialized websites (such

[2] For these firms, the impact on corporate value is fundamentally different from other companies because their core business is related to cryptocurrency.

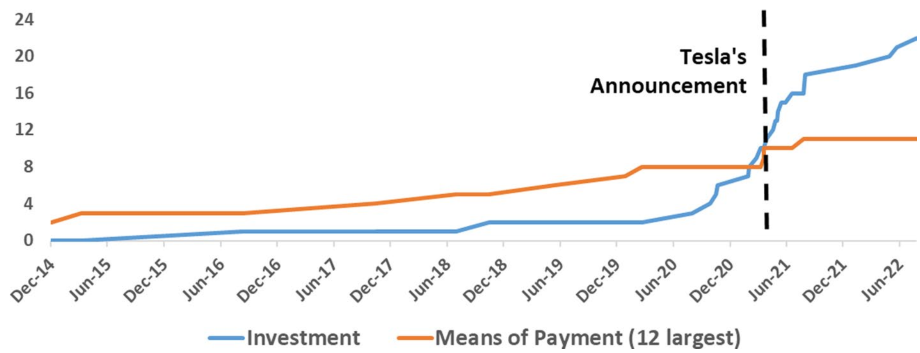

Fig. 2 Publicly Traded Companies Investing in Cryptocurrencies. Note: This Figure shows the number of publicly traded companies adhering to cryptocurrencies over time. Such exposition is divided into investment throughout acquisitions (blue line) and acceptance as means of payment (orange line). The steeper slope, starting in early 2021, coincides with Tesla's announcement of investing USD 1.5 billion worth of bitcoin under the new policy of diversifying and maximizing returns on excess cash (the fraction of cash that is not required to maintain the company's operations). Source: authors' elaboration

as Cryptotreasuries.org, Cointelegraph.com, Bitcoinmagazine.com, among others, to search for corporate announcements related to cryptocurrency). We also searched for Twitter posts linked to company announcements and official statements from investor relations sites. Our sample period ranges from January 2014 to December 2022. Following our procedure, we identified 35 events associated with 32 companies traded on stock exchanges in New York, London, Toronto, Oslo, Hong Kong, Tokyo, and São Paulo. Prices are collected in U.S. dollars, and log returns were calculated for each stock and reference index (S&P 500, FTSE100, TSX, OSEBX, HSI, Nikkei225, and Ibovespa, respectively). Appendix A provides a complete list of the 35 events considered in this study.

An important issue in our study relates to the determination of the effective date of the event. In most cases, we found that the date on which the cryptocurrency-related event occurred was not explicitly disclosed by the company through relevant filings with regulatory authorities (e.g. SEC *filings*), appearing only in its financial statement disclosures. Therefore, we determined the event date as the first news published on that fact.

Figure 2 displays the number of publicly traded companies that have added cryptocurrency to their balance sheets, either through acquisitions or by accepting it as a means of payment. For companies that began accepting cryptocurrency as a means of payment, we focused on the 12 largest corporations. We excluded those that converted cryptocurrency into fiat currency when they received payments because they are not exposed to price fluctuations in crypto assets.

Event windows and estimation of abnormal returns

We employ the event study method to estimate the market reaction to corporate announcements of cryptocurrency-related events (see Mackinlay 1997, and further references). First, we estimate expected returns using stock market information from 126 days before the start of the anticipation period (21 days before the event). In addition, to the estimating window, we also consider pre-event (from 21 days before the event to the day of the event) and post-event windows (from the day of the event to

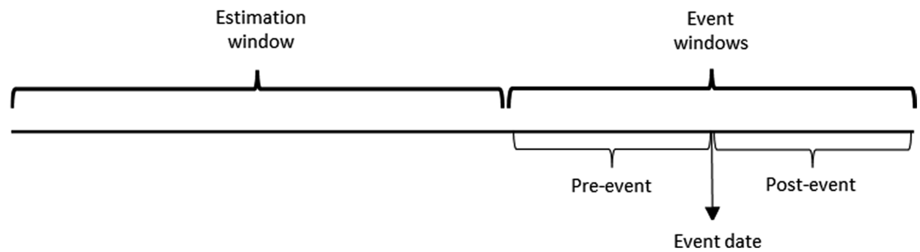

Fig. 3 Flow of the estimation period and observation period of abnormal returns. Note: the estimation, pre-, and post-event windows comprehend 126, 21, and 21 days, respectively. Source: authors' elaboration

21 days after). By using these distinct windows, we ensure that there is no overlap between them, as illustrated in Fig. 3.

To assess the potential abnormal market movements before, during, and after the announcement of each event, we estimate abnormal returns on the day of the event [0;0] and cumulative abnormal returns at various windows ([− 1;1], [− 2;2], [− 5;5], [0;1], and [0;3]). While we include other pre-, during, and post-event windows in our analyses, we focus on these six windows because the marginal benefit of adding other event windows proved to be minimal.[3] Furthermore, these core event windows follow previous studies (e.g., Autore et al. 2021).

As previously stated, we collect all stock prices in U.S. dollars and calculate daily log returns. Next, we estimate "normal return" by conducting OLS regressions of each stock's returns against the returns of the core index of the Stock Exchange where the stock is traded on a 126-working day window. In other words, we estimate the alpha (intercept) and beta (regression slope) parameters for each stock using the market model, as illustrated in Eq. 1.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

where R_{it}: Return of stock i on day t, R_{mt}: Return of the market portfolio index on day t, α_i: Alpha parameter of stock i, β $_{\mathrm{i}}$: Beta parameter of stock i, ε_{it} : Random error term of stock i on day t, with $\mathrm{E}(\varepsilon_{it\ \mathrm{it}}) = 0$ and $\sigma^2(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}$

We project the estimated parameters from Eq. (1) ($\widehat{\alpha}_i$ and $\widehat{\beta}_i$) to the event window along with the observed market index returns. This allows us to obtain an estimator for each stock's expected "normal" return. The subsequent step is to calculate the abnormal return (A.R.) of each stock as the residual term of the market model (Mackinlay 1997):

$$AR_{it} = R_{it} - \widehat{\alpha}_i - \widehat{\beta}_i R_{mt} \tag{2}$$

where AR_{it} measures the difference between the observed and the expected return. Before aggregating A.R.s on the time dimension, we standardize these returns using the standard deviation of the estimation period, adjusted to the observation window (Eq. 3).

$$SAR_{it} = \frac{AR_{it}}{\sigma_i \times \sqrt{n_i}} \tag{3}$$

[3] A previous version of this paper analyzed CARs at nineteen-time windows. However, because the results are similar across these alternative event windows, we restricted the analysis to six of the most used time spams in event studies.

where SAR_{it} refers to the standardized (scaled) abnormal returns. After that, we estimate the CARs by summing the SARs over time for each firm using Eq. 4. The date of the event is a particular case with a single day in the sample (n = 1) and is included as a window.

$$CAR_i(t1, tn) = \sum_{t=t1}^{tn} SAR_{it} \tag{4}$$

where $CAR_i(t1, tn)$: CAR of stock i between t = 1 and t = n, t: tth day in the event window, n: number of days in the event window.

Finally, apart from the time dimension, we also aggregate returns on the cross-sectional dimension. To be specific, we compute the standardized average abnormal return (SAAR) for period t using the following formula:

$$SAAR_t = \frac{1}{N} \sum_{i=1}^{N} SAR_{it} \tag{5}$$

where N denotes the number of cross-sectional observations (i.e., i = 1,…,N stocks), and the standardization approach follows the one shown in Eq. (3). Next, we sum the SAAR values for different days within the event window to derive the CAARs:

$$CAAR(t1, tn) = \sum_{t=t1}^{tn} SAAR_t \tag{6}$$

where t = t1,…,tn refers to the length of the event window used to calculate that specific CAAR.

To begin with, we examine the trend of cumulative average abnormal returns stratified by event type. Figure 4 illustrates the trend of CAARs starting from five working days prior to the event. The data is segregated into three categories: *means of payment*, *divestment*, and *total* (which includes all events).[4] From this graphical representation, it is apparent that companies in all categories exhibit nearly-zero abnormal returns. However, on the day of the event and the following day, there seems to be a positive market reaction for the investment and total categories. Given that this is an initial exploration of the data, we refrain from analyzing t-stats and p-values to evaluate the statistical significance of the results.

Hypothesis testing

Regarding statistical analyses, parametric tests of hypotheses assume normality of the distributions of observations, which may not hold for small sample sizes. Given that we analyze a small sample of only 35 events, we employ several additional tests besides the t-test. These include the crude dependence adjustment test (CDA), the Patell test of standardized residuals, the adjusted Patell test of standardized residuals, the Corrado

[4] Divestments are excluded from the Figure because this category has only two events (Tesla and Ruffer). However, these events are part of the *Total* category.

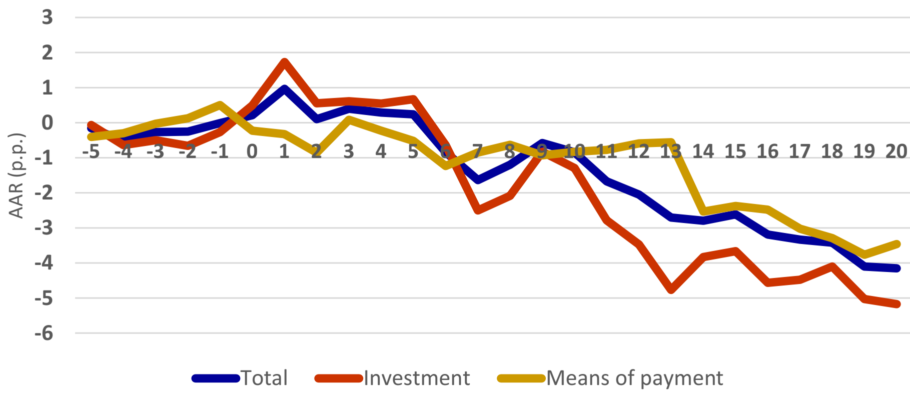

Fig. 4 Evolution of cumulative average abnormal returns (CAARs) for monitoring windows. Notes: Average cumulative daily returns for 5 days before each event up to 20 days after the event, stratified by the type of event. Source: authors' elaboration, based on data from Bloomberg

rank test, the generalized sign test, and the Wilcoxon signed-ranks test. These tests are widely used in event studies, as described in the literature (e.g., see Agarwal et al. 2013; Kaspereit 2021, for a review of the most common test statistics used in event studies in finance, accounting, and management).

Determinants of cumulative abnormal returns (CARs)

After conducting both parametric and non-parametric tests of hypotheses, we adopt a multivariate regression approach to investigate whether abnormal returns calculated in different windows are associated with firm, industry, and market-level variables. To this end, we collect the following firm-level data immediately before the event: market capitalization (Ln(Market Capitalization)), cumulative log-returns over 21 days preceding the event (Ln(Prior Return)), the ratio of cash to assets (Cash/Assets), and a proxy for investment opportunities (Price/Book). To account for market-specific fluctuations that could impact the CARs, we incorporate the 6-week cumulative log-return of Bitcoin in the pre-event period (Ln(Past BTC Return)) as a regressor. Following Autore et al. (2020) and Chen et al. (2022), we also add a binary indicator to identify tech sector firms, whose market reaction may differ from the other sample firms (Tech Firms Dummy).[5] We additionally include a dummy variable to control for financial firms (Financial Firms Dummy), so our baseline sectoral category consists of non-financial, non-tech firms.[6] Finally, we include country-fixed effects in the regression to account for potential systematic differences between stock market or jurisdictional levels that may affect abnormal returns.[7] Specifically, the regression we estimate is as follows:

[5] For example, tech firms have larger investment opportunities than retail firms, on average. Furthermore, the asset structure of tech firms is also likely to be different since they disproportionately rely on human capital. Thus, firm-level technological orientation may be relevant to explain the CARs in our sample.

[6] The baseline sectoral category comprises Consumer Cyclical (N = 11), Telecom Services (N = 6), and Industrials (N = 1).

[7] The country dummies absorb any systematic jurisdiction or market differences that are not reflected in the country market index and may affect CARs. We thank an anonymous referee for the suggestion. Results are similar if we exclude these dummies.

$$
\begin{aligned}
CAR(t1, tn)_{ijc} =& \alpha_0 + \beta_1 Tech\_Firms\_Dummy_{ijc} \\
&+ \beta_2 Financial\_Firms\_Dummy_{ijc} \\
&+ \beta_3 Investment\_Dummy_{ijc} \\
&+ \sum_k \delta_k X_{ijc}^k + \theta_c + \varepsilon_{ijc}
\end{aligned} \tag{7}
$$

where the dependent variable $CAR(t1, tn)_{ijc}$ indicates the cumulative abnormal return for the interval $(t1, tn)$ of firm i in the industry j in the country c. *Investment_Dummy* equals one if the type of event is investment/acquisition and zero otherwise (i.e., means of payments or divestment). Tech Firms Dummy and Financial Firms Dummy indicate sectoral characteristics. X is the vector of firm and market-level regressors, including Ln(Market Capitalization), Ln(Prior Return), Cash/Assets, Price/Book, and Ln(Past BTC Return). θ_c denotes country-fixed effects. To examine whether market responses depend on the degree of exposure to cryptocurrency (i.e., "skin in the game"), we add two separate dummy variables to Eq. (7):

$$
\begin{aligned}
CAR(t1, tn)_{ijc} =& \alpha_0 + \gamma_1 High\_Exposure\_Dummy_{ijc} \\
&+ \beta_1 Tech\_Firms\_Dummy_{ijc} \\
&+ \beta_2 Financial\_Firms\_Dummy_{ijc} \\
&+ \beta_3 Investment\_Dummy_{ijc} \\
&+ \sum_k \delta_k X_{ijc}^k + \theta_c + \varepsilon_{ijc}
\end{aligned} \tag{8}
$$

$$
\begin{aligned}
CAR(t1, tn)_{ijc} =& \alpha_0 + \gamma_2 Low\_Exposure\_Dummy_{ijc} + \\
&+ \beta_1 Tech\_Firms\_Dummy_{ijc} \\
&+ \beta_2 Financial\_Firms\_Dummy_{ijc} \\
&+ \beta_3 Investment\_Dummy_{ijc} \\
&+ \sum_k \delta_k X_{ijc}^k + \theta_c + \varepsilon_{ijc} +
\end{aligned} \tag{9}
$$

where $High\_Exposure\_Dummy_{ijc}$ and $Low\_Exposure\_Dummy_{ijc}$ are dummy variables equal to one if the event is classified as high or low exposure to cryptocurrency, respectively, and zero otherwise. We provide the systematic approach used to classify events in high, medium, or low exposure to cryptocurrency in Sect. 3.4—Heterogeneity Analysis.

Results and discussion

Prior to examining the market reaction to corporate announcements of investments, divestments, or acceptance of cryptocurrency for payments, we investigate whether firms attempt to "time" the market. Table 1 presents the 5-day cumulative Bitcoin returns immediately preceding each investment announcement (N=21) or acceptance as a means of payment (N=12). As shown in the table, 60.6% (20/33) of the investment or acceptance announcements occur during periods of positive fluctuations in BTC prices.[8] In other words, corporations are more

[8] We have also made this analysis using the CCi30 (a rules-based index designed to objectively measure the overall growth, daily and long-term movement of the Blockchain sector) as benchmark, and the conclusions remain. However, since the referred index starts in 2015, it is impossible to compare earlier events in our sample (like Microsoft and Newegg).

Table 1 Weekly return of bitcoin, verified 5 days before each investment or acceptance as means of payment event

Company	Prior BTC return	Company	Prior BTC return	Company	Prior BTC return (%)
AT&T	24%	JP Morgan	4%	Mercado_Livre (2)	− 1
Xiaomi	21%	Tesla	4%	Visa	− 2
Mastercard	21%	BlackRock	3%	Metromile	− 3
Meitu	17%	Chipotle	3%	AMC	− 3
Rakuten	16%	Microstrategy	3%	Paypal	− 4
Overstock	15%	FRMO	2%	Newegg	− 4
Ruffer	13%	Mercado Livre	2%	Starbucks	− 6
Phunware	6%	RBI Inc	1%	Nexon	− 12
BMW	6%	Microsoft	0%	Aker ASA	− 19
Brook	5%	Oracle	− 1%	Meliuz	− 22
Square	5%	Townsquare	− 1%	Globant	− 28
Positive returns	20	Negative returns	13		

Sample excludes divestment announcements (N = 2)

Source: Authors' elaboration

likely to announce that they are exposed to cryptocurrency when the crypto market is performing well. This suggestive evidence supports the hypothesis that managers attempt to time the market, a well-documented phenomenon in corporate debt and equity issuances (see, for example, Berk and DeMarzo 2020).

Individual cumulative abnormal returns (CARs)

Table 2 displays the cumulative abnormal returns (CARs) for each stock in different windows around the event date, namely pre-event, post-event, and total period. We present the results in order of the event type: investment, acceptance as a means of payment, and divestment. Overall, the evidence is inconclusive, and no clear pattern emerges. Regarding the investment group, we highlight the positive results obtained for MicroStrategy on the day of the event and in other event windows, particularly [0;1] and [0;3]. This strong reaction may be because of the fact that MicroStrategy made the most substantial investments in cryptocurrency among all the corporations analyzed (in relative terms, as shown in Fig. 1), and the event garnered significant attention in the market. Additionally, while The Brooker Group had significantly positive returns, Metromile showed an adverse market reaction in several windows.

In the group of firms that announced acceptance of cryptocurrency as a means of payment, no particular event stands out. The only statistically significant return was observed for BMW on the day of the event (+ 2.5 p.p.). Overall, this group exhibited slightly negative CAARs across all event windows.

Parametric and non-parametric hypotheses tests on the cumulative average abnormal returns (CAARs)

To assess the statistical significance of returns, we use the parametric and non-parametric tests described in Sect. 2.3. Table 3 reports the results for the various periods analyzed, including AAR[0] and several CAARs around the event date. In addition to

Table 2 Cumulative abnormal returns for each event in different windows

Company	Event category	Event window					
		[0,0]	**[− 1,1]**	**[− 2,2]**	**[− 5,5]**	**[0,1]**	**[0,3]**
FRMO Corporation	Investment (N = 21)	− 5.3	3.5	3.5	3.2	3.2	− 0.1
AMC Entertainment Holdings		− 5.8	− 3.1	− 3.1	− 0.8	− 0.8	5.6
JPMorgan Chase & Co		− 2.5	− 2.4	− 2.4	− 2.9	− 2.9	6.4
Mastercard Incorporated		0.5	1.4	1.4	− 1.0	− 1.0	− 1.7
Meitu		− 4.5	2.0	2.0	− 3.2	− 3.2	− 3.6
MercadoLibre		0.6	− 6.4	− 6.4	− 4.4	− 4.4	− 13.1
MercadoLibre_2		4.1	0.7	0.7	− 1.7	− 1.7	− 3.5
Metromile		− 3.2	**− 36.6**	**− 36.6**	**− 30.9**	− 30.9	− 42.5
MicroStrategy Incorporated		**10.4**	10.5	10.5	11.1	**11.1**	**11.8**
Méliuz S.A		− 1.9	− 0.2	− 0.2	3.2	3.2	− 4.9
NEXON Co		0.0	− 0.5	− 0.5	− 0.2	− 0.2	3.0
Oracle Corporation		0.5	2.9	2.9	3.5	3.5	6.7
Phunware		11.1	20.5	20.5	13.4	13.4	1.0
Ruffer Investment Company Limited		− 1.3	0.0	0.0	1.9	1.9	3.3
Aker ASA		− 1.5	− 1.2	− 1.2	− 2.5	− 2.5	− 2.6
Tesla		0.4	− 1.7	− 1.7	− 8.6	− 8.6	− 4.7
The Brooker Group Public Company Limited		**18.5**	**61.4**	**61.4**	**46.2**	**46.2**	**34.9**
Townsquare Media		− 6.1	− 3.3	− 3.3	− 0.4	− 0.4	2.6
BlackRock		0.4	1.9	1.9	1.4	1.4	6.4
Block		1.3	2.8	2.8	− 2.4	− 2.4	10.1
Globant S.A		0.2	− 2.1	− 2.1	− 2.8	− 2.8	− 1.0
Avg. of "Investment"		0.76	2.39	2.39	1.05	1.05	0.67
Microsoft Corporation	Acceptance as Means of Payment (N = 12)	0.1	1.0	1.0	0.7	0.7	− 0.6
AT&T Inc		1.2	1.5	1.5	1.1	1.1	5.2
Newegg Commerce		− 5.9	− 3.9	− 3.9	− 8.9	− 8.9	− 11.3
Overstock.com		− 0.9	− 0.6	− 0.6	− 4.8	− 4.8	− 5.1
PayPal Holdings		0.5	− 0.1	− 0.1	1.7	1.7	1.2
Rakuten Group		− 0.3	− 0.8	− 0.8	3.0	3.0	4.5
Restaurant Brands International Inc		− 2.6	− 1.8	− 1.8	− 3.9	− 3.9	− 5.1
Starbucks Corporation		− 1.6	− 4.1	− 4.1	− 3.1	− 3.1	0.9
Visa Inc		1.1	1.4	1.4	− 0.4	− 0.4	2.1
Xiaomi Corporation		− 1.2	1.8	1.8	3.8	3.8	0.7
BMW		**2.5**	2.0	2.0	0.7	0.7	− 0.2
Chipotle Mexican Grill		− 1.3	− 1.9	− 1.9	0.2	0.2	1.6
Avg. of "Acceptance as means of payment"		− 0.73	− 0.45	− 0.45	− 0.82	− 0.82	− 0.52
Tesla_Out	Divestment (N = 2)	0.4	− 2.2	− 2.2	0.7	0.7	2.6
Ruffer_Out		0.2	0.2	0.2	0.0	0.0	− 2.1
Avg. of "Divestment"		0.32	− 1.00	− 1.00	0.35	0.35	0.26
Avg. of all categories		0.22	1.22	1.22	0.37	0.37	0.24

Bold numbers indicate statistical significance at least at the 10% level

Table 3 Hypothesis tests applied to different event windows, full sample and stratification by type of event

Event group	Event window	CAAR	Test						
			t-test	***CDA***	***Patell***	***PatellADJ***	***Corrado-Cowan***	***GenSign***	***Wilcox***
All events (N = 35)	AAR[0]	0.223	0.78	0.77	0.26	0.23	0.51	0.51	0.49
	[− 1;1]	1.222	0.37	0.36	**0.01**	**0.00**	0.53	0.98	0.69
	[− 2;2]	0.37	0.83	0.83	0.13	0.11	0.77	0.98	0.75
	[− 5;5]	0.24	0.93	0.92	0.10	**0.08**	0.75	0.51	0.98
	[0;1]	0.978	0.38	0.37	**0.03**	**0.02**	0.88	0.49	0.90
	[0;3]	0.407	0.80	0.79	0.13	0.11	0.61	0.72	0.70
Investment/Acquisition (N = 21)	AAR[0]	0.758	0.54	0.54	0.13	0.12	0.79	0.42	0.88
	[− 1;1]	2.39	0.27	0.26	**0.00**	**0.00**	0.35	0.71	0.46
	[− 2;2]	1.053	0.70	0.70	**0.07**	**0.06**	0.79	0.35	0.84
	[− 5;5]	0.671	0.87	0.87	0.11	**0.10**	0.74	0.71	0.94
	[0;1]	1.997	0.25	0.25	**0.00**	**0.00**	0.40	0.95	0.54
	[0;3]	0.881	0.72	0.72	**0.02**	**0.01**	0.90	0.62	0.83
Means of payment (N = 12)	AAR[0]	− 0.729	0.34	0.33	0.88	0.88	0.41	0.61	0.27
	[− 1;1]	− 0.453	0.73	0.72	0.78	0.79	0.93	0.61	0.74
	[− 2;2]	− 0.823	0.63	0.62	0.90	0.91	0.81	0.52	0.62
	[− 5;5]	− 0.517	0.84	0.83	0.42	0.44	0.88	0.52	0.88
	[0;1]	− 0.827	0.45	0.43	0.61	0.63	0.35	0.28	0.30
	[0;3]	− 0.417	0.79	0.78	0.49	0.51	0.60	0.94	0.65
Divestment (N = 2)	AAR[0]	0.316	0.88	0.85	0.82	0.83	0.74	0.18	0.18
	[− 1;1]	− 0.996	0.78	0.74	0.60	0.61	0.94	0.95	0.60
	[− 2;2]	0.349	0.94	0.93	0.95	0.95	0.78	0.18	0.33
	[− 5;5]	0.258	0.97	0.96	0.76	0.77	0.90	0.95	0.94
	[0;1]	1.111	0.71	0.65	0.68	0.70	0.68	0.95	0.27
	[0;3]	0.38	0.93	0.91	0.92	0.93	0.89	0.95	0.78

The table shows the *p* values of each hypothesis test—t-test, Crude Dependence Adjustment test (CDA), Patell test, Adjusted Pattel test, Corrado rank test, Generalized Sign test, and Wilcoxon signed-ranks test for different groups of events based on its type: all events (full sample), investment/acquisition of cryptocurrencies, acceptance as means of payment, and divestment. We highlight in **bold** the p-values lower or equal to 0.10

Source: authors' elaboration

the entire sample (N = 35), we perform the tests individually on the investment (N = 21), divestment (N = 2), and means of payment (N = 12) groups.

Based on Table 3, we observe that the average market reaction is slightly positive for the entire sample of events, with CAARs ranging from 0.22 percentage points (p.p.) on the day of the event to a maximum of 1.22 p.p. in the [− 1,1] window. However, the CAARs are mostly statistically insignificant, with exceptions being the Patell and adjusted Patell tests at very narrow windows around the event ([− 1, 1] and [0,1]). Therefore, the aggregate evidence suggests a nearly "neutral" market reaction. However, one crucial caveat applies to inference: the sample size is small (N = 35 in the entire sample), and the small sample size increases the likelihood of a Type II error (i.e., failing to reject a false null hypothesis).

The average market responses appear to mask significant differences among event groups. Specifically, Table 3 indicates that positive abnormal returns are concentrated in the investment/acquisition group (N = 21). CAARs for this group range from + 0.67 to 2.39 p.p. Moreover, we find that responses within this group are more pronounced when the investment/acquisition involves a direct acquisition of BTC or ETH—we provide this analysis in Appendix B–Table 12.[9] Therefore, market reactions appear to be stronger for events related to the direct acquisition of cryptocurrency than for other events.[10]

Multivariate analysis: determinants of cumulative abnormal returns (CARs)

Table 4 displays the results of OLS regressions using cumulative abnormal returns (CARs) on different windows as dependent variables. We conduct this analysis for the entire sample (Panel A: all events, N = 35) and the subsample excluding divestment events (Panel B: N = 33). In addition, we include as regressors the following company-specific data: market capitalization (Ln_Market Capitalization), price return in the previous period (Ln_Prior Return), cash/assets, and price/book. We also include past Bitcoin returns (Ln(Past BTC Return)) to account for fluctuations in the crypto market that may impact CARs, a dummy for niche technological (Tech Firms Dummy, as in Autore et al. 2021) and financial (Financial Firms Dummy) companies, and country-fixed effects. Descriptive statistics (mean, S.D., etc.) for each variable used in the cross-sectional regressions are presented in Appendix B—Table 13.

One particular result from Table 4 warrants further discussion. Tech firms exhibit larger CARs than their counterparts in other sectors in nearly all windows (except [− 5,5]), indicating that market reactions are stronger for tech companies. Specifically, ceteris paribus, market reactions for tech companies are between 5.17 and 9.44 p.p. greater than those for non-tech and non-financial peers. Table B3 in Appendix B demonstrates that the CAARs for the tech sector are indeed higher than those for the financial, consumer cyclical, and other (communication and industrial) sectors. These findings are consistent with Chen et al. (2022), who report that high-tech firms receive more substantial abnormal returns on blockchain announcements. The authors suggest the presence of a credibility channel—high-tech firms with more technological attributes may be regarded as more credible and result in more significant stock returns than non-high-tech firms. The credibility channel may also be a plausible explanation for our findings.

Overall, we find that only tech firm status is strongly associated with CARs at the aggregate level.[11] We find limited evidence that CARs are positively (negatively) related to past BTC returns (firm size). However, none of the coefficients are statistically significant across all regressions. We emphasize that our findings should be interpreted with caution given the small sample size.

[9] In our sample, only Meitu, Inc. directly acquired ETH – a mix of USD 22 million in ETH and USD 17.9 million in BTC, announced in 08/03/2021. All the other 14 firms in our sample acquired only BTC.

[10] Consistent with non-significant or even negative market reactions to divestment announcements, Gerritsen, Lugtigheid, and Walther (2022) show that bitcoin investors react to bearish predictions but not to buy recommendations of crypto experts.

[11] We also test for a dummy variable that reflects a broader definition of tech companies – including technology-based firms that operate outside the tech sector, such as Tesla, Inc., Meitu, Inc., Mercado Libre, Inc., Méliuz, S/A, and NEXON Co., Ltd., and we find very similar results.

Table 4 Multivariate Regression: determinants of the CARs

Window	Panel A: All events						Panel B: Excluding divestment events					
	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]
Tech Firms Dummy	5.4432**	7.3108	8.2274*	5.1743	5.4608	6.0838	5.4950*	7.8939	9.4356**	6.5195	6.2283	6.8269
	(2.45)	(5.34)	(4.21)	(5.14)	(3.71)	(3.90)	(2.58)	(5.71)	(4.33)	(5.14)	(3.85)	(3.91)
Financial Firms Dummy	0.2661	− 1.2891	0.8367	− 2.2872	− 0.0670	− 0.4414	0.2961	− 0.6335	2.3205	− 0.6410	0.8325	0.4596
	(1.84)	(4.98)	(4.56)	(5.76)	(2.53)	(2.90)	(2.12)	(4.75)	(4.14)	(5.34)	(2.47)	(2.60)
Type of Event: Investments	− 1.3314	1.5361	− 0.3135	5.4576	0.1950	0.2910	− 1.0262	2.5202	0.7611	6.6993	1.2095	1.0422
	(1.36)	(3.41)	(3.01)	(3.67)	(2.11)	(1.93)	(1.64)	(4.41)	(3.83)	(4.61)	(2.42)	(2.13)
Ln(Market Capitalization)	0.1349	− 0.4383	− 0.4213	0.3496	− 0.2054	− 0.0785	0.1439	− 0.5100	− 0.6379	0.1116	− 0.3196	− 0.2054
	(0.34)	(0.79)	(0.61)	(0.75)	(0.48)	(0.36)	(0.38)	(0.88)	(0.60)	(0.73)	(0.48)	(0.36)
Ln(Prior Return)	0.3818	9.5889	0.1468	8.9169	− 0.1071	0.8850	0.0576	9.0843	0.3388	9.0725	− 0.4109	0.8873
	(4.54)	(16.27)	(13.85)	(16.59)	(9.84)	(7.32)	(4.81)	(16.64)	(13.95)	(16.54)	(9.74)	(6.94)
Ln(Past BTC Return)	9.8480	11.5291	14.5057	6.2154	9.5042	7.3177	11.3451	13.9614	13.8706	5.7748	11.0532	7.4580
	(7.27)	(16.04)	(10.55)	(11.13)	(10.08)	(8.37)	(8.02)	(17.82)	(12.29)	(13.57)	(11.43)	(9.92)
Cash/Assets	7.9078	− 16.7218	− 14.9491	− 32.2203	− 1.0675	− 7.6145	7.5469	− 19.5978	− 20.4432	− 38.3591	− 4.7178	− 11.0376
	(6.55)	(26.23)	(22.69)	(26.08)	(11.04)	(13.61)	(7.47)	(29.52)	(24.36)	(28.23)	(11.26)	(14.50)
Price/Book	0.0462	0.1554	0.0705	0.4398	0.1889	0.0520	0.0252	0.0780	− 0.0275	0.3279	0.1052	− 0.0140
	(0.32)	(0.69)	(0.62)	(0.86)	(0.51)	(0.53)	(0.35)	(0.73)	(0.69)	(0.94)	(0.54)	(0.55)
Obs	35	35	35	35	35	35	33	33	33	33	33	33
Adj. R-Sq	0.467	0.503	0.429	0.23	0.513	0.432	0.438	0.478	0.426	0.219	0.514	0.421

Sectoral dummies follow Yahoo Finance's sectoral classification – Tech Firms Dummy equals one for the MicroStrategy, Block, Inc. (former Square), Globant, Microsoft, Oracle, Phunware, Inc., and Xiaomi Corporation. Financial Firms Dummy equals one for Blackrock, Inc., FROM Corporation, JPMorgan Chase & Co., Mastercard Incorporated, Metromile, Inc., PayPal Holdings, Inc., Ruffer Investment Company Limited, The Brooker Group Public Company Limited, and Visa, Inc. All firm-level accounting and market information are collected at the date of the Financial Statements disclosed right before the crypto-related event – Market capitalization (Ln(Market Capitalization)), cumulative log-returns on 21 days preceding the event (Ln(Prior Return), the ratio between Cash and Assets (Cash/Assets), and a proxy for investment opportunities (Price/Book). To account for market-specific fluctuations that may impact the CARs, we include the 6-week cumulative log-return of bitcoin on the pre-event period (Ln(Past BTC Return)) as a regressor. Finally, we include country-fixed effects in the regression to account for potential systematic differences between stock market or jurisdictional levels that may affect abnormal returns. Robust standard errors are reported in parentheses. ***, **, and * represent statistical significance at the 10%, 5% and 1% levels, respectively

Heterogeneity analysis

One critical aspect that has been overlooked so far is the level of exposure that the announcing company has to cryptocurrency. Treating all corporate cryptocurrency investments equally, regardless of size, may obscure the genuine underlying market reactions to cryptocurrency-related corporate announcements. Our sample demonstrates significant variation in the size of cryptocurrency acquisitions. As Table 5 indicates, within the category of direct cryptocurrency acquisition (BTC or ETH), the ratio between the USD volume of crypto acquisition and total assets of the firm ranges from 0.0% (Globant S.A. announced the acquisition of USD 1 million in BTC relative to USD 1,289 million in total assets) to 27.3% (MicroStrategy Incorporated announced the acquisition of USD 250 million in BTC relative to USD 917 million in total assets). We utilize this market-based measure of the level of exposure the firm has in cryptocurrency to categorize events into three groups: high (top), medium, and low (bottom tercile) cryptocurrency exposure.

One limitation of the analysis is the small number of direct acquisition/sale events for cryptocurrencies (N = 15: 13 acquisitions and 2 divestments). To account for the entire sample, a qualitative assessment is necessary to assign a "high," "medium," or "low" cryptocurrency exposure to indirect investment events and acceptance as a means of payment. This is accomplished through a manual analysis of the news announcement and regulatory filing (such as 10-Q, 8-K, etc.), and the following systematic sorting strategy, similar to the classification proposed by Autore et al. (2021) for corporate blockchain investments, is adopted. First, we classify as low exposure the following types of announcements: i) plans to accept cryptocurrency but with no actual acceptance (such as AMC Entertainment Holdings and Mastercard), ii) global companies that started accepting cryptocurrency in only one country or store (such as BMW and Xiaomi Corporation), and iii) only indirect or partial acceptance of crypto as a means of payment, such as gift cards (Starbucks). In contrast, we classify as high exposure the following types of announcements: i) effective, direct acceptance of cryptocurrency as a means of payment by industry pioneers (such as Telecom Services, AT&T Inc.; Diversified Banks, JPMorgan Chase & Co.; Software-Infrastructure, Microsoft; Internet Retail, Overstock.com, Inc.; and Credit Services, Visa Inc.[12]) and ii) worldwide, economically relevant M&A or partnerships (such as Blackrock, Inc. and MercadoLibre). Finally, we categorize as medium exposure the remaining events—the effective acceptance by non-industry pioneers (i.e., a non-prime mover in its industry) and M&A or partnerships not noticed worldwide (such as FRMO Corporation and Méliuz). While Fig. 5 provides specific examples of the systematic approach used to classify indirect investments and acceptance as a means of payment events, Appendix C shows the cryptocurrency exposure assessment of each of these events.

We use the cross-sectional variation in the degree of corporate exposure to cryptocurrency to examine the abnormal returns for each categorical value (high, medium, and low exposure) and their contribution to explaining the CARs. Table 6 shows that

[12] Visa Inc. announced cryptocurrency integration into its network one month later than Mastercard Incorporated. However, while Visa's announcement disclosed an already-launched pilot program, Mastercard mentioned that the firm would start supporting selected cryptocurrencies later that year. Because of that, we classify Visa, Inc. as the prime-mover.

Table 5 The market-based measure of the degree of cryptocurrency exposure

Company	Announcement date	Degree of cryptocurrency exposure	Crypto acquisition (USD million)	Assets (USD Million)	Ratio (%)
MicroStrategy Incorporated	11/Aug./2020	High	250	917	27.3
NEXON Co., Ltd	27/Apr./2021	High	100	862	11.6
The Brooker Group Public Company	11/May/2021	High	7	82	8.0
Ruffer_Out	07/Jun./2021	High	1,840	27,300	6.7
Phunware, Inc	06/Apr./2021	High	2	32	4.7
Tesla, Inc	08/Feb./2021	Medium	1,500	52,148	2.9
Ruffer Investment Company Limited	15/Dec./2020	Medium	744	27,300	2.7
Tesla_Out	20/Jul./2022	Medium	936	52,148	1.8
Block, Inc	08/Oct./2020	Medium	50	4551	1.1
Meitu, Inc	08/Mar./2021	Medium	40	4507	0.9
Aker ASA	08/Mar./2021	Low	50	6779	0.7
Townsquare Media, Inc	10/May/2022	Low	5	726	0.7
Metromile, Inc	11/Aug./2021	Low	1	202	0.5
MercadoLibre, Inc	05/May/2021	Low	8	6526	0.1
Globant S.A	24/May/2021	Low	1	1289	0.0

This table reports all the corporate announcements of direct acquisition or divestment of cryptocurrency (N = 15). All events refer to BTC, except for Meitu, Inc., which announced the addition of BTC and ETH. The total USD value of cryptocurrency is obtained from regulatory fillings (e.g., 10-Q, 8-K), firms' announcements, or media posts. The USD value of total assets is obtained from the Financial Statements right before the cryptocurrency announcement. The data is sorted by the ratio of Crypto Acquisition / Total Assets of the firm. Degree of Cryptocurrency Exposure is a categorical variable that equals 3 (High) if the ratio of crypto acquisition over total assets is in the top tercile, 2 (Medium) if it is in the middle tercile, and 1 (Low) if in the bottom tercile

the CAAR for high-exposure events (N = 12) is positive and significantly greater (ranging from 3.6 to 8.0 p.p., N = 13) than for medium (ranging from − 1.5 to 0.0) and low-exposure events (ranging from − 1.6 to − 5.2 p.p., N = 10). Additionally, the CAARs for high-exposure events are statistically significant for most tests. In contrast, the CAARs for low-exposure events are negative and, in some cases, statistically different from zero. Appendix B contains a graphical representation of the notable differences in market reactions based on the degree of exposure to cryptocurrency— see Subfigure B1a of Figure B1.

Although the previous analysis suggests that the degree of exposure is a crucial factor in affecting market returns to corporate announcements of cryptocurrency adoption, it does not account for variables that may be related to both the degree of corporate exposure and the CARs. To address this limitation, we incorporate a dummy variable for low and high cryptocurrency exposure (see Eqs. 8 and 9, respectively) and estimate the determinants of the 35 CARs, as in the previous regression analysis. The results are shown in Table 7.

The results presented in Table 7 validate that the CARs are strongly linked to the degree of corporate exposure to cryptocurrency. After adjusting for factors including firm size, cash/assets, investment opportunities, prior stock return, prior BTC return, and sectoral and country characteristics, the table displays a substantial contrast in CARs for high and low-cryptocurrency exposure events. Specifically, the High (Low)

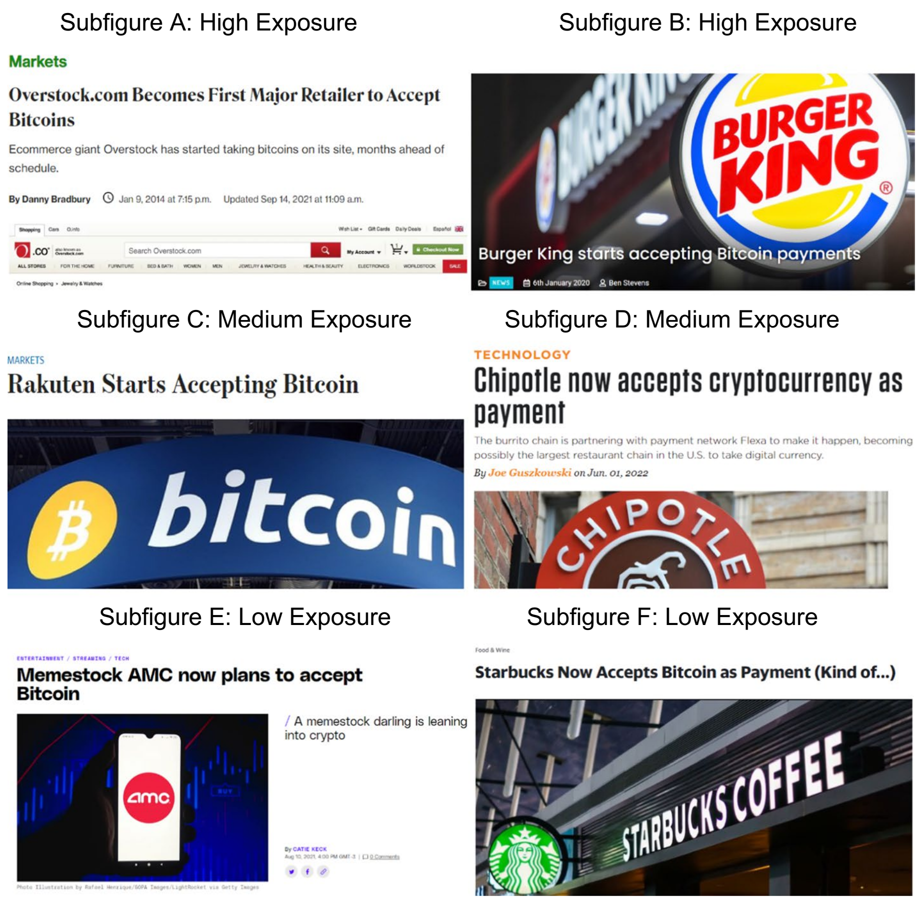

Fig. 5 Examples of the systematic approach to classifying the corporate degree of cryptocurrency exposure. Note: This Figure shows examples of the systematic approach to classifying corporate announcements where we do not have an objective, market-based criterion (i.e., not a direct market acquisition of BTC or ETH) into High, Medium, or Low cryptocurrency exposure. Each example refers to the following assorting rule: High exposure (Subfigures A and B): effective acceptance of cryptocurrency by an industry pioneer (Online Retail and Restaurants, respectively). Medium Exposure (Subfigures C and D): effective acceptance of cryptocurrency by a non-prime mover in its industry – i.e., following an industry pioneer (Rakuten operates in the Online Retail industry and started accepting bitcoin after Overstock.com, and Chipotle operates in the Restaurants industry and started to accept cryptocurrency after Restaurant Brands International [Burger King]). Low Exposure (Subfigure E): AMC announced *plans* to accept cryptocurrency, not actual acceptance. Low Exposure (Subfigure F): Starbucks announced cryptocurrency could now be applied to gift cards saved in the Starbucks app, but not directly accepting cryptocurrency for payments

Exposure Dummy reveals positive (negative) coefficients that are statistically significant for most event windows. Additionally, the effects are economically significant: high exposure events exhibit a larger CAR ranging from 2.5 to 4.8 p.p. relative to medium and low exposure events, on average. In contrast, on average, low exposure events are associated with lower CARs, ranging from 2.8 to 9.0 p.p. on average. This pattern implies that the degree of exposure plays a critical role in shaping market reactions to corporate cryptocurrency announcements. One potential explanation for this phenomenon is that, on average, investors value corporate cryptocurrency adoption only when such events have significant economic implications (i.e., have enough "skin in the game").

Table 6 CAARs stratified by the degree of cryptocurrency exposure

Event Group	Event Window	CAAR	Test						
			t-test	***CDA***	***Patell***	***PatellADJ***	***Corrado-Cowan***	***GenSign***	***Wilcox***
High Exposure (N = 12)	AAR[0]	3.632	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.04**
	[− 1;1]	7.966	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**	**0.02**
	[− 2;2]	5.327	**0.02**	**0.00**	**0.00**	**0.00**	0.37	0.45	0.55
	[− 5;5]	4.958	0.14	**0.08**	**0.00**	**0.00**	0.24	0.18	0.65
	[0;1]	5.091	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	0.45	**0.09**
	[0;3]	4.825	**0.02**	**0.00**	**0.00**	**0.00**	0.16	0.45	0.37
Medium Exposure (N = 13)	AAR[0]	− 1.547	0.13	**0.10**	**0.09**	**0.08**	**0.04**	0.41	0.10
	[− 1;1]	− 0.1	0.95	0.95	0.94	0.94	0.90	0.41	0.82
	[− 2;2]	− 0.74	0.74	0.72	0.47	0.45	1.00	0.40	0.96
	[− 5;5]	0.009	1.00	1.00	0.43	0.41	0.60	0.78	0.53
	[0;1]	− 0.236	0.87	0.86	0.47	0.45	0.72	0.41	0.97
	[0;3]	− 1.358	0.50	0.47	0.22	0.20	0.41	0.41	0.53
Low Exposure (N = 10)	AAR[0]	− 1.567	0.48	0.47	0.57	0.57	0.21	0.58	0.14
	[− 1;1]	− 5.151	0.18	0.17	**0.00**	**0.00**	**0.06**	0.23	**0.07**
	[− 2;2]	− 4.136	0.41	0.39	**0.02**	**0.02**	0.18	**0.07**	0.29
	[− 5;5]	− 5.12	0.49	0.47	0.16	0.16	0.25	0.58	0.28
	[0;1]	− 2.378	0.45	0.44	0.35	0.35	0.18	0.23	0.14
	[0;3]	− 2.599	0.56	0.55	0.19	0.19	0.23	0.58	0.33

This table shows the p-values of each hypothesis test – t-test, Crude Dependence Adjustment test (CDA), Patell test, Adjusted Pattel test, Corrado rank test, Generalized Sign test, and Wilcoxon signed-ranks test for different groups of cryptocurrency exposure. We highlight in bold the *p* values lower or equal to 0.10. The degree of cryptocurrency exposure is assessed using data from regulatory fillings (e.g., 10-Q, 8-K), firms' announcements, and media posts. For cryptocurrency direct acquisitions (BTC or ETH), we assign high (low) exposure to events at the top (bottom) tercile of the ratio between the USD value of cryptocurrency acquisitions and the USD value of total assets. For indirect acquisitions/investments and acceptance as means of payment, we qualitatively analyze the information content of each event and use the following sorting criteria. Plans to accept cryptocurrency (not actual acceptance) and indirect acceptance of crypto as means of payment (e.g., only through gift cards) are classified as *low* cryptocurrency exposure events. Conversely, effective acceptance of cryptocurrency by a firm pioneer in its industry and worldwide, economically relevant M&A or partnerships are classified as *high* exposure. Finally, we categorize *medium* exposure as the effective acceptance of crypto by a non-pioneer firm in its industry and M&A or partnerships not worldwide noticed

Robustness analyses on heterogeneous market reactions

Subsample of market-based measures of the degree of corporate exposure

A potential drawback of the previously conducted heterogeneity analysis is that the majority of events (22 out of 35) lack an objective measure of corporate "skin in the game," such as the ratio between the market value of acquired cryptocurrency and the firm's assets. While we use a systematic approach to classify events into high, medium, and low exposure categories, the sorting criterion is subjective by nature. Therefore, it could be argued that the findings are driven primarily by the subjective criterion used to categorize events into high, medium, and low corporate exposure groups.

To address this concern, we focus our analysis on the subsample of events (13 out of 35) where we have an objective, monetary-based measure of "skin in the game" – Cryptocurrency announced acquisition (USD Million) over Total Assets (USD Million) (see Table 5 for details on all 13 events). These events correspond to direct corporate

Table 7 CARs and the heterogeneity among high and low cryptocurrency-exposure events

Window	High exposure to cryptocurrency						Low exposure to cryptocurrency					
	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]
High Exposure Dum	3.94***	4.80	3.25	2.47	3.79*	3.81*						
	(1.14)	(3.61)	(3.16)	(4.01)	(1.94)	(2.10)						
Low Exposure Dum							− 2.77*	− 9.02**	− 5.90*	− 6.28	− 5.10**	− 3.87
							(1.48)	(3.57)	(3.29)	(4.20)	(2.01)	(2.34)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	35	35	35	35	35	35	35	35	35	35	35	35
Adj. R-Sq	0.686	0.569	0.489	0.225	0.62	0.546	0.563	0.651	0.541	0.296	0.661	0.534

This table shows the results of OLS regressions considering the Abnormal Returns (A.R.s) on the day of the event [0] and Cumulative Abnormal Returns (CARs) estimated at different event windows ([− 1,1], [− 2,2], [− 5,5], [0,1], [0,3]) as dependent variables. High Exposure Dum (Low Exposure Dum) is a dummy that equals one if the event is classified as High Exposure (Low Exposure) to Cryptocurrency and zero otherwise. All regressions include country-fixed effects and firm, industry, and market-level controls as reported in Table 4. Robust standard errors are reported in parentheses. ***, **, and * represent statistical significance at the 10%, 5% and 1% levels, respectively

Table 8 CAARs stratified by the degree of cryptocurrency exposure – only market-based events (direct acquisition of BTH or ETH)

Event group	Event window	CAAR	Test						
			t-test	*CDA*	*Patell*	*PatellADJ*	*Corrado-Cowan*	*GenSign*	*Wilcox*
High exposure (N = 4)	AAR[0]	10.008	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.03**	**0.07**
	[− 1;1]	22.959	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	0.23	**0.02**
	[− 2;2]	17.609	**0.00**	**0.00**	**0.00**	**0.00**	**0.09**	0.23	0.16
	[− 5;5]	12.666	0.16	0.12	**0.00**	**0.00**	0.58	**0.03**	0.89
	[0;1]	15.335	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	0.23	**0.07**
	[0;3]	14.447	**0.01**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	0.18
Medium exposure (N = 4)	AAR[0]	− 1.036	0.60	0.56	0.45	0.49	0.26	0.99	0.72
	[− 1;1]	0.78	0.82	0.80	0.71	0.73	0.89	0.31	0.53
	[− 2;2]	− 3.06	0.48	0.45	0.58	0.61	0.27	0.32	0.30
	[− 5;5]	1.263	0.85	0.83	0.49	0.52	0.92	0.99	0.57
	[0;1]	0.27	0.92	0.92	0.82	0.83	0.71	0.99	0.89
	[0;3]	− 2.009	0.61	0.58	0.41	0.44	0.31	0.32	0.53
Low exposure (N = 5)	AAR[0]	− 1.995	0.20	0.16	0.13	0.12	0.17	0.66	0.22
	[− 1;1]	− 9.907	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.03**	**0.04**
	[− 2;2]	− 8.179	**0.02**	**0.01**	**0.00**	**0.00**	0.13	**0.03**	0.22
	[− 5;5]	− 11.299	**0.03**	**0.02**	**0.03**	**0.03**	0.16	0.18	0.11
	[0;1]	− 3.848	**0.08**	**0.05**	**0.03**	**0.03**	**0.07**	0.18	0.17
	[0;3]	− 5.809	**0.06**	**0.04**	**0.01**	**0.01**	**0.06**	**0.03**	0.10

This table shows the p-values of each hypothesis test—t-test, Crude Dependence Adjustment test (CDA), Patell test, Adjusted Pattel test, Corrado rank test, Generalized Sign test, and Wilcoxon signed-ranks test for different groups of cryptocurrency exposure—subsample of thirteen Balance Sheet events (i.e., only direct acquisition of BTC or ETH). The top, medium and bottom tercile of the variable USD Crypto Acquisition / USD Total Assets of the firm define High, Medium and Low exposure, respective. We highlight in **bold** the p-values lower or equal to 0.10

cryptocurrency acquisitions that are reflected in the company's balance sheet. Table 8 presents the abnormal returns for the high, medium, and low USD Crypto/USD Total Assets groups: the CAARs for high-exposure events are positive and significantly higher (ranging from 10.01 to 22.96 p.p.) than for medium (ranging from − 3.06 to 1.26) and low-exposure events (ranging from − 11.30 to − 1.99 p.p.). Additionally, the CAARs for both high- and low-exposure events are statistically significant in most tests. A graphical representation of these differences is provided in Appendix B–see Subfigure B1b of Figure B1.

Therefore, the robustness analysis indicates that the results are not influenced by the subjective classification of events. Instead, the difference between high and low exposure CAARs in the restricted sample of objective, market-based events is even more significant than in the previous analysis that includes acceptance as a means of payment and indirect investment and partnership events. Consequently, our central finding that the market reaction increases with the degree of "skin in the game" remains valid, even when we consider only events where there is an objective, market-based metric to determine high, medium, and low corporate exposure to cryptocurrency.

Table 9 Robustness analysis to mitigate the influence of outliers

Window	OLS excluding p1 and p99						Median linear regression (MLR)					
	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]	[0]	[− 1,1]	[− 2,2]	[− 5,5]	[0,1]	[0,3]
Panel A. High Exposure to Cryptocurrency												
High Exposure Dummy	4.2529**	4.8908**	3.0610*	2.9734	3.8717*	4.1334*	2.3242*	3.5163	2.3471	1.4863	4.5306**	4.6807**
	(1.50)	(1.69)	(1.57)	(4.62)	(1.82)	(2.20)	(1.11)	(2.27)	(2.80)	(3.79)	(2.08)	(1.65)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	31	31	31	31	31	31	33	33	33	33	33	33
Adj. R-Sq	0.324	0.57	0.473	− 0.254	0.133	0.117	–	–	–	–	–	–
Panel B. Low Exposure to Cryptocurrency												
Low Exposure Dummy	− 2.7781	− 4.8753**	− 1.7896	− 7.0344	− 3.7929	− 1.9693	− 1.5908	− 3.4063	− 3.3819	− 3.9626	− 4.1328**	− 2.2714
	(1.84)	(1.91)	(2.33)	(5.92)	(2.29)	(2.10)	(1.41)	(2.80)	(2.90)	(3.60)	(1.71)	(1.53)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	31	31	31	31	31	31	33	33	33	33	33	33
Adj. R-Sq	0.0277	0.495	0.352	− 0.105	0.0614	− 0.167	-	-	-	-	-	-

This table shows the results of the robustness analysis that deals with the influence of outliers. OLS regressions are reported on a subsample after dropping extreme events (p1 and p99 of each CAR). Alternatively, on the right-hand side of the Table, we estimate each equation using Median Linear Regression (MLR). The dependent variables are the CARs associated with each event window—[− 1,1], [− 2,2], [− 5,5], [0,1], and [0,3]. High Exposure Dum (Low Exposure Dum) is a dummy that equals one if the event is classified as High Exposure (Low Exposure) to Cryptocurrency and zero otherwise. All regressions include country-fixed effects and firm, industry, and market-level controls, as reported in Table 4. Robust standard errors are reported in parentheses. ***, **, and * represent statistical significance at the 10%, 5% and 1% levels, respectively

Influence of outliers

In this subsection, we conduct several additional tests to evaluate whether our results on the heterogeneous market responses are biased due to extreme values in CARs that could impact the estimated OLS coefficients. Firstly, we exclude the tail events[13] (p1 and p99) of each CAR and perform OLS regressions on this new subset of events. Secondly, we utilize median linear regression (MLR) instead of OLS to estimate the parameters, departing from the original cross-sectional regressions.[14] By conducting these exercises, we can examine the extent to which extreme events might distort the empirical results.

Table 9 displays the results of the estimation of Eq. 9. For the sake of brevity, we present only the coefficients of the variable of interest (High Exposure Dummy). We observe that both the median regression and the OLS regression, which excludes observations at both tails of abnormal returns (p1 and p99), produce the same outcome as before: the more significant the "skin in the game," the more substantial the abnormal market reaction around the event. Furthermore, the majority of the coefficients are statistically significant, especially for the High Exposure Dummy. Therefore, we conclude that the central findings are not affected by extreme CARs.

Dissecting high and low cryptocurrency exposure status

A final sensitivity analysis involves breaking down the High Exposure Dummy and the Low Exposure Dummy into their components and examining the impact of each one on the CARs separately. This allows us to investigate the contribution of each underlying sorting factor in explaining abnormal returns. Notably, one may be concerned that the results are biased due to subjective evaluations of "high skin in the game."

In this analysis, High Exposure events (N = 12) are divided into their individual components: Top Tercile Acquisitions (direct acquisition of BTC or ETH, N = 4), Industry Pioneer Acceptance (prime mover in accepting crypto for payments in its industry, N = 6), and Worldwide Noticed Partnerships or M&A (N = 2). Similarly, Low Exposure events (N = 10) are divided into Bottom Tercile Acquisitions (N = 5), only Partial Acceptance of Cryptocurrency for Payments (N = 2), and Plans to Accept (N = 3).

Table 10 presents the outcomes of the cross-sectional regressions conducted by OLS using each component of the High (Panel A) and Low Exposure (Panel B) Dummies. All regressions include firm, industry, and country-level controls, as outlined in Eqs. 8 and 9. As observed, the only statistically significant and robust component of High Exposure (Panel A) is the top tercile of BTC or ETH acquisitions—coefficients range from 10.6 to 22.7 (i.e., economically meaningful). In other words, the factor that drives the influence of the High Exposure Dummy in explaining CARs is precisely the economically meaningful direct acquisitions of cryptocurrencies, rather than any subjective definition

[13] For example, The Brooker Group Public Company (an event assigned as high exposure since the Crypto Acquisition / Total Assets equaled 8% and is in the top tercile of this ratio) earned the most substantial abnormal returns at the day of the event and in all CARs surrounding the event (See Table 2 for details). Such an outlier is excluded in this robustness analysis.

[14] Unlike in usual regression method, the the median regression or the least absolute deviations (LAD) minimizes the sum of absolute value of the prediction error, and is less sensitive to outliers than OLS estimates.

of high exposure. Conversely, Panel B demonstrates that the same principle applies to the Low Exposure Dummy: the underlying mechanism that systematically accounts for CARs is the economic significance of direct cryptocurrency acquisition. Scatterplots shown in Appendix B–Figure 7 intuitively demonstrate the positive correlation between CARs and the Value of Crypto Acquisitions/Value of Total Assets. Therefore, we can infer that economically meaningful direct acquisitions of cryptocurrencies increase value in the short run, while insignificant corporate investments in cryptocurrencies are associated with adverse market reactions.

In summary, the sensitivity analyses confirm that market returns are heterogeneous in terms of the degree of exposure and news content, which has significant implications for corporate managers, analysts, and investors. It demonstrates that not all events are treated equally, and "skin in the game" is a critical factor underlying market reactions.

Table 10 Breaking down High Exposure and Low Exposure to Cryptocurrency into its components

Window	**CARs**					
	[0]	**[− 1,1]**	**[− 2,2]**	**[− 5,5]**	**[0,1]**	**[0,3]**
Panel A. High exposure to cryptocurrency						
Top Tercile Acquisitions (BTC or ETH)	10.604***	22.742*	18.555*	16.453	14.999***	16.228**
	(1.82)	(12.05)	(9.89)	(13.59)	(3.85)	(5.60)
Industry Pioneer in Accepting for Payments	− 0.820	− 5.612	− 5.656	− 4.476	− 3.519	− 3.921
	(1.36)	(5.83)	(4.89)	(7.01)	(2.41)	(2.50)
Worldwide Noticed M&As or Partnerships	3.781***	− 2.347	− 4.300	− 3.777	0.722	0.822
	(0.99)	(8.45)	(6.24)	(8.82)	(3.52)	(3.73)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Obs	33	33	33	33	33	33
Adj. R-Sq	0.876	0.633	0.574	0.237	0.797	0.758
Panel B. Low exposure to cryptocurrency						
Bottom Tercile Acquisitions (BTC or ETH)	− 3.793	− 17.195**	− 12.632*	− 15.500**	− 7.676**	− 8.711**
	(2.52)	(7.38)	(6.73)	(7.09)	(3.28)	(3.28)
Only Partial Acceptance for Payments	− 1.161	0.336	1.768	2.857	− 1.040	2.182
	(2.32)	(3.66)	(3.44)	(4.88)	(3.66)	(1.76)
Plans to Accept Cryptocurrency for Payments	− 2.802	− 4.777	0.730	1.182	− 6.981	− 0.840
	(3.98)	(7.42)	(6.32)	(9.16)	(5.18)	(6.12)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Obs	33	33	33	33	33	33
Adj. R-Sq	0.44	0.708	0.582	0.457	0.646	0.581

This Table shows the results of OLS regressions considering the Abnormal Returns (A.R.s) on the day of the event [0] and Cumulative Abnormal Returns (CARs) estimated at different event windows ([− 1,1], [− 2,2], [− 5,5], [0,1], [0,3]) as dependent variables. The High Exposure Dummy (Panel A) is collapsed into Top Tercile Acquisitions (BTC or ETH), Industry Pioneer in Accepting Cryptocurrency for Payments, and Worldwide Noticed M&As or Partnerships. Similarly, the Low Exposure Dummy (Panel B) is separated into Bottom Tercile Acquisitions (BTC or ETH), Only Partial Acceptance for Payments, and Plans to Accept Cryptocurrency for Payments. regressions include country-fixed effects and firm, industry, and market-level controls, as reported in Table 4. Robust standard errors are reported in parentheses. ***, **, and * represent statistical significance at the 10%, 5% and 1% levels, respectively

Conclusions

In summary, our study is based on a sample of 35 corporate events related to the acquisition, acceptance as means of payment, or divestment of cryptocurrencies. We discovered that the cumulative average abnormal returns around these events are slightly positive but statistically non-significant, on average. However, our findings indicate that abnormal returns are primarily explained by how much "skin in the game" a firm has in crypto. High (low) exposure to cryptocurrency events results in positive (negative) and statistically significant CAARs. Additionally, the degree of exposure to cryptocurrency is a critical factor in determining CARs, with the economically meaningful acquisition of BTC or ETH (relative to the total assets of the firm) being a significant predictor of CARs. Crucially, to evaluate the impact of cryptocurrency adoption on corporate value, we focused on firms whose core business is unrelated to blockchain technology or digital assets (i.e., we excluded crypto mining companies, digital asset management firms, and cryptocurrency exchanges from the sample).

To the best of our knowledge, this is the first study to examine the stock market response to cryptocurrency-related corporate events, which is undoubtedly a research topic of significant practical importance. Despite being a recent trend, we are witnessing companies in traditional sectors of the economy moving part of their investments to cryptocurrencies. Furthermore, from a theoretical perspective, the net present value of cryptocurrency adoption is unclear ex-ante. On the one hand, past returns of crypto assets are high and almost uncorrelated with the returns of fiat currencies and other traditional investments. On the other hand, the lack of uniform and international regulation, legal uncertainty, cyber risks, and high volatility of these assets may result in high present value costs.

By providing evidence that the perceived present value of the costs and benefits of cryptocurrency adoption is of similar magnitude at the aggregate level (i.e., stock market reactions are close to zero, on average) but varies significantly based on the degree of exposure to cryptocurrency, our study helps corporate managers, analysts, and investors to comprehend the relationship between crypto adoption and firm value. Moreover, we contribute to two strands of the literature: one that examines the impacts of cryptocurrency on portfolios of various investors (e.g., Bialkowski 2020; Platanakis and Urquhart 2020) and another that investigates the corporate implications of blockchain-related projects (Adhami et al. 2018; Cheng et al. 2019; Jain & Jain 2019; Akyildirim et al. 2020; Autore et al. 2021; and Ali et al. 2023).

Finally, it is crucial to note that our study has several limitations. One limitation is the small number of events (N = 35), which could result in type II errors in our hypothesis testing (accepting a null hypothesis that is actually false). Additionally, announcements are sometimes clustered in time and markets, which may limit the generalizability of our findings. As corporate cryptocurrency adoption is an ongoing phenomenon, future studies could analyze a larger sample of events and stratify samples by sectors or regions, among other groupings, to address these limitations.

Appendices

Appendix A: Table of corporate cryptocurrency-related events

See Tables 11

Table 11 List, description, and date of all 35 events analyzed in the study

Company name	Industry	Category	Event Date	Reference Index
Newegg	E-commerce	Means of Payment	01/Jul./14	Nasdaq (U.S.)
Microsoft	Operational systems	Means of Payment	11/Dec./14	Nasdaq (U.S.)
Rakuten	E-commerce	Means of Payment	17/Mar./15	Nikey 225 (J.P.)
FRMO	Holding	Investment	18/Aug./16	Nasdaq (U.S.)
Overstock	Outlet	Means of Payment	25/Oct./17	Nasdaq (U.S.)
BMW	Auto Manufacturers	Means of Payment	09/Jul./18	DAX (D.E.)
AT&T	Telecom	Means of Payment	23/May/19	Nasdaq (U.S.)
RBI Inc	Restaurant	Means of Payment	06/Jan./20	Nasdaq (U.S.)
Starbucks	Restaurant	Means of Payment	01/Mar./20	Nasdaq (U.S.)
Microstrategy	B.I	Investment	11/Aug./20	Nasdaq (U.S.)
Square	Payment Solutions	Investment	07/Oct./20	Nasdaq (U.S.)
JP Morgan	Financial institution	Investment	27/Oct./20	Nasdaq (U.S.)
Ruffer	Investment company	Investment	01/Nov./20	FTSE100 (U.K.)
Tesla	Auto Manufacturers	Investment	08/Feb./21	Nasdaq (U.S.)
Mastercard	Payment Solutions	Investment	10/Feb./21	Nasdaq (U.S.)
Aker ASA	Holding	Investment	07/Mar./21	OSE (NO)
Meitu	Smartphones	Investment	18/Mar./21	HSI (H.K.)
Visa	Payment Solutions	Means of Payment	29/Mar./21	Nasdaq (U.S.)
Paypal	Payment Solutions	Means of Payment	30/Mar./21	Nasdaq (U.S.)
Phunware	Cloud platform	Investment	06/Apr./21	Nasdaq (U.S.)
Nexon	Online games	Investment	27/Apr./21	Nikey 225 (J.P.)
Mercado Livre	E-commerce	Investment	05/May/21	Nasdaq (U.S.)
Tesla	Auto Manufacturers	Divestment	12/May/21	Nasdaq (U.S.)
The Brooker Group	Financial Advisory and Consultancy	Investment	13/May/21	MAI (T.H.)
Ruffer	Investment company	Divestment	06/Jun./21	FTSE100 (U.K.)
Meliuz	Cashback services	Investment	29/Jun./21	Ibovespa (B.Z.)
Xiaomi	Cell Phones	Means of Payment	05/Aug./21	HSI (H.K.)
Metromile	Digital Insurance Platform	Investment	10/Aug./21	Nasdaq (U.S.)
AMC Entertainment Holdings, Inc	Entertainment	Investment	10/Aug./21	Nasdaq (U.S.)
MercadoLibre, Inc	Internet Retail	Investment	20/Jan./22	Nasdaq (U.S.)
Townsquare Media, Inc	Advertising Agencies	Investment	10/May/22	Nasdaq (U.S.)
Chipotle Mexican Grill, Inc	Restaurants	Means of Payment	01/Jun./22	Nasdaq (U.S.)
BlackRock, Inc	Asset Management	Investment	04/Aug./22	Nasdaq (U.S.)

Appendix B: Additional Tables and Figures

See Tables 12, 13, 14 and Figs. 6, 7

Table 12 Hypotheses tests on the subsample of firms that directly acquired cryptocurrency (BTC or ETH)

Event Group	Event Window	CAAR	Test						
			t-test	*CDA*	*Patell*	*PatellADJ*	*Corrado-Cowan*	*GenSign*	*Wilcox*
Investment—Treasury BTC or ETH acquisition (N = 13)	AAR[0]	1.993	**0.07**	**0.06**	**0.05**	**0.04**	0.88	0.34	0.65
	[− 1;1]	3.494	**0.07**	**0.06**	**0.00**	**0.00**	0.92	0.88	0.63
	[− 2;2]	1.331	0.59	0.57	**0.07**	**0.06**	0.43	0.21	0.68
	[− 5;5]	− 0.06	0.99	0.99	0.26	0.25	0.55	0.69	0.54
	[0;1]	3.321	**0.04**	**0.03**	**0.00**	**0.00**	0.97	0.88	0.57
	[0;3]	1.593	0.47	0.45	**0.01**	**0.01**	0.50	0.48	0.76

The Table shows the p-values of each hypothesis test – t-test, Crude Dependence Adjustment test (CDA), Patell test, Adjusted Pattel test, Corrado rank test, Generalized Sign test, and Wilcoxon signed-ranks test treasury cryptocurrency acquisition events (i.e., incorporation of BTC or ETH into the Balance Sheet). We highlight in bold the *p* values lower or equal to 0.10.

Source: authors' elaboration.

Table 13 Descriptive statistics of CARs and explanatory variables used in the regression analysis

Variable	Mean	P50	SD	p1	p99
AR[0]	0.223	0.06	4.829	− 6.093	18.499
CAR[− 1,1]	1.222	− 0.072	13.009	− 36.588	61.352
CAR[− 2,2]	0.37	− 0.229	10.454	− 30.889	46.192
CAR[− 5,5]	0.24	0.929	10.776	− 42.466	34.855
CAR[0,1]	0.978	− 0.166	7.44	− 11.553	35.399
CAR[0,3]	0.407	− 0.351	7.387	− 16.508	32.085
Tech Firms Dummy	0.2	0	0.406	0	1
Financial Firms Dummy	0.286	0	0.458	0	1
Type of Event: Investment	0.6	1	0.497	0	1
Ln(Market Capitalization)	9.716	10.287	2.731	4.651	13.643
Ln(Prior Return)	− 0.026	− 0.017	0.155	− 0.436	0.316
Ln(Past BTC Return)	0.024	0.017	0.102	− 0.218	0.245
Cash/Assets	0.256	0.233	0.183	0.01	0.675
Price/Book	2.562	1.784	2.169	0	6.957

Table 14 Hypotheses tests on subsamples stratified by sectors

Event Group	Event Window	CAAR	Test						
			t-test	***CDA***	***Patell***	***PatellADJ***	***Corrado-Cowan***	***GenSign***	***Wilcox***
Financial sector (N = 10)	AAR[0]	0.876	0.33	0.29	0.13	**0.10**	0.88	0.42	0.80
	[− 1;1]	3.069	**0.05**	**0.03**	**0.00**	**0.00**	0.17	0.15	0.52
	[− 2;2]	1.925	0.34	0.30	**0.01**	**0.00**	0.59	0.42	0.77
	[− 5;5]	0.784	0.80	0.78	0.20	0.15	0.37	0.42	0.80
	[0;1]	2.47	**0.05**	**0.04**	**0.00**	**0.00**	0.31	0.65	0.55
	[0;3]	1.441	0.42	0.39	**0.01**	**0.00**	0.55	0.86	0.69
Consumer cyclical (N = 11)	AAR[0]	− 0.434	0.66	0.65	0.94	0.94	0.37	0.78	0.59
	[− 1;1]	− 1.876	0.27	0.26	0.14	0.17	**0.10**	**0.04**	0.12
	[− 2;2]	− 2.806	0.20	0.19	0.26	0.30	0.11	0.37	**0.10**
	[− 5;5]	− 3.034	0.35	0.34	0.52	0.55	0.26	0.37	0.21
	[0;1]	− 1.274	0.35	0.34	0.32	0.36	**0.09**	0.14	0.22
	[0;3]	− 1.789	0.36	0.35	0.14	0.17	0.11	0.37	0.23
Technology sector (N = 7)	AAR[0]	3.197	**0.04**	**0.03**	**0.03**	**0.02**	0.12	**0.05**	**0.09**
	[− 1;1]	5.363	**0.05**	**0.03**	**0.00**	**0.00**	**0.01**	**0.05**	**0.01**
	[− 2;2]	3.903	0.26	0.23	**0.05**	**0.04**	**0.10**	0.22	0.11
	[− 5;5]	4.094	0.43	0.40	**0.02**	**0.02**	0.24	0.22	0.38
	[0;1]	4.282	**0.05**	**0.04**	**0.00**	**0.00**	**0.04**	0.22	**0.04**
	[0;3]	4.145	0.18	0.15	**0.00**	**0.00**	0.10	0.22	0.14
Other sectors (N = 7)	AAR[0]	− 2.652	0.42	0.39	0.12	0.13	**0.08**	0.26	**0.06**
	[− 1;1]	− 0.688	0.90	0.90	0.64	0.65	0.64	0.26	0.85
	[− 2;2]	− 0.394	0.96	0.95	0.75	0.76	0.50	0.26	0.73
	[− 5;5]	0.756	0.94	0.94	0.50	0.52	0.98	0.71	0.66
	[0;1]	− 0.917	0.84	0.83	0.60	0.61	0.57	0.71	0.55
	[0;3]	− 1.356	0.83	0.83	0.34	0.36	0.27	0.26	0.27

The Table shows the *p* values of each hypothesis test—t-test, Crude Dependence Adjustment test (CDA), Patell test, Adjusted Pattel test, Corrado rank test, Generalized Sign test, and Wilcoxon signed-ranks test for different groups of events based on sectoral classification: Financial Sector (N = 10), Consumer Cyclical (N = 11), Technology Sector (N = 7), and Other Sectors (N = 7, composed of Communication Services [N = 6] and Industrials [N = 1]). We highlight in bold the p-values lower or equal to 0.10

Source: authors' elaboration

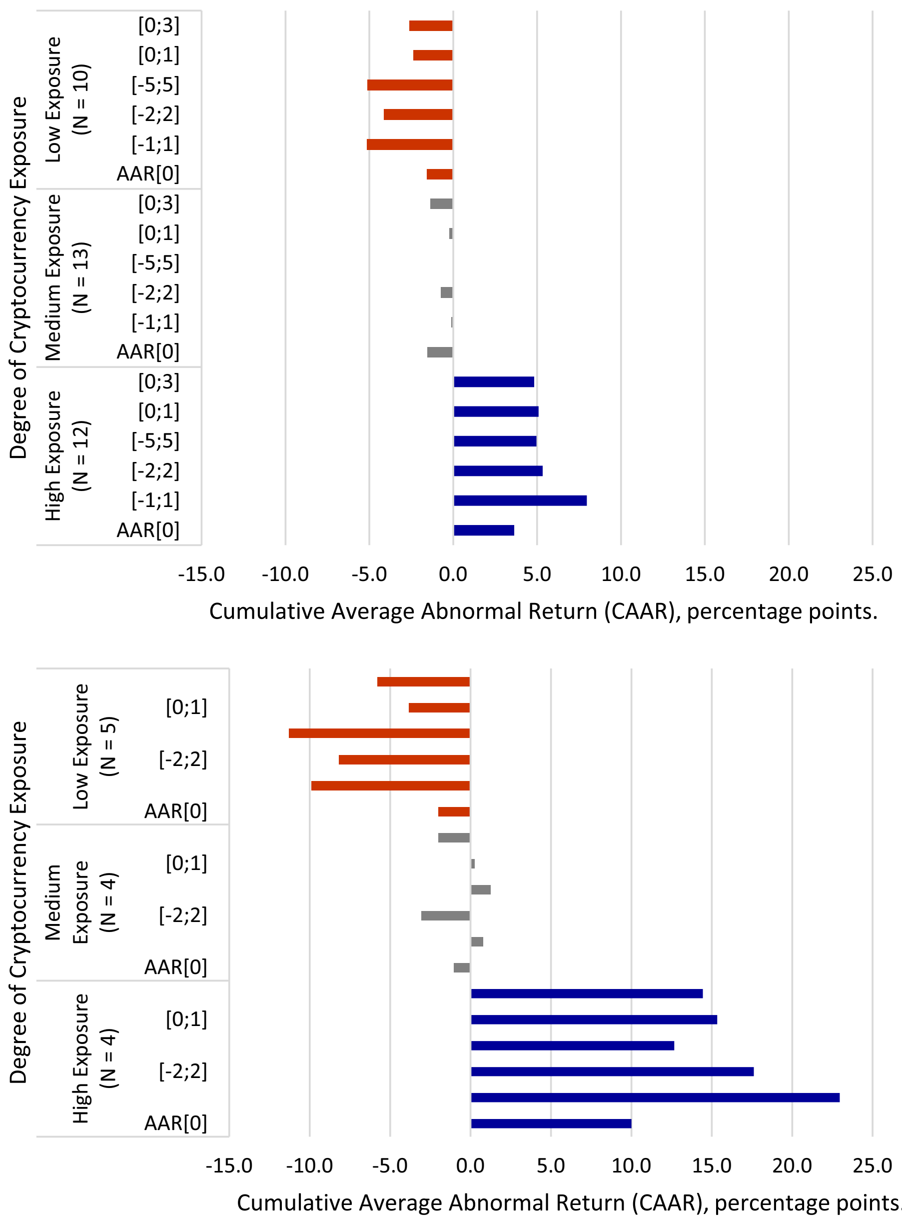

Fig. 6 Graphical visualization of market reactions according to the degree of cryptocurrency exposure, full sample (N = 35) and subsample comprising only direct acquisitions (N = 13). **a** Full sample (N = 35), which includes objective (N = 13) and subjective (N = 22) classification of cryptocurrency exposure. **b** Direct acquisitions of BTC or ETH (N = 13), which includes only objective classification of cryptocurrency exposure

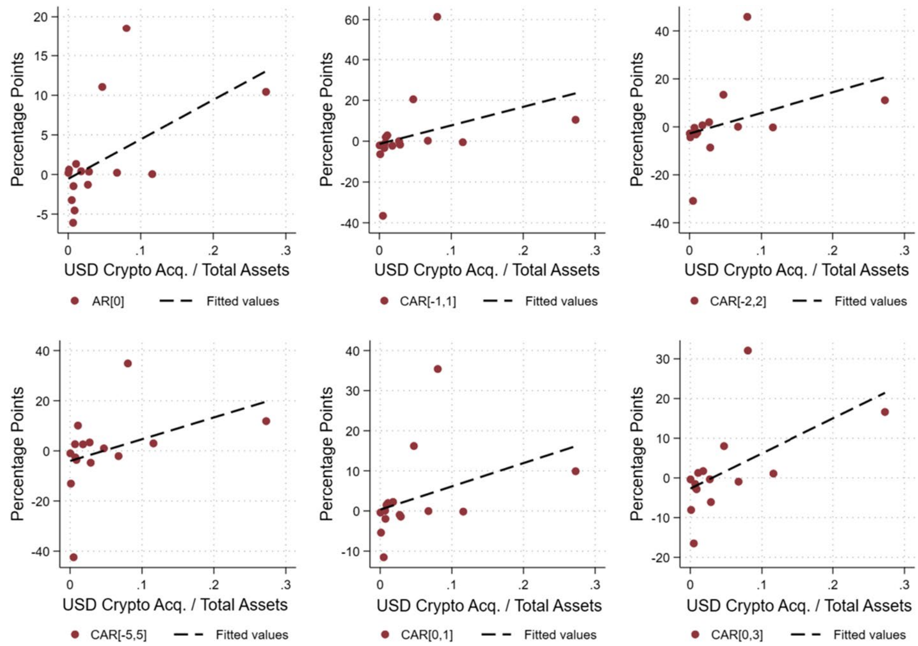

Fig. 7 Scatterplots of cumulative abnormal returns (Y axis) and the ratio between Cryptocurrency Acquisition (USD) and Total Assets (USD)

Appendix C

See Table 15

Table 15 Qualitative assessment of cryptocurrency corporate exposure for announcements of indirect investments and acceptance as means of payment

Company	Announcement date	Degree of Cryptocurrency Exposure	News' Headline
BlackRock, Inc	04/aug./2022	3	BlackRock partners with Coinbase to expand into crypto
Overstock.com, Inc	09/jan./2014	3	Overstock.com First Online Retailer to Accept Bitcoin
Visa Inc	29/mar./2021	3	EXCLUSIVE Visa moves to allow payment settlements using cryptocurrency
AT&T Inc	23/may/2019	3	U.S. Telecoms Giant AT&T Now Accepting Crypto Payments via BitPay
Microsoft Corporation	11/dec./2014	3	Microsoft begins accepting Bitcoin
JPMorgan Chase & Co	27/oct./2020	3	JPMorgan Chase (JPM) has started using its digital currency for commercial transactions
MercadoLibre_2	20/jan./2022	3	MercadoLibre Doubles Down on Crypto With Two Purchases

Table 15 (continued)

Company	Announcement date	Degree of Cryptocurrency Exposure	News' Headline
PayPal Holdings, Inc	30/mar./2021	2	PayPal Launches "Checkout with Crypto"
Newegg Commerce, Inc	01/jul./2014	2	Newegg is Now Accepting Bitcoin
Rakuten Group, Inc	16/mar./2015	2	Rakuten Starts Accepting Bitcoin
Chipotle Mexican Grill, Inc	01/jun./2022	2	Chipotle Now Accepts Cryptocurrency as Payment
FRMO Corporation	18/aug./2016	2	Investment in grayscale
Méliuz S.A	30/jul./2021	2	Méliuz anuncia contrato para compra da negociadora de criptomoedas Alter Pagamentos por R$ 25
Oracle Corporation	23/oct./2018	2	Oracle Unveils Business-Ready Blockchain Applications
Restaurant Brands International Inc	06/jan./2020	2	Burger King starts accepting Bitcoin payments
Xiaomi Corporation	05/aug./2021	1	Xiaomi's Portuguese outlet now accepts Bitcoin
Starbucks Corporation	01/apr./2021	1	Starbucks Now Accepts Bitcoin as Payment (Kind of…)
BMW (Bayerische Motoren Werke Aktiengesellschaft)	05/jul./2018	1	Stephen James is now accepting Bitcoin for the purchase of your new BMW!
Mastercard Incorporated	10/feb./2021	1	Why Mastercard is bringing crypto onto its network
AMC Entertainment Holdings, Inc	10/aug./2021	1	Memestock AMC now plans to accept Bitcoin

This table reports the assessment of corporate cryptocurrency exposure for indirect cryptocurrency investments (e.g., crypto-related partnerships and acquisitions) and announcements of cryptocurrency acceptance as means of payment. Degree of Cryptocurrency Exposure is a categorical variable that equals 3 if the qualitative assessment of the news' content indicates a high exposure (effective, direct acceptance of cryptocurrency as means of payment by industry pioneers and worldwide, economically relevant M&A or partnerships), 2 for medium exposure, and 1 for low exposure (just plans to accept cryptocurrency, not actual acceptance; global companies that started accepting cryptocurrency only in a single country or store; and indirect or partial acceptance of crypto as means of payment, such as gift cards

Abbreviations

AAR Average abnormal return
AR Abnormal return
CAAR Cumulative average abnormal returns
CAR Cumulative abnormal returns

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Author contributions

Author 01 and author 02 contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. Author 03 contributed to the writing of the manuscript.

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Availability of data and materials

Data is available under reasonable request to the authors.

Declarations

Competing interests
There are no competing interests to disclose.

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