Stock Market Reactions to Corporate Blockchain Announcements

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Declaration

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I herewith formally declare that I, Timo Jannis Rogalski, have written the submitted dissertation independently pursuant to § 22 paragraph 7 of APB TU Darmstadt. I did not use any outside support except for the quoted literature and other sources mentioned in the dissertation. I clearly marked and separately listed all of the literature and all of the other sources which I employed when producing this academic work, either literally or in content. This dissertation has not been submitted for any other degree or professional qualification.

I am aware, that in case of an attempt at deception based on plagiarism (§38 Abs. 2 APB), the dissertation would be counted as one failed examination attempt.

T. Rogalski

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1 Synopsis

1.1 Motivation

On October 31, 2008, a short whitepaper with the title "*Bitcoin: A Peer-to-Peer Electronic Cash System*" was published via a public mailing list by a pseudonymous person or group going by the name of Satoshi Nakamoto[1]. It introduced the idea of a decentralized digital currency and its underlying technology called *blockchain*. Likely influenced by the financial crisis of 2007 and 2008, Nakamoto envisioned a secure and transparent way of conducting financial transactions, without the need of centralized authorities. The idea was realized shortly after in the beginning of 2009 with the creation of the *Bitcoin*-blockchain and the so-called *genesis* block – a digital artefact, which included the first Bitcoin. The initial block also possesses a special encoded message, referencing the headline of the newspaper *The Times* on that day[2] - providing further evidence for the agenda behind the development of this new type of technology:

"The Times 03/Jan/2009 Chancellor on brink of second bailout for banks."

At first, each Bitcoin traded around a few cents, crossing the total market capitalization of 1 million USD in early November 2011. From thereon, its growth happened exponentially; a market capitalization of 100 million USD was crossed in August 2012, 1 billion USD early April 2013 and a total market cap of over 100 billion USD was reached in early November 2017[3]. Other cryptocurrencies such as Ethereum or Litecoin followed, broadening the landscape of blockchain-based digital money. As of late June 2023, the total market capitalization of all cryptocurrencies lies around 1.17 trillion USD.

A blockchain itself can be described as a digital, decentralized ledger technology which is able to store and facilitate immutable and validated data across a system of networked participants (Beck et al., 2018; Risius & Spohrer, 2017). Therefore, blockchain eventually transcended its association with cryptocurrencies and captured the attention of corporations to harness its potential power (Beck et al., 2018). With its ability to create a shared, tamper-resistant record accessible to multiple stakeholders, blockchain emerged as an intriguing solution for addressing challenges in corporate environments. By leveraging blockchain, organizations saw the opportunity to streamline operations, increase efficiency, reduce costs, mitigate counterparty-risk, and foster collaboration within complex ecosystems (Chong et al., 2019; Schlecht et al., 2021; Weking et al., 2020). Hence, the field of supply chain management (SCM) emerged as the most compelling and logical area of application for many companies. IBM and logistics firm Maersk hit international news headlines by introducing *TradeLens*, a blockchain-based platform for tracing containers

[1] https://bitcoin.org/bitcoin.pdf. Accessed 13.08.2023.
[2] https://www.thetimes.co.uk/article/chancellor-alistair-darling-on-brink-of-second-bailout-for-banks-n9l382mn62h. Accessed 13.08.2023.
[3] https://coinmarketcap.com/currencies/bitcoin/. Accessed 13.08.2023.

shipped across the world (Jensen et al., 2019). Another consortium, including corporations such as Pfizer or Novartis, announced the development of a blockchain system called *MediLedger* with the goal of supporting the pharmaceutical and healthcare sector by increasing prescription drug security and visibility along the supply chain (MediLedger, 2020). Apart from logistics, corporate blockchain use cases primarily also emerged in the financial sector. JPMorgan Chase introduced the open-source blockchain platform *Quorum* which should serve as a decentralized alternative for other financial institutions that require a confidential transaction system for exchanging trusted data and information between selected participants (Mazzoni et al., 2022). It was later acquired by blockchain software technology company ConsenSys (ConsenSys, 2020). Other, but not all-encompassing areas of organizational blockchain applications include fraud- and counterfeiting prevention and detection (Pun et al., 2021), certification processes (Bauer et al., 2022) or environmental-, social- and governance (ESG) issues (Kouhizadeh & Sarkis, 2018).

Academia expresses a similar interest in blockchain technology (Beck et al., 2018). Initially, scholars focused on topics surrounding cryptocurrencies (e.g., Böhme et al., 2015; Li & Wang, 2017). Nonetheless, blockchain possesses features - and therefore also possible study areas - that go beyond the analysis of decentralized payment systems. Research on blockchain technology in the field of information systems (IS) sets out to understand enablers and inhibitors of successful blockchain adoption (Bossler & Kroenung, 2022). Moreover, blockchain design features (e.g., Gaur & Gaiha, 2020), case studies (e.g., Chong et al., 2019) as well as framework analyses (e.g., Beck et al., 2018; Risius & Spohrer, 2017) are common research types conduced in the IS field. This also applies to the academic fields of SCM (e.g., Hastig & Sodhi, 2020; Pun et al., 2021) and management research (e.g., Chen et al., 2021; Lumineau et al., 2023). Researchers from the realm of finance diligently delve into various aspects of cryptocurrencies to shed light on their risk-return profiles (Bolt & Van Oordt, 2020; W. Zhang et al., 2021) and the underlying market mechanisms that drive their valuation (Cong et al., 2021). Additionally, investigations into trading strategies and market inefficiencies within cryptocurrency markets provide valuable insights for investors seeking to capitalize on emerging opportunities (e.g., Makarov & Schoar, 2020).

Lately, an overarching stream of research in the fields of IS, SCM, Finance and Management started to investigate the impact of blockchain on the business- and market value of corporations. Hereby, analysing the short-term reaction of public equity markets to corporate announcements that reference blockchain technology became a popular approach to quantify this type of impact (Cahill et al., 2020). Cheng et al. (2019) analyse how the stock market reacts to unspecified plans of companies wanting to implement blockchain. They find significant positive market reactions which are more amplified in times where the price of Bitcoin is rising. Cahill et al. (2020) come to the same conclusion by analysing a dataset of organizational blockchain news between 2016 and 2018. Announcements specifically related to SCM also exhibit significant positive stock market reactions (Klöckner et al., 2022). Moreover, initial research also hints to the existence of a longer-term positive impact (Klöckner et al., 2022; Lui & Ngai, 2019). Liu et al. (2022) as well as Y. Zhang et al. (2022) specifically analyse the Chinese stock market and also reveal the existence of positive stock market reactions to blockchain announcements by Chinese firms.

Overall, academia shows that there are clearly favorable stock price effects for firms publishing news related to blockchain. This raises the question of specific drivers for these reactions. Research to date has only dealt with this question superficially. For instance, Klöckner et al. (2022) show that a firms innovativeness does not play a crucial role when searching for specific drivers of market reactions. Moreover, the price of Bitcoin and the level of speculation of the announcement play a crucial role (Cahill et al., 2020; Cheng et al., 2019). Latest studies also demonstrate the impact of country specific drivers such as the degree of data restrictions or supporting national policies (Klöckner et al., 2022; Y. Zhang et al., 2022). Nevertheless, other potential drivers of reactions to blockchain announcements are still unknown.

Theoretically founded, this dissertation aims to shed light on a variety of factors which could serve as explanatory variables when searching for enablers or inhibitors of positive blockchain-related stock market returns. Based on past research, we organize the effects analysed into distinct levels, initially focusing on *temporal* and *company-specific* considerations. Additionally, we investigate the influence of *industry-specific* and *project-specific* elements. We specifically emphasize a range of project-related effects that have received limited attention in previous research. Table 1.1 outlines the different factors analysed and the respective chapter in which they appear.

Level	Effect Analysed	Chapter
Time-level	Blockchain- and crypto hype	1
Industry-level	Industry affiliation	2
Firm-level	US vs. EU	1
Project-level	Business-Relatedness	1
Project-level	Project progress	1
Project-level	Consortium news	2
Project-level	Commitment	2
Project-level	Concreteness of announcements	3
Project-level	Blockchain use cases	3
Project-level	Inclusion of service providers	3

Table 1.1:Factors and levels analysed in this dissertation.

The overarching research question of this dissertation is formulated as follows:

What is the influence of temporal, industry, firm-specific, and project-specific factors on the market risk and return associated with corporate blockchain announcements?

1.2 Dissertation Design

This dissertation consists of three chapters. Hereby, each study possesses an individual introduction, hypotheses development, empirical results as well as a conclusion comprising theoretical and practical implications.

Chapter 2 first analyses the general market impact of corporate blockchain announcements. Theoretically founded on signaling theory (Steele et al., 2002), we consider time- and firm-level factors by taking into account the factors of the two cryptocurrency-hype phases between 2017-2018 and 2020-2021 as well as differences between US- and EU-based companies. Lastly, we incorporate possible project-level effects in the form of a blockchain project's business-relatedness and the progress of the project as potential mediating factors. Based on an international data set of corporate blockchain announcements between 2014 and 2021 we show that blockchain news led to significant positive stock market returns. Additionally, we demonstrate how this positive effect is enhanced in cases where the blockchain project is (1) already successfully finished, (2) related to the respective firm's business processes, (3) performed by companies based in the US and (4) published during phases of blockchain- and cryptocurrency hypes. We argue that signaling effects play an important role for the creation of enhanced stock market returns during times of heightened blockchain attention by the public.

Chapter 3 focuses on additional explanatory factors for the creation of blockchain market value and incorporates the measure of market risk. We add to the existing research gap of industry-level related factors by finding support for the hypothesis that firms from the Information Technology (IT) industry benefit more from blockchain announcements than non-IT companies. We substantiate the hypotheses by applying the lens of the resource-based view (RBV) and consider additional project-level effects previously neglected by existing research. First, we unveil positive stock market returns for news related to a blockchain partnership or the joining of a blockchain consortium. Moreover, we show that an initial announcement of a firm regarding a blockchain project exhibits less positive market returns than subsequent corporate publications concerning the same project. In this study we also conduct an empirical analysis of the impact of blockchain news on a company's systematic risk, measured by changes in the firm's beta. We cannot find evidence for a general impact of blockchain announcements on market risk. Additional analyses also indicate that neither initial blockchain announcements nor single-company announcements lead to a higher increase in systematic risk compared to subsequent announcements and consortia-announcements, respectively.

Consequently, investors do not appear to attribute a substantial impact on a firm's risk profile to the announcement or commitment to blockchain projects.

Finally, Chapter 4 shifts the focus to the differentiation between specific blockchain use cases and their impact on market performance. Hereby, companies increasingly direct their blockchain efforts on areas with a sustainability-linked impact. By enabling so called “green supply chains” via blockchain, firms aim to trace and store environmentally critical data such as carbon emissions. Moreover, ethical issues can be tackled by verifying the sourcing of materials such as diamonds or coffee from developing countries. We summarize these use cases as environmental-, social- and governance (ESG) related issues and demonstrate that such announcements lead to significant positive short-term stock market reactions. Furthermore, we show that ESG blockchain news induce higher shareholder returns than non-ESG related blockchain initiatives. Besides focusing on ESG blockchain announcements, we also concentrate our analysis on use cases stemming from the fields of supply chain management (SCM)-, finance- and certification processes. Significant positive shareholder returns occur for both SCM- and finance-related blockchain use cases. On the other side, blockchain announcements related to the implementation of certification processes do not lead to abnormal shareholder returns. This shows that shareholders could be aware of potential security risks which are mostly associated with certification-based blockchain applications (Babich & Hilary, 2020). Our results also indicate that shareholders react more favorably to project-specific blockchain announcements than vague ones like consortium participation or non-fungible token (NFT) marketing gigs. Lastly, the outcomes suggest that the involvement of external IT service providers in a blockchain project leads to inferior stock market returns in comparison to initiatives that do not include external IT consultants. Hence, the possible future dependance on external maintenance services as well as difficulties of post-project adjustments might impose an additional level of uncertainty for investors in cases where IT service firms are involved.

Each study within this dissertation entails a thorough analysis of diverse factors, each capable of impacting market return and market risk. By examining both the facilitating and inhibiting elements pertaining to the corporate market value- and risk of blockchain, the following studies serve to complement and extend the ongoing academic discourse surrounding the valuation of blockchain technology.

2 Is blockchain worth it? Value drivers of corporate blockchain announcements in public equity markets

2.1 Introduction

Blockchain technology has garnered increasing interest among companies seeking to explore its potential opportunities (Lacity, 2018; Rossi et al., 2019; Zavolokina et al., 2020). A Deloitte survey of 1280 senior executives revealed that 78% believe their company possesses a compelling business case for blockchain (Pawczuk et al., 2021). Moreover, firms like Walmart or Maersk have set prime examples by developing and operationalizing trade- and traceability platforms based on blockchain technology (Choudary et al., 2019). Furthermore, the surge in popularity and value of the cryptocurrency Bitcoin has sparked public curiosity in its underlying technology (Cheng et al., 2019). Academic interest in this topic closely follows the advancements made in practice. Most scientific blockchain publications are settled in the fields of information systems (IS), operations- and supply chain management or in finance literature. Thus, various conceptual studies discuss the characteristics of blockchain technology and how its attributes can enable different firm-specific use cases. Among others, scholars analyse advantages of organizational blockchain applications in the areas of business model innovation (Chong et al., 2019), vendor inventory management (Babich & Hilary, 2020; Kolb et al., 2018), counterfeit prevention (Pun et al., 2021) or corporate governance (Yermack, 2017).

On the other hand, the building block of qualitative and conceptual blockchain research is only substantiated by anecdotal evidence. The market research firm Grand View Research states that the projected value of the worldwide blockchain technology market is anticipated to achieve $1.4 trillion by the year 2030 (PRNewswire, 2022), but until now only a handful of firms can report a substantial positive operational impact of blockchain systems (Klöckner et al., 2022). This circumstance requires more research on the value of blockchain in an organizational context.

Companies that adopt an opportunistic approach to emerging technologies are often rewarded with increased stock market returns (Sarkees, 2011). Consequently, researchers started analysing the influence of blockchain technology on financial markets, particularly on the market value of firms. Notably, when companies release blockchain-related announcements, the behavior of their stock returns exhibits some correlation with the price movements of Bitcoin (Cahill et al., 2020; Cheng et al., 2019). Likewise, the market responds positively to blockchain-related patent filings and name changes, leading to significant positive market reactions (Bowman & Steelman, 2019; Sharma et al., 2020), and long-term market value is expected to be present (Klöckner et al., 2022; Lui & Ngai, 2019). Recent studies also examine market reactions to blockchain announcements in emerging markets (Liu et al., 2022) and supply chain related blockchain announcements, both demonstrating substantial positive returns (Klöckner et al., 2022).

The current stream of research on blockchain market value surprisingly presents no clear differentiation of announcement characteristics that might influence *how* investors perceive a blockchain-related statement. Consequently, we seek to advance blockchain market value research by relying on signaling theory to show that undifferentiated views ignore differences between relevant blockchain project- and firm characteristics. Hence, our research is guided by the following research question:

How do firm- and blockchain project characteristics impact shareholder reactions to blockchain announcements?

We approach this research question by utilizing the event study methodology to investigate shareholder reactions to blockchain announcements in a multi-country setting. Researchers regularly utilize this method to quantify the value of innovative information technology (IT) (Dehning & Richardson, 2002; Schryen, 2013). It enables an overview of short-term stock market reactions to corporate blockchain announcements and serves as an initial signal of the prospective business value linked to blockchain initiatives (Klöckner et al., 2022). Our analysis relies on a sample of 606 announcements between 2014 and 2021 from publicly traded US- and European firms and we substantiate the results by conducting two additional robustness checks as well as a multivariate regression analysis.

We contribute to the literature on the value of blockchain technology in several ways. Initially, we find significant positive average abnormal stock market returns of 0.38% to blockchain announcements during an event window of three days around the announcement day.

Moreover, we build on previous research which showed that various factors influence the value of IT for businesses (Melville et al., 2004). Our empirical results suggest that investors differentiate between the value of a successfully *finished* blockchain initiative and the additional risk associated with the announcement of an *unfinished* or *planned* blockchain project. Another notable difference compared to other digital technologies becomes apparent in how many companies solely depend on the potential marketing impact that comes with announcing a blockchain project (Cheng et al., 2019). Past studies did not focus on possible differences between announcements that are related to a company's actual business process or announcements where no or little of such relation exists. By observing the *business-relatedness* of the blockchain announcement and recognizing that more investors become knowledgeable about blockchain technology (Bracci et al., 2022), we show that shareholders are able to differentiate between varying intentions of blockchain announcements. Another significant driver lies in differences of the degree of knowledge about blockchain technology between different regions or countries (Buchholz, 2022). We expect investors in countries which should be more aware of the possible business value of blockchain technology to better recognize its potential value for a company. Thus, we deem it as important to understand how *regional distinctions* influence shareholder reactions to blockchain announcements. Additionally, past research has shown that time effects in investors' reactions as well as dependencies on the public perception of information systems (IS) subjects exist (Cheng et al., 2019; Drechsler et al., 2019). By showing that in times of a *hype* or *mania* (Cheng et al., 2019; Drechsler et al., 2019) returns are amplified, we conclude that reactions to blockchain announcements depend on the degree of public attention to blockchain.

We contribute to existing research on market value through blockchain technology by explicitly showing that blockchain projects do not deliver business value per se, but that specific value drivers lead to increased positive shareholder perception. Additionally, we substantiate these findings by arguing that signaling effects of companies in times of increased public attention on blockchain are main underlying mechanisms for the creation of market value through public blockchain announcements. Practitioners benefit from our research by understanding and being able to focus on drivers under which positive stock market reactions to blockchain announcements can be expected.

The remainder of this study is structured in the following way. First, we give an overview of existing literature on market value through blockchain technology and provide the necessary theoretical background for our study. Next, we develop our hypotheses and describe the research methodology applied. We then explain the data collection method with the resulting dataset and our different measure definitions. Subsequently, we present the results of our analysis, including the robustness checks performed, and provide a discussion which is corroborated by possible implications for research and practice. We conclude by showing the limitations of the study and laying out ideas for possible future research paths.

2.2 Literature Review and Theoretical Background

2.2.1 Related Work

Investments in blockchain technology projects can be considered as a specific form of IT- or innovation investment by companies. A well-established stream of research has analysed the impact of innovative IT investments on the market value of companies (Chatterjee et al., 2001; Dehning et al., 2003; Dobija et al., 2012). Most studies found positive relationships for this type of firm value influence (Bose & Leung, 2019). However, the impact of such investments on shareholder reactions cannot be generalized and depends on the type of technology in question (Schryen, 2013). Therefore, several researchers studied the impact of different types of emerging technology investments on the market value of companies. Zhang et al. (2017) find an increase in market valuations of organizations after big data announcements. Son et al. (2014) identify significant positive shareholders returns after examining cloud computing initiatives. The same applies to companies actively pursuing the adaption of Internet of Things (IoT) technology (Tang et al., 2018) or business analytics systems (Teo et al., 2016). Existent market value research on blockchain technology found that between 2015 and 2018 investors reacted to US firms' announcements mentioning blockchain in a way that is correlated to the price development of Bitcoin (Cahill et al., 2020). Thus, researchers assume that shareholders mistakenly used Bitcoin as an indicator for the expected success of blockchain technology (Cahill et al., 2020; Cheng et al., 2019). Firms that change their corporate name so that it includes the word “blockchain” or “bitcoin” experience significant positive stock market returns (Sharma et al., 2020). Furthermore, preliminary results from a recent study show that blockchain announcements by companies generated long-term abnormal returns between 2015 and 2018 (Lui & Ngai, 2019). Liu et al. (2022) find positive short-term abnormal returns for companies with blockchain announcements in emerging markets. Moreover, an event study observing the period between 2015 and 2019 finds significant abnormal returns of 0.30% for supply chain related blockchain announcements on the announcement day (Klöckner et al., 2022).

2.2.2 Signaling Theory

Signaling theory, initially proposed by Spence (2002) to address information asymmetry in the labor market, serves as our theoretical foundation for understanding abnormal stock market returns resulting from corporate blockchain announcements. It assumes that companies possess a greater set of information compared to their investors, creating an asymmetry that needs to be bridged (Spence, 2002). In the context of the company-shareholder relationship, signaling theory suggests that corporations transmit signals to shareholders, conveying specific information, which is then interpreted and reacted to by the receivers (Teo et al., 2016). When companies release new information, shareholders evaluate and form perceptions of the announcement, which subsequently shape their reactions (Connelly et al., 2011). These reactions then reflect the shareholders' assessment of the company's future prospects, making signals an essential tool for firms to communicate their expected financial impact and IT capabilities (Zmud et al., 2010). By relying on strategic signals, organizations implicitly or explicitly communicate their motivations, goals, and ongoing actions, aiming to influence stakeholder perceptions and behaviors (Teo et al., 2016). These signals allow shareholders to react positively or negatively based on their interpretation (Y. Zhang et al., 2022).

To address information asymmetry, the quality of information and the intent behind the signals are crucial factors. Shareholders' reactions depend on their awareness of the sender's characteristics, implementation capabilities, and the current status of a project at the time of the announcement (Stiglitz, 2000; Teo et al., 2016). Moreover, firms may strategically signal their recognition of the value associated with emerging technologies, such as blockchain, even if they have no immediate plans to implement them in their actual business processes (Elitzur & Gavious, 2003).

2.3 Hypotheses Development

Blockchain technology is recognized for its transformative potential in business and society (Chanson et al., 2019; Rossi et al., 2019). Companies worldwide are actively involved in various blockchain projects to explore their operational value. The surging popularity and price of Bitcoin has sparked public interest not only in cryptocurrencies but also in blockchain technology (Grant, 2017). Consequently, announcing a blockchain project allows a company to signal its commitment to exploring and potentially implementing emerging technologies. Organizations that engage in technological exploration and signal their capacity to do so tend to outperform their market peers financially (Srinivasan et al., 1999). Through this quality signaling, firms may strive to generate positive shareholder reactions by highlighting potential advantages such as cost reductions (Carson et al., 2018), enhanced data transaction efficiency (Risius & Spohrer, 2017) and transformative industry practices like product traceability (Chong et al., 2019). Therefore, blockchain announcements can indicate future competitive advantages and short-term financial benefits, resulting in positive abnormal returns. Additionally, companies may seek to enhance their reputation (Teo et al., 2016) by capitalizing on investor appreciation for commitments in promising and hyped technologies (Cheng et al., 2019), despite the limited number of blockchain implementations that genuinely enhance long-term business value (Chong et al., 2019). Furthermore, publicly listed organizations may leverage the knowledge gap between Bitcoin and blockchain technology among shareholders (Cahill et al., 2020; Cheng et al., 2019). Particularly during the periods of Bitcoin price surges in 2017-2018 and 2020-2021, firms might have deliberately exploited this information asymmetry to participate in the "blockchain mania" (Cheng et al., 2019, p. 1). Therefore, we hypothesize:

H1: Blockchain announcements lead to positive short-term abnormal returns.

Blockchain announcements by companies cover a variety of topics. Those can range from the announcement of joining a blockchain consortium, such as Hyperledger, to presenting a fully implemented blockchain-based product. Other recent publications on market reactions to blockchain announcements also recognize this and execute sub-sampling analyses to distill which specific types of announcements lead to significant abnormal returns. Klöckner et al. (2022) focus on announcements in the supply chain sector and find that news related to traceability or data sharing lead to weaker abnormal returns than other supply chain related announcements. In an analysis focusing on company blockchain news in emerging markets, Liu et al. (2022) find that announcements related to a company's overall strategy exhibit higher abnormal returns than announcements focusing on operational issues. Cheng et al. (2019) compare speculative and non-speculative announcements, with speculative news leading to higher abnormal returns with a dataset focusing on US companies.

As Tables 2.1 and 2.2 show, firms usually make an announcement that either indicates the planned development of blockchain prototypes with or without other partners or announce an already finished project, often with a working and sometimes already implemented blockchain infrastructure.

Company	Date	Announcement
Cisco Systems	16.11.2020	Cisco and DHL Partner to Develop a Blockchain Solution
Mastercard Inc.	11.09.2019	Mastercard and R3 Partner to Develop New Blockchain-Powered Cross-Border Payments Solution

Table 2.1: Announcement examples of planned or unfinished blockchain projects.

Company	Date	Announcement
Amazon.com Inc.	30.04.2019	AWS Announces General Availability of Amazon Managed Blockchain
IBM	09.08.2018	Maersk and IBM Introduce TradeLens Blockchain Shipping Solution

Table 2.2: Announcement examples of finished blockchain projects.

Past analyses estimate that more than 90% of blockchain projects by large international companies fail (Disparte, 2019). Thus, company news that announces a planned blockchain project could be considered as riskier by shareholders than news that present an already successfully completed project or prototype. Additionally, in accordance with signaling theory, finishing a blockchain initiative could indicate confidence to investors that the company is able to successfully leverage the technology to provide business value for the corporation. Therefore, we hypothesize:

H2: Abnormal stock market returns are higher for blockchain announcements declaring finished projects than for blockchain announcements declaring a planned or unfinished project.

The incorporation of emerging technologies such as big data analytics or blockchain technology can improve data-driven decision-making processes or supply chain agility and adaptability and thus create competitive advantages which is acknowledged by shareholders in the form of abnormal returns (Sheel & Nath, 2019; Teo et al., 2016). Nevertheless, companies not only pursue blockchain projects related to these types of core IT business processes such as improving supply chain traceability or making data management processes more secure and transparent. One recent prominent example of non-core business related blockchain initiatives is the release of Non-Fungible Tokens (NFTs). Those are digital tokens representing digital artefacts which are distinguishable and non-dividable and are usually based on the Ethereum blockchain (Regner et al., 2019). An example is Pepsi's "Mic Drop NFT Collection" which was generated in December 2021 on the Ethereum blockchain (PRNewswire, 2021). Such NFTs are usually offered as marketing gigs and are neither related to a core business process nor are they part of the product range. In contrast to announcements which can be expected to generate longer-term competitive advantages for a company, shareholders could consider announcements that are not related to the actual business of the company as not relevant enough to enhance the firm's business value. Additionally, according to signaling theory, shareholders acknowledge announcements that signal a high probability of future improved financial performance (Connelly et al., 2011). If investors are not able to recognize how a blockchain announcement could impact or improve business processes and consequently its financial situation, there might be no incentive to invest in the company based on the announcement. Therefore, we postulate:

H3: Blockchain announcements related to companies' core business processes generate higher abnormal stock market returns than blockchain announcements not related to companies' core business processes.

As a McKinsey study shows, Europe still lies behind the US in disruptive digital innovation as well as core innovative areas such as quantum computing, artificial intelligence and blockchain (Bughin et al., 2019). The US also leads cryptocurrency adoption in comparison to most European countries. Various surveys claim an adoption rate between 8% and 13% in the US versus an adoption rate between 3% and 6% in Germany, France, and Great Britain in 2021 (Laycock, 2022; Triple-A, 2021). Moreover, the worldwide monthly share of web traffic to cryptocurrency platforms is significantly higher in the US than in Europe, with the US averaging a monthly share of around 20% and Europe averaging less than 10% between 2019 and 2021 (Chainalysis, 2021). As cryptocurrencies are the most well-known use case of blockchain technology, this implies that US investors might be more familiar with blockchain technology. Shareholders who are more knowledgeable about the topic or circumstance of a corporation's announcement react more positively if the announcements imply an innovative step of the company (Lane & Jacobson, 1995). Moreover, the cue utilization theory by Cox (1967) states that a person's ability to correctly classify a cue also determines the cue's usage. As US investors could be more aware of blockchain technology and are also exposed to more companies engaged in digital disruption (Bughin et al., 2019), they might be more confident in the cue, here represented in the form of a blockchain announcement, and therefore might react more positively to a company proposing blockchain technology news. Hence, we hypothesize:

H4: Blockchain announcements by firms listed in the United States generate higher abnormal stock market returns than blockchain announcements by firms listed in Europe.

Based on a google trend search analysis with the terms "blockchain" and "cryptocurrency", Figure 2.1 shows that a steep rise in interest can be observed between October 2017 and March 2018 as well as between October 2020 and January 2022 [4] [5]. We define those periods as times of a blockchain and cryptocurrency hype or "mania" (Cheng et al., 2019, p. 1). In a timeframe of blockchain hype, shareholders are generally more aware of topics regarding blockchain and cryptocurrencies (Cheng et al., 2019). Additionally, investors often confuse the rise of the price in cryptocurrencies with the concept of industrial blockchain applications and assume increasing business value through blockchain in times when the prices of cryptocurrencies are rising (Cahill et al., 2020). This is also corroborated by Figure 1 where a correlation between the trend search line and the total market capitalization of cryptocurrencies in the timeframe between 2013 and 2022 can be

[4] https://trends.google.com/trends/explore?date=all&q=blockchain. Accessed 03.08.2022.
[5] https://trends.google.com/trends/explore?date=all&q=cryptocurrency. Accessed 03.08.2022.

observed. Conversely, in times of falling interest in blockchain and falling cryptocurrency market capitalization, shareholders might question the business value of blockchain projects by companies. By confounding cryptocurrencies with blockchain projects (Cahill et al., 2020), investors might be deterred from a corporation's blockchain announcement during periods of falling cryptocurrency prices. Therefore, we hypothesize:

H5: Blockchain announcements by firms in periods of a blockchain- and cryptocurrency hype generate higher abnormal stock market returns than blockchain announcements during non-hype periods.

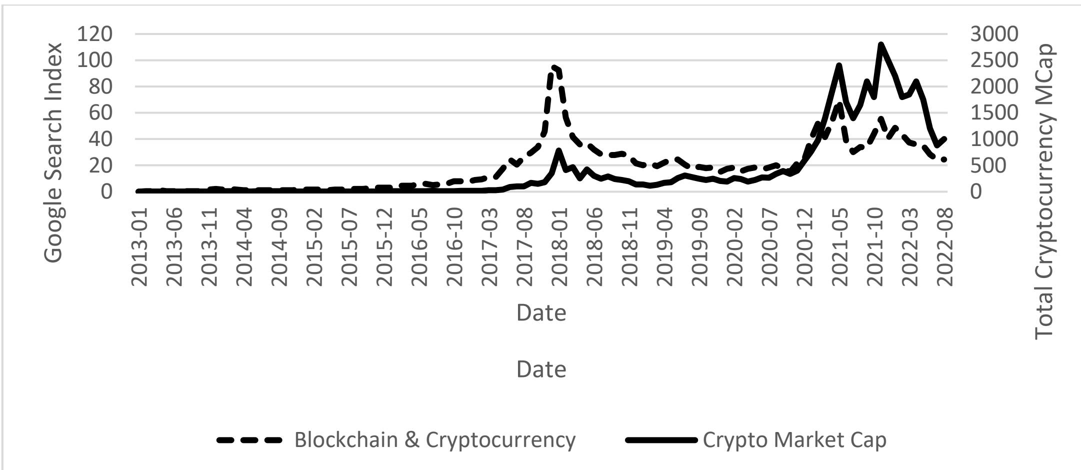

Figure 2.1:Google Search Index of search items "blockchain" and "cryptocurrency" and total cryptocurrency market capitalization between 01/13 and 08/22.

2.4 Research Methodology

2.4.1 Estimation Method

We rely on the event study methodology described by Brown & Warner (1980) to study the effects of blockchain technology announcements on the market value of firms (MacKinlay, 1997). Shareholder reactions are captured by measuring abnormal returns (ARs) during a predefined time window after the announcement. This is a commonly used methodology to assess the impact of different types of IS events on market value (Aggarwal et al., 2011; Bose & Leung, 2019; Chatterjee et al., 2001) . We use the event study method to calculate short-term market reactions regarding a blockchain announcement of a company. Positive ARs should occur if investors react to these strategic signals of the announcing companies.

Most early event studies in the IS field relied on the use of the efficient market model (e.g., Chatterjee et al., 2001; Dewan & Ren, 2007). Nevertheless, this model omits relevant stock market factors such as firm size or the book-to-market ratio which have an impact on returns. Thus, we applied the Fama-French five-factor model (FFM5) described by the following formula:

$$r_{i,t} - r_{f,t} = \propto_i + \beta_{1i}(r_{m,t} - r_{f,t}) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}RMW_t + \beta_{5i}CMA_t + \varepsilon_{it} \quad (2\text{-}1)$$

Here, $r_{i,t}$ is the return of stock i for period t, $r_{f,t}$ represents the risk-free return, $r_{m,t}$ is the return of the respective market portfolio m and SMB_t is the difference in returns of a diversified portfolio of small stocks and a portfolio of large stocks. HML_t is the difference in returns of a portfolio of shares with a high book-to-market ratio and a portfolio of shares with a low book-to-market ratio, RMW_t represents the difference in returns of portfolios with high and low profitability and CMA_t is the difference in returns between a portfolio of firms with low investments and a portfolio with high investments (Fama & French, 2015). ε_{it} is the zero-mean residual or error term. We utilize three-month U.S. treasury bills as an estimator for the returns of a risk-free asset (Teo et al., 2016) and retrieve the factor data from the official K.-French data website (French, 2022). Abnormal returns are estimated as $AR_{i,t} = r_{i,t} - E(r_{i,t})$ where $E(r_{i,t})$ represents the expected stock returns. ARs are calculated by:

$$AR_{i,t} = r_{i,t} - r_{f,t} - \left[\hat{\alpha}_i + \hat{\beta}_i\left(r_{m,t} - r_{f,t}\right) + \hat{\beta}_i SMB_t + \hat{\beta}_i HML_t + \hat{\beta}_i RMW_t + \hat{\beta}_i CMA_t\right] \qquad (2\text{-}2)$$

Based on the methodology of recent earlier event studies we rely on an estimation window of 120 days before the event and 15 days prior to the event (-120, -15) (A. Bharadwaj et al., 2009; Schweikl et al., 2022) to calculate the model parameters. The next step includes the summation of event specific ARs to cumulative ARs (CAR):

$$CAR_{i,t_1;t_2} = \sum_{t_1}^{t_2} AR_{i,t}\ , \qquad (2\text{-}3)$$

with t_1 and t_2 being the respective start- and end date of the event window. Initial event windows are set to two weeks [-5;+5] as well as three [-1;+1] and five [-2;+2] days around the event. Hereby, we followed previous IS research (e.g., Sabherwal & Sabherwal, 2005; Yang et al., 2012) and purposely did not include single day event windows, as a significant amount of press releases are distributed with a lag of one or two days across the news platforms chosen.

The last step includes the calculation of cumulative average abnormal returns (CAARs):

$$CAAR_{i,t_1;t_2} = \frac{1}{n}\sum_{1}^{n} CAR_{i,t_1;t_2}\ , \qquad (2\text{-}4)$$

with n being the number of events.

We test statistical significance with two parametric- and two non-parametric tests. The Patell z-test and an adjusted standardized cross-sectional test (Adjusted StdCSect) represent the parametric tests. Corrado rank tests (Corrado & Zivney, 1992) and Generalized Sign tests (Cowan, 1992) serve as non-parametric tests to assure statistical significance for the assumption that the sample is not normally distributed. Welch t-tests as well as Mann-Whitney U tests serve as difference-in-mean and difference-in-median tests.

2.4.2 Data Collection

We collected announcements of blockchain initiatives by utilizing Nexis Uni (former Lexis-Nexis), which is a database providing daily worldwide press news. Hereby, we obtained an international sample of public firms who announce and show intention to implement blockchain technology and followed earlier approaches by relying on a predefined set of firms (Borah & Tellis, 2014; Klöckner et al., 2022) from the S&P500 index and the STOXX Europe 600 index, leading to an initial sample of 1100 firms. We chose these two indices for our data sample as all their constituents are large- or at least mid-cap-sized, which indicates a high trading volume of the firms' stocks. Another reason why we selected these two indexes is that we are interested in differences in shareholder reactions to announcements by US firms and European firms. Thus, we refrained from applying the commonly used MSCI World Index (Asness et al., 2013; Klöckner et al., 2022) as our sample firm pool. Public attention about blockchain technology is considered to be weak prior to 2014 (Cahill et al., 2020), therefore we focused on announcements between January 1, 2014, and December 31, 2021. We followed a structured approach to obtain relevant blockchain announcements from the sample firm pool. Based on earlier studies utilizing event studies with news headlines, we focused on the search of the news sources PR Newswire and Business Wire (Barua & Mani, 2018; Subramani & Walden, 2001; Teo et al., 2016). Additionally, we also searched all investor-relations news websites of the respective companies for first-hand announcements that might not have been covered by relevant business news. In the search process, each company name was combined with the term *blockchain* or *cryptocurrency*.

This search led to an initial amount of 15,156 announcements. At first, we only kept announcements related to our study purpose. Duplicates and statements on general outlooks on blockchain technology were eliminated (Klöckner et al., 2022). The announcements identified included statements on collaborations for blockchain projects, finished blockchain prototypes, firms joining blockchain consortia, investments in blockchain companies, blockchain patents, crypto coverage, or payment possibilities and NFT offerings. Moreover, we eliminated announcements that could have a confounding effect, such as financial earnings announcements, executive changes or merger and acquisition (M&A) announcements that occurred during the event window (Konchitchki & O'Leary, 2011). The final sample comprised 271 US announcements and 335 European announcements from 267 unique firms overall. Next, we collected all respective stock price data of the companies filtered from Thomson Reuters. We chose the MSCI World Index as our market benchmark for the combined data sets (H1, H2, H3, H5) as publicly listed companies from the US and Europe represent more than 50% of the worldwide market capitalization of publicly traded stocks (Worldbank, 2022). For H2, the market benchmarks are the S&P500 index for the US data set and the STOXX Europe 600 index for the European data set. Fama-French factors were retrieved from the Dartmouth College database website (Fama & French, 1993). In case of differing announcement dates among different sources we chose the earlier date where the news can be interpreted as confirmed (Wilcox et al., 2001). Announcements on non-trading days are moved to the next trading day (MacKinlay, 1997). Table 2.3 displays a summary about the sample, presenting announcement years, industry- as well as country distribution.

Country	Freq.	Industry	Freq.	Year	Freq.
United States	271	Financials	212	2022	57
Germany	98	Technology	101	2021	127
France	59	Industrials	82	2020	83
United Kingdom	43	Consumer Discretionary	73	2019	131
Netherlands	30	Consumer Staples	43	2018	118
Spain	29	Utilities	22	2017	65
Switzerland	18	Telecommunications	21	2016	21
Italy	13	Basic Materials	20	2015	3
Sweden	10	Health Care	17	2014	1
Austria	9	Energy	10		
Belgium	5	Real Estate	5		
Denmark	5				
Finland	5				
Ireland	3				
Norway	3				
Isle of Man	2				
Luxemburg	1				
Poland	1				
Portugal	1				

Table 2.3: Sample Statistics.

2.4.3 Measure Definitions

To test our hypotheses following H1, we conduct subsampling analyses (Bose & Leung, 2019; Drechsler et al., 2019). For each of the hypotheses, the overall sample is split into two groups which are based on additional measures.

For testing H2, we define the *blockchain project stage* as either a planned or a finished blockchain project. We categorize a *planned blockchain project* as an initiative where the announcement indicates that it is either expected to begin in the future or has already started but has not yet delivered any types of preliminary results. If the announcement indicated the successful completion of a blockchain initiative, this was labeled as a *finished blockchain project*.

For testing H3, *business relatedness* is defined as a blockchain project related to a company's business processes such as logistics, data management or payment methods. Hereby, two independent coders thoroughly evaluated each announcement, considering the type of industry as well as the core businesses the company is operating in. The coding processes led to an agreement rate of over 84%. In cases of non-congruency, the coders discussed the announcement until a conclusion was reached.

H4 relies on the *regional location* of the firm. Firms that are part of the STOXX 600 Europe are defined as *European firms* whereas companies from the S&P 500 are defined as *US firms*.

Lastly, to test H5, a *blockchain hype period* is considered as a time frame in which the google search index for "blockchain" and "cryptocurrency" lies above 50. If it lies at or below 50, we consider it a *non-hype period*.

2.5 Results

2.5.1 Event Study

Panel A1 of Table 2.4 illustrates the event study results for H1. For the (-1, 1) and the (-2, 2) event window, we find significant support for H1. For the three-day event window, we see positive cumulative average abnormal stock market returns of 0.38% which are significant at the 1% level for the parametric- and significant at the 5% level for the non-parametric tests. The five-day event window also shows a positive CAAR of 0.50% with significance at the 1% level for both parametric tests and significance at the 5% level for both non-parametric tests. Results become mostly insignificant for the (-5, 5)-day event window. We observe a positive mean cumulative abnormal return of 0.42% which is only significant at the 10% level for the Generalized Sign test. Overall, the findings indicate significant support for H1.

Panel A1: Total sample (-120 to -15)							
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Observations**
[-1;+1]	0.38%	0.22%	2.98***	3.08***	2.51**	1.96**	606
[-2;+2]	0.50%	0.59%	3.86***	2.89***	2.39**	2.31**	606
[-5;+5]	0.42%	0.53%	1.01	1.07	1.31	1.75*	606

*p<10%, **p<5%, ***p<1%

Table 2.4: Event Study Results for H1.

Panel A2 and B2 in Table 2.5 present results for testing H2 where the sample is divided into finished and unfinished or planned blockchain projects. CAARs for Panel A2, which represents the finished blockchain projects sample, are significantly positive for the three- (CAAR = 0.64%) and five-day event window (CAAR = 0.58%). All test statistics show significance at the 1% level. Statistical significance becomes weaker for the two-week event window (CAAR = 0.51%) with only the Generalized Sign test showing significance at the 1% level and the Corrado test with a 10% level significance. In contrast, Panel B2 shows weaker CAARs with almost no significance across all event windows. The only exception is the General Sign test for the five-day event window with a significance at the 10% level. A Welch t-test and the Mann-Whitney U test show that the differences of the three-day event window CAARs and median CARs of Panel A2 and Panel B2 are statistically significant.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Observations
Panel A2: Finished projects							
[-1;+1]	0.64%	0.52%	4.99***	3.78***	4.48***	4.37***	288
[-2;+2]	0.58%	0.44%	4.70***	3.51***	2.83***	2.81***	288
[-5;+5]	0.51%	1.11%	1.54	1.59	1.72*	3.17***	288
Panel B2: Planned- or unfinished projects							
[-1;+1]	0.09%	0.16%	0.67	0.73	0.17	0.87	318
[-2;+2]	0.28%	0.34%	1.00	0.98	0.75	1.78*	318
[-5;+5]	-0.16%	0.19%	-0.99	-0.56	-0.32	0.75	318

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U test (z)
[-1;+1]	0.55%	0.38%	2.40**	2.81***
[-2;+2]	0.30%	0.10%	0.97	1.01
[-5;+5]	0.67%	0.92%	1.50	2.01**

*p<10%, **p<5%, ***p<1%

Table 2.5: Event Study Results for H2.

Panel A3 and B3 in Table 2.6 depict the results of the subsamples created for testing H3. Panel A3, which represents the subsample for blockchain events related to a company's business processes, shows highly significant positive abnormal returns at the 1% level for the three-day- (CAAR = 0.66%) and five-day (CAAR = 0.83%) event window. The two-week window presents slightly weaker significant results for the CAAR of 0.62%. Here, the Patell test is significant at the 10% level and the Generalized Sign test shows significance at the 5% level. The other two tests do not show statistical significance. On the other hand, blockchain announcements unrelated to a firm's business processes exhibit a different picture with insignificant and lower positive abnormal returns for all three event windows. Further Welch t- and Mann-Whitney U tests show that the CAAR and median CAR differences between Panel A3 and B3 are significant for the three-day as well as for the five-day event window.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Observations
Panel A3: Related to business processes							
[-1;+1]	0.66%	0.44%	4.14***	3.65***	3.11***	4.19***	327
[-2;+2]	0.83%	0.68%	4.08***	3.23***	3.16***	3.84***	327
[-5;+5]	0.62%	0.51%	1.66*	1.40	1.49	2.25**	327
Panel B3: Unrelated to business processes							
[-1;+1]	0.17%	0.14%	1.32	1.39	1.06	0.80	279
[-2;+2]	0.33%	0.18%	1.41	1.41	1.44	1.06	279
[-5;+5]	0.13%	0.52%	0.55	0.44	1.18	1.30	279

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U test (z)
[-1;+1]	0.49%	0.30%	2.30**	2.02**
[-2;+2]	0.50%	0.50%	1.77*	1.95*
[-5;+5]	0.49%	0.01%	1.15	-0.30

*p<10%, **p<5%, ***p<1%

Table 2.6: Event Study Results for H3.

Analysis results for H4 are presented in Table 2.7. H4 suggests that announcements by US firms exhibit higher abnormal stock returns than announcements by European firms. Panel A4 shows the analysis results for the US subsample. We find robust positive abnormal returns between 0.72% and 0.80% for all three event windows. For the three- and five-day event window, our results are also statistically significant for all parametric and non-parametric tests at the 1% level. The CAAR of 0.74% for the two-week event window is also significant at the 1% level for the Patell - and Generalized Sign test. The European subsample presented in Panel B4 shows much lower CAARs with overall less significance than the US firm panel. For the three-day event window, results are significant at the 1% and 5% level with negative abnormal stock returns of -0,46%. CAARs become positive but less significant for the five-day and two-week event period. The five-day event window CAAR of 0.36% is significant at the 10% level for the two parametric tests and significant at the 5% level for both non-parametric tests. In the two-week event period, statistical significance almost disappears for the CAAR of 0.08%, with only the Corrado test showing a 10% level significance. The CAAR differences between Panel A4 and B4 are statistically significant at the 1% level for the three-day event window and significant at the 10% level for the two-week event window. Moreover, the median CAR deltas are statistically significant across all three event windows.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Observations
Panel A4: US firms							
[-1;+1]	0.72%	0.59%	5.90***	4.07***	4.16***	3.68***	271
[-2;+2]	0.80%	0.86%	5.33***	3.30***	4.03***	3.68***	271
[-5;+5]	0.74%	1.34%	2.77***	1.77*	1.22	4.41***	271
Panel B4: European firms							
[-1;+1]	-0.46%	-0.94%	-3.91***	-1.98**	-2.18**	-2.04**	335
[-2;+2]	0.36%	0.26%	1.87*	1.84*	2.36**	1.96**	335
[-5;+5]	0.08%	0.25%	0.44	0.40	1.68*	0.94	335

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U test (z)
[-1;+1]	1.18%	1.53%	4.76***	7.61***
[-2;+2]	0.44%	0.60%	1.49	2.47**
[-5;+5]	0.66%	1.09%	1.69*	3.40***

*p<10%, **p<5%, ***p<1%

Table 2.7: Event Study Results for H4.

Lastly, Panel A5 and B5 in Table 2.8 depict the results for testing H5. CAARs for Panel A5, which shows results of the blockchain hype-period subsample, are only partially significant but nonetheless stable across the three- and five-day event periods. The three-day event window CAAR of 0.63% exhibits 1% significance for all tests. The same applies to the five-day event window where only the Generalized Sign test is not significant at the 1% level. For the two-week event window, we do not find statistical significance. Representing the results of the non-hype period subsample, Panel B5 exhibits lower and more unstable abnormal stock returns. We observe insignificant negative abnormal returns of -0.29% for the three-day event window. The five-day event period shows an insignificant CAAR of 0.24% for all test statistics except for the Corrado test, which is significant at the 10% level. Statistical insignificance is also prevalent for the two-week event window (CAAR = 0.11%). Only the Generalized Sign test identifies a statistically significant effect at the 5% level. Welch t- and Mann-Whitney U tests show that the differences in CAARs are statistically significant at the 1% level for the three-day event window. CAAR- and median CAR differences for the five-day and two-week event window remain statistically insignificant.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Observations
Panel A5: Hype-Period							
[-1;+1]	0.63%	0.27%	3.89***	4.00***	3.00***	4.05***	218
[-2;+2]	0.43%	0.53%	4.89***	3.90***	3.97***	2.65**	218
[-5;+5]	0.44%	0.48%	1.11	1.43	-0.42	1.54	218
Panel B5: Non-Hype-Period							
[-1;+1]	-0.29%	-1.39%	-1.70*	-1.26	-0.31	-1.04	388
[-2;+2]	0.24%	0.16%	1.64	1.51	1.67*	1.57	388
[-5;+5]	0.11%	0.57%	-0.19	-0.16	1.67	2.04**	388

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U test (z)
[-1;+1]	0.92%	1.66%	3.66***	7.63***
[-2;+2]	0.19%	0.36%	0.59	1.36
[-5;+5]	0.33%	0.09%	0.66	-0.06

*p<10%, **p<5%, ***p<1%

Table 2.8: Event Study Results for H5.

For robustness reasons, we also performed an additional analysis for H1 by utilizing a longer estimation window of (-200, 50) (Schweikl et al., 2022). This limits the impact of sudden market moves on the estimations (Park, 2004). Table 6.1 in the Appendix shows the results for this first robustness check. The results remain robust for the three- and five-day event window and become more significant for the (-5, 5)-day window by showing significance at the 5% level for the non-parametric Generalized Sign test. Moreover, the choice of the FFM5-model might impact our results. Therefore, we also executed the event study for the total sample based on the market model which is described by:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_{it}. \quad (2\text{-}5)$$

Results for this second robustness check are presented in Table 6.2 of the Appendix. Applying the market model also does not change the results and the effects are consistent with the findings of the original model.

2.5.2 Multivariate Regression

To further investigate the impact of the measures, which we expect to have a positive impact on stock market returns, we perform ordinary least squared (OLS) regressions in different variations described by the following formula:

$$CAR_i = \alpha_i + \beta_1 Finished\ Project_i + \beta_2 Business\ Related_i + \beta_3 US\ Firm_i + \beta_4 Hype\ Period_i + \beta_5 ROE_i + \beta_6 Free\ Float_i + \beta_7 \frac{Cash}{Assets}_i + \beta_8 \frac{Debt}{Equity}_i + \beta_9 Net\ Income_i + \beta_{10} MCap\_log_i + \beta_{11} Time_i + \in_i. \quad (2\text{-}6)$$

The dependent variable consists of the five-day (-2; +2) event window CARs as these proved to be the most significant results of the total sample. $Finished\ Project$ is the coded dummy variable which is equal to 1 when the blockchain project is already finished, and 0 otherwise. $Business\ Related$ refers to the coded dummy variable equaling 1 when the blockchain project is related to the firm's business operations, and 0 otherwise. $US\ Firm$ is a dummy variable which is 1 for blockchain announcements by US firms, and else 0. The final dummy variable is $Hype\ Period$ which equals 1 for the blockchain hype periods between October 2017 and March 2018 as well as between October 2020 and January 2022. Moreover, we follow the suggestion of previous literature and take additional firm-specific control variables into account. We focus on leverage-, profitability- and valuation-related metrics and include the measures ROE, $Free\ Float$, $Cash\ to\ Assets$, $Debt\ to\ Equity$, $Net\ Income$ and the logarithmized market capitalization ($MCap\_log$) (Bassen et al., 2019). Data for the control variables is retrieved from Refinitiv Workspace. Lastly, we also include time-fixed effects. Table 2.9 provides an overview of descriptive statistics of the explanatory variables.

	Observations = 606				
Variable	Min	Median	Mean	Max	SD
ROE	-0.869	0.146	0.197	0.818	0.197
Free Float	0.217	0.991	0.887	1.000	0.174
Cash to Assets	0.004	0.068	0.084	0.383	0.067
Debt to Equity	0.004	0.963	1.276	4.981	1.001
Net Income	-0.306	0.133	0.150	0.532	0.117
Mcap_log	3.292	4.453	4.524	6.244	0.629
Finished	0.000	0.000	0.474	1.000	0.499
Business_Related	0.000	1.000	0.531	1.000	0.499
US	0.000	0.000	0.420	1.000	0.494
Hype	0.000	0.000	0.352	1.000	0.478

Table 2.9: Descriptive Statistics of Independent Variables.

Table 2.10 displays the correlation matrix of the dependent- and independent variables. If the magnitudes of covariates between variables are less than 0.31, it can be inferred that there is no substantial multicollinearity effect on the regression analysis (Kutner et al., 2005). As none of the covariates surpass the threshold of 0.31, it can be concluded that collinearity does not pose a concern in our analysis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)CAR	1									
(2)ROE	0.01	1								
(3)Free_Float	0.1*	0.11*	1							
(4)Cash_Assets	0.08*	0.01	0.04	1						
(5)Debt_Equity	0.01	-0.16*	0.03	0.04	1					
(6)Net_Income	0.02	0.11*	0.15*	0.07	0.04	1				
(7)Finished	0.09*	-0.08	0.01	0	0.05	0.02	1			
(8)Hype	0.13*	0.01	-0.04	0.21*	0.05	0.02	0.07	1		
(9)Core	0.11*	0.09*	0.05	-0.01	-0.04	0.04	0.16*	-0.02	1	
(10)US	0.09*	0.13*	0.23*	0.17*	0.06	0.15*	-0.1*	0.08	0.04	1
(11)MCap_log	0.01	0.01	0.02	0.04	0	0.12*	-0.03	0.04	-0.13*	0.09*

*p<5%, n=606.

Table 2.10: Correlation Matrix.

Table 2.11 shows the results of the multivariate regressions. Model 1 refers to H2 and shows that the dummy variable $Finished\ Project$ has a significant positive impact on CARs at the 10% level. This supports our finding in the univariate subsampling event study where the three-day (-1; 1) event window CAAR for finished projects is significantly higher than the three-day (-1; 1) event window CAAR for planned- or finished projects. Consequently, we defer that announcements of finished blockchain initiatives could lead to stronger stock market reactions than corporate news of projects still in progress, which supports H2. In Model 2, we observe a statistically significant positive impact of the dummy variable $Business\ Related$ at the 5% level on CARs for blockchain announcements. Hence, we find support for H3 where we argue that business-related blockchain announcements should lead to higher stock market returns than non-business-related blockchain announcements. Model 3 presents regression results for the influence of the dummy variable $US\ Firm$ on abnormal stock returns. Here, we also find a significant positive effect at the 5% level. In support of H4, our results suggest that US firms benefit from higher stock market returns to blockchain announcements than non-US firms. Lastly, Model 4 features results for regressing the dummy variable $Hype\ Period$ on abnormal stock market returns. The observable positive impact is statistically significant at the 1% level and provides support for H5 where we argue that shareholders should benefit from increased stock market returns due to blockchain announcements in times of blockchain- and cryptocurrency hypes.

For robustness reasons, we also perform a multivariate regression analysis where we consider the potential impact of the type of blockchain specification. Therefore, we first categorized the announcements based on the technical blockchain application in use. We follow the approach of Klöckner et al. (2022) and create an additional dummy variable which equals 1 for announcements mentioning a permissioned blockchain, and else 0. Examples of permissioned blockchains are the Hyperledger Fabric platform, the R3 Corda platform, or the Quorum protocol. Next, we include the dummy variable $Permissioned$ in the multivariate regression models. Table 6.3 in the Appendix provides the corresponding results of including this variable. We do not observe a significant effect of the dummy $Permissioned$ in all four models calculated. Moreover, the hypothesized effects remain unchanged in comparison to the original models. Hence, this robustness analysis suggests that our findings are not biased by the type of technical blockchain specification.

Parameter	Model 1	Model 2	Model 3	Model 4
Finished Project	0.006 (1.95*)	-	-	-
Business Related	-	0.007 (2.15**)	-	-
US Firm	-	-	0.007 (1.98**)	-
Hype Period	-	-	-	0.015 (2.96***)
ROE	0.001 (0.30)	0.000 (0.02)	0.000 (0.06)	0.000 (0.11)
Free Float	0.021 (2.29**)	0.021 (2.24**)	0.016 (1.62)	0.023 (2.43**)
Cash to Assets	0.053 (2.20**)	0.053 (2.18**)	0.046 (1.88*)	0.048 (1.98**)
Debt to Equity	0.000 (0.01)	0.000 (0.13)	0.000 (-0.04)	0.000 (0.03)
Net Income	-0.002 (-0.16)	-0.002 (-0.18)	-0.003 (-0.21)	-0.003 (-0.27)
Market Cap (log)	0.001 (0.61)	0.001 (0.82)	0.001 (0.42)	0.001 (0.49)
Intercept	0.034 (0.88)	0.033 (0.85)	0.039 (1.02)	0.034 (0.89)
Time-fixed	Yes	Yes	Yes	Yes
Adjusted R^2	3.69%	3.84%	3.72%	4.56%
F Statistic (p-value)	2.42 (0.002)	2.48 (0.002)	2.43 (0.002)	2.78 (0.000)

*p<10%, **p<5%, ***p<1%, n=606.

Table 2.11: Multivariate Regression Results.

2.6 Discussion

Based on a multi-national sample, this study explores the shareholder value created through blockchain initiatives as well as relevant contingency factors which lead to significant positive market reactions. For the overall sample including 606 announcements we find support for the generation of additional positive market value through such announcements. This is in line with previous research (Cahill et al., 2020; Klöckner et al., 2022) and thus complements the assumption that investments in disruptive digital technologies are valued by shareholders. Furthermore, by applying the theoretical lens of signaling, we extend existent research on the market value of blockchain and are able to analyse the impact of regional-, timing- and project characteristics.

Specifically, our empirical analysis first indicates that blockchain announcements of already finished projects lead to higher stock market returns than blockchain news of planned- and unfinished projects. This suggests that shareholders might consider the possible risk of failure when evaluating a firm's involvement in blockchain. Our finding also supports previous event studies which consider the degree of uncertainty of US firms' blockchain announcements (Cheng et al., 2019). Second, we show that the market reaction to blockchain announcements related to the company's business processes is significantly stronger than the reaction to blockchain processes which are not business-related. Hence, investors might recognize whether the blockchain project is related to the company's business processes and thus might be able to deliver additional business value in the future. Moreover, it might be possible that shareholders, induced by the extensive media coverage and public attention since 2017, have gathered enough knowledge about the technology to be able to make sophisticated decisions about its usefulness in the context of improving business processes. We also interpret that firms appear to be able to effectively signal the intended future value of the technology instead of solely relying on marketing signals. Third, US firms experience a more positive stock market reaction to publishing blockchain news than European firms. We expect investors in the US to be more knowledgeable about blockchain technology (Bughin et al., 2019; Laycock, 2022). Therefore, they might exhibit higher confidence in its applicability. Moreover, there could be a broader and deeper understanding of the advantages that blockchain could deliver for a firm. Lastly, our study reveals that blockchain announcements delivered during the times of prevalent blockchain- and cryptocurrency hypes induce much higher stock market returns than announcements during non-hype periods. By including the period of extensive cryptocurrency between 2020 and 2022 in our dataset, this finding confirms and extends the research of Cahill et al. (2020) who show that blockchain announcement returns were correlated to the price of Bitcoin during the first hype-period of 2017 - 2018.

2.7 Theoretical Implications

We contribute to the existing stream of literature on blockchain market value in several ways. First, we complement research on blockchain market value (e.g., Liu et al., 2022) by deploying the perspective of signaling and highlighting the performance implications for companies that specifically focus on publishing news about successfully finished projects. Existing empirical studies on blockchain market value already show that blockchain technology creates business value (Cahill et al., 2020), but the explanatory power behind the creation of positive market reactions is severely limited. We fill this gap by showing that focusing on signaling specific characteristics of blockchain projects to shareholders provides significant additional value, especially when considering that signaling theory focuses on short-term influence (Teo et al., 2016). Our findings on announcements related to the companies' business processes affirm this perspective as they show that investors value the area of application signaled. Accordingly, shareholders might have reached a critical stage of understanding and classifying the applicability of blockchain technology.

Second, we extend past research (Cahill et al., 2020; Cheng et al., 2019) by providing a deeper understanding of the dependence of shareholders' perceptions on blockchain technology and the public attention on the topics of blockchain and cryptocurrencies. Our data indicates that investors seem to value blockchain announcements more in times of increased public blockchain attention. Consequently, during such times investors might focus less on the individual use case or the state of maturity of the technology and could be guided more by the general momentum building up through the blockchain-hype. This finding complements the research of Cahill et al. (2020) who show that market returns to blockchain news are higher in times of increased Bitcoin returns.

Lastly, prior research on blockchain value does not focus on regional differences when analysing stock market returns to blockchain announcement. We aim to bridge this gap by showing that US firms benefit more from blockchain announcements than European firms in terms of perceived shareholder value. By applying the lens of cue utilization (Cox, 1967), we challenge the implicit assumption of current blockchain research that stock market returns to blockchain announcements are indifferent to geographical factors.

2.8 Practical Implications

Our research also delivers important insights for managers who seek to enhance their company's market value through blockchain technology. First, this study provides evidence that blockchain announcements lead to positive abnormal returns. This should give executives additional confidence that blockchain projects have a positive impact on market value. As unfinished or planned projects do not deliver additional market value, managers should ensure the successful completion of a blockchain project before publishing news related to the initiative. Moreover, executives might focus on blockchain projects that are related to the company's actual business processes as investors appear to be knowledgeable enough to differentiate between marketing gigs and blockchain projects with real potential business value. By carefully observing the public perception as well as the development of the cryptocurrency market, practitioners might benefit from delivering finished and value-enhancing blockchain projects during times of increased public attention on blockchain and cryptocurrencies. Lastly, managers from European organizations should pay attention to educating their shareholders about the various fields of blockchain applications in a firm's industry.

Enhancing investor knowledge and confidence could increase the likelihood of firms amplifying the positive impact resulting from the announcement of new blockchain initiatives.

2.9 Conclusion, Limitations and Future Research

With our empirical study we provide insights into relevant drivers of market value through blockchain technology by applying the signaling perspective. Relying on the event study methodology, we confirm prior findings of general positive investor perception of blockchain project announcements. Moreover, news by companies that signal commitment by announcing successfully finished projects and blockchain initiatives related to their business processes are perceived positively by investors. This positive impact of blockchain announcements diminishes when they pertain to unplanned or unrelated projects. We also reveal the positive impact on shareholder perception through news published during times of heightened blockchain- and cryptocurrency attention and in countries of increased blockchain technology familiarity. From a theoretical perspective, this indicates the necessity to include the perspective of signaling besides the commonly applied resource-based view to explain relevant market value factors of a new disruptive digital technology. Practitioners and executives also benefit from our insights by focusing on announcements of blockchain projects that have been successfully finished and promise to deliver real future business value by being related to the company's business processes.

As with any empirical study, our research faces several limitations, thus leaving room for future research. First, we only examined the impact of four variables on stock market reactions to blockchain projects. On the organizational level, additional research in the form of regression analyses might be necessary to show how factors such as industry affiliation impact shareholder behavior. On the project level, it would be interesting to know how different blockchain use cases such as data-security, accounting or payment processing provoke different market reactions. Second, we rely on the factor of shareholder value as the primary indicator for financial firm performance. This neglects the impact blockchain can have on operating performance which might be possible to observe with more mature projects being implemented and analysed, possibly also in the form of qualitative case studies. Third, we focus exclusively on market reactions to blockchain announcements in developed countries. As emerging countries are also considered to benefit significantly from blockchain technology (Gupta & Knight, 2017), literature on blockchain market value could benefit from exploring or confirming drivers of success in terms of perceived shareholder value. Finally, we did not perform an analysis on the possible long-term value effects of blockchain projects. Even though results of empirical long-term market value analyses need to be taken with caution, we believe that such studies can be a useful indicator of the long-term creation of business value through blockchain.

3 Value- and risk drivers of corporate blockchain announcements

3.1 Introduction

Various studies have examined the relationship between Information Technology (IT) initiatives and financial firm performance. As such, most empirical analyses show that IT projects have a significant positive impact on key financial indicators of a firm (Bose & Leung, 2019; Melville et al., 2004; Teo et al., 2016). Performance measures vary from profit ratios (e.g., Return on Assets, Return on Equity (Barua et al., 1995)) to market measures such as Tobin's Q (A. S. Bharadwaj et al., 1999). The additional financial value generated through IT is mostly mediated through an increase in operational performance (Schryen, 2013). To be more specific, newly introduced IT can lead to cost reductions, operational efficiency and an increase in revenue (Klöckner et al., 2022). Recently, blockchain has risen as a leading contender among emerging technologies. Its impact on operational performance, with providing the opportunity to enhance relevant factors such as cost efficiency, counterfeit prevention and data transaction security, is backed by a variety of studies (e.g., Fridgen et al., 2018; Kolb et al., 2018; Weking et al., 2020). Based on these findings, past research started to examine the impact of blockchain technology on the stock market value of companies. Cahill et al. (2020) find a significant correlation between the price of Bitcoin and the stock market reaction to blockchain announcements by firms. Liu et al. (2022) and Y. Zhang et al. (2022) analyse stock market reactions to blockchain news by companies located in Asia and also find significant positive results. While Cheng et al. (2019) explore the market impact of speculative blockchain announcements, Klöckner et al. (2022) execute a use case specific blockchain announcement analysis settled in the area of supply chain management. Both studies also find significant positive stock market returns in the face of organizational blockchain news.

Whereas previous studies on blockchain market value mostly focus on the general relationship between the technology announcement and the consecutive market reaction, little is known about relevant mediating factors and specific blockchain announcement characteristics impacting the market value. Most blockchain announcements are either released in the form of a single firm declaring a proprietary blockchain project, or in a multi-company setting such as a blockchain-partnership or consortia announcement. As inter-organizational IT initiatives are associated with a higher degree of human and technological capabilities leading to a higher success rate of such projects (Ravichandran & Giura, 2019), we deem it relevant to consider this differentiation when analysing stock market returns to blockchain projects. Moreover, increased IT capabilities are mostly found in firms settled in the IT industry (Felipe et al., 2020). Therefore, industry classification is another factor that we expect to have a significant impact on market reactions to a blockchain announcement. Lastly, past research has not yet considered the circumstance that firms should experience an increase in blockchain capabilities, mainly in the form of knowledge and experience, when continuing to work on a blockchain project. This, in turn, should increase the probability of finishing a blockchain initiative with the goal of longer-term operational implementation. Thus, we expect firms which provide continuous blockchain announcements to significantly progress towards a successful completion of the respective project. On the other hand, initial announcements should be prone to a high probability of failing, as approximately 90% of corporate blockchain initiatives do not succeed (Disparte, 2019). Consequently, stock market participants should consider such announcements as riskier and attribute a lower probability to ultimately provide added business value.

Besides *market value*, academic research also considers *market risk* to be a fundamental indicator for determining the value of Information Systems (IS). In general, past research has shown that the introduction of new IT leads to a decreasing risk of holding the firm's respective stock. This is attributable to the fact that past subjects under study such as Business Intelligence Systems (Rubin & Rubin, 2013) or ERP Systems (Tian & Xu, 2015) facilitate internal as well as external information flow and benefit managerial decision making processes. Therefore, they reduce the risk of sudden or non-rational decisions of major impact (Rubin & Rubin, 2013). The same argument could be used for the market effect of blockchain implementation, as this emerging technology also leads to more effective data- and information distribution processes (Weking et al., 2020). However, we argue that the novelty of blockchain, the high uncertainty of successful implementation and the general lack of knowledge regarding this technology (Cheng et al., 2019) outweigh the possible risk-mitigating factors and hypothesize that blockchain announcements lead to increases in firm-specific market risk.

Research on stock market reactions regularly applies the event study method when intending to quantitatively determine the value of IT. This methodology is especially useful for the examination of short-term stock market reactions and serves as a reliable indicator of the business value of emerging technologies (Klöckner et al., 2022). In this study, we execute an event study and measure additional market value via the calculation of abnormal returns (AR) which represent differences between actual returns of a security and the expected returns based on historical performances. Our study is based on an overall sample of 672 different blockchain announcements from 277 companies. In this context, we first perform three different subsampling event studies and supplement our findings with a multivariate regression to further examine the magnitude of the effects observed. In the second part, we perform a risk analysis by examining changes in market risk in the form of changes in a company's beta factor. We are interested in the general impact of blockchain announcements on market risk and posit that consortia-related announcements as well as increased persistence in the form of continuing blockchain project news have a mitigating impact on the general risk-increasing effect. In summary, our study is guided by the following research question: *How do industry affiliation, blockchain project persistence, and the involvement of partners impact shareholder reactions to blockchain announcements?*

Our findings in both the univariate- and multivariate analysis show that stock markets react more positively to blockchain news by firms who make an announcement with relation to a partnership or blockchain consortium. Additionally, our second analysis indicates that firms from the tech industry exhibit higher returns than firms from non-tech industries. Results from the third subsampling analysis show significantly increased returns for subsequent organizational blockchain announcements in comparison to initial blockchain announcements. The multivariate regression analysis also strengthens these findings. On the other hand, the risk analyses show insignificant results. We neither observe a general significant increase in market risk nor significant mediating effects.

Theoretically founded on the resource-based view (RBV), we make various contributions to the existing stream of research on the value of blockchain technology. We provide additional evidence for circumstances under which companies benefit from blockchain announcements and demonstrate that shareholders recognize individual blockchain resources and capabilities. We also show that investors appear to assign a lower probability of success to initial blockchain announcements than to subsequent blockchain announcements. Results of the risk analyses provide initial hints that shareholders do not consider blockchain projects to exert a significantly high impact on a firm's risk profile. Lastly, our results provide implications for practitioners trying to maximize the market value impact of blockchain projects by focusing on initiatives that include at least one partner, are settled in the IT industry, and followed up through subsequent announcements.

The remainder of this paper is structured as follows. First, we give an overview of related work on blockchain value and risk literature and the theoretical RBV background of our study. Next, we develop our hypotheses and provide an overview of the research methodology, dataset and measures applied. Subsequently, we present the results of the subsampling-, multivariate regression-, and market risk analyses. We then discuss our results, present their theoretical and practical implications and finish by explaining limitations to the study as well as future research paths.

3.2 Related Work

3.2.1 Blockchain Market Value

Several empirical studies have shown that the announcement of a blockchain initiative creates additional market value for companies.

Based on an international data sample of announcements between November 2016 and December 2018, Cahill et al. (2020) demonstrate that declaring a blockchain initiative leads to average abnormal returns of 5% on the announcement day. This effect is amplified for companies situated in the US as well as for small- and medium sized firms. Moreover, they show that the price performance of Bitcoin and abnormal returns are significantly correlated and speculative blockchain announcements create more positive market reactions than non-speculative news (Cahill et al., 2020). These findings are supported by Cheng et al. (2019) who provide evidence that shareholders react positively to blockchain announcements by speculative firms and that the reactions depend on the current price of Bitcoin.

Sharma & Paul (2021) examine blockchain- and cryptocurrency related name changes of companies and their effect on the firms' market value. Compared to non-blockchain related name changes, they exhibit higher abnormal returns, and the market reaction is stronger during times of heightened public attention on cryptocurrencies (Sharma & Paul, 2021).

Klöckner et al. (2022) also confirm the significant positive abnormal returns. The analysis of announcements between 2015 and 2019 also shows that news about blockchain projects related to the tracing of physical objects or sharing of explicit data exhibit less positive abnormal returns. Moreover, a company's innovativeness does not lead to a more positive market reaction. Industry- and macro factors such as research and development (R&D) intensity and a country's data restriction level significantly impact market reactions to blockchain announcements (Klöckner et al., 2022)

Y. Zhang et al. (2022) as well as Liu et al. (2022) present evidence of positive stock market reactions to blockchain announcements in the Asian market. Hereby, technical innovation- and strategic-level announcements lead to higher abnormal returns than non-technical innovation- and operational-level blockchain news (Liu et al., 2022). Furthermore, announcements by Chinese IT-firms as well as the existence of a Chief Information Officer have a positive mediating impact on abnormal returns (Y. Zhang et al., 2022).

3.2.2 The Resource-Based View and Blockchain

Past research has regularly relied on the resource-based view (RBV) for the explanation of business value through IT (Konchitchki & O'Leary, 2011) or emerging technologies such as big data analytics (Teo et al., 2016). RBV declares that business value is derived through resources and capabilities that have (1) value, (2) are uncommon, (3) incomparable and (4) are hardly replaceable (Chatterjee et al., 2002; Teo et al., 2016). Moreover, business value through IT cannot only be achieved through resources but also through firm specific capabilities (Hulland & Wade, 2004).

The business value (1) of blockchain has been discussed widely in existing literature. As such, blockchain technology can ensure greater efficiency in business processes (Schlecht et al., 2020). Moreover, it enables the mitigation of information asymmetries in supply chains through its decentralized character (Bauer et al., 2022). Thereby, it can also lead to cost- and time reductions when dealing with intermediaries (Weking et al., 2020). As entries in an existing blockchain are usually immutable, an increase of trust in the data and in interorganizational ecosystems as a whole can be expected (Weking et al., 2020). Furthermore, multiple examples have shown that blockchain can enhance data integrity, transparency and simultaneously provides opportunities to decrease transaction costs in multi-organizational settings (Cho et al., 2021). Consequently, blockchain can also be effective in combating counterfeiting and shielding businesses from fraud and corruption activities (Sarker et al., 2021). Secondly, companies possess individual capabilities and use cases to utilize blockchain technology. As firms often lack internal capabilities to successfully incorporate blockchains (Klöckner et al., 2022), they either hire external service- and IT providers, or firms join a blockchain consortium to individually extract the most value out of a possible blockchain use case. This shows the rarity of current organizational blockchain capabilities (2). Thirdly, literature has demonstrated that in order for IT to effectively provide value and to be adopted successfully, it must align with the highly individualized tasks within a company (Liang et al., 2021). In comparison to standardized IT systems such as enterprise resource planning systems (ERP), blockchain systems are rarely standardized and need to be tailored specifically to a company's needs and existing infrastructure. Therefore, firms need to be able to specifically determine and develop the blockchain capabilities and resources necessary to ensure a successful implementation. These customized requirements make individual organizational blockchain capabilities inimitable (3). Lastly, there is currently no other technology that possesses the distinct set of characteristics—such as decentralization and immutability—found in a blockchain. Thus, if organizations identify use cases that require the whole specific characteristics of blockchain technology, there is currently no other IT system available to replace a blockchain system (4).

3.2.3 Systematic Risk

Recent studies in the IS field also started to incorporate the concept of market risk when analysing the value of IT. Thereby, various quantitative measures of risk have been utilized. Hunter et al. (2005) as well as Kobelsky et al. (2008) find a significant positive relation between the amount of a firm's IT investments and market risk, conceptualized as the volatility of future earnings. Ren & Dewan (2015) examine the volatility of the return on assets and show that it increases with more investments in IT. Moreover, increases in yield spreads as well as decreasing bond ratings are observed by Kim et al. (2017) in cases of risky IT investments. Other studies also specifically consider the impact of digital technology implementations on equity risk. Agrawal et al. (2005) show that eCommerce initiatives by organizations lead to a significant increase in stock return volatility. Additionally, investments in ERP systems have mitigating effects on earnings- and stock return volatility during post-implementation stages (Parra et al., 2015; Tian & Xu, 2015). Lastly, implementing a business intelligence system also has a decreasing effect on a company's stock return volatility (Rubin & Rubin, 2013). Other studies have considered the effect of security breaches and data thefts on the systematic market risk of firms. Cardenas et al. (2012) as well as Hinz et al. (2015) show that such events lead to an increase in systematic market risk, measured as the firm's beta. Furthermore, initiating an IT-standard setting process together with other peer companies leads to a significant reduction in systematic market risk (Aggarwal et al., 2011).

3.3 Hypotheses Development

As a blockchain in essence represents an immutable decentralized ledger, its value inherently lies in applications where several partners or participants of a network benefit from its design features (Klöckner et al., 2022). In the financial sector, blockchain technology is often explored in the context of increasing trust, consensus and security in institutional financial transactions (Liang et al., 2021). Hereby, smart contracts represent one common form of financial blockchain applications where transactions are executed based on a predefined set of conditions (Yuan et al., 2018). Hence, for a smart contract to be executed, at least two individuals, parties or organizations are necessary. Advantages of industrial blockchain implementations also become more apparent in an inter-organizational context (Babich & Hilary, 2020). For instance, blockchain can establish trust between supply chain partners and simultaneously decrease costs associated with intermediaries. On the other hand, use cases of blockchain technology in non-interorganizational settings are usually not associated with characteristics that enhance business value. One prominent example is the release of Non-Fungible Tokens (NFTs) which are usually published with marketing intentions (Hofstetter et al., 2022).

On a broader scale, stock market participants value companies forming alliances when pursuing IT innovation (Han et al., 2012). As such, organizational partnerships or consortia offer a wider range of complementary resources and also benefit from shared costs in comparison to projects executed by a single company (Klöckner et al., 2022; Ravichandran & Giura, 2019). Moreover, it facilitates the creation of new knowledge (Hardy et al., 2003). Having access to specific and possibly inimitable knowledge from other firms is a central organizational resource and often the core of a company's competitive strategy (Zack et al., 2005). In addition, the more complex the technology under discussion, the more important the role and availability of expertise becomes (Juell-Skielse et al., 2017; Lundin, 2007). By being part of a blockchain consortium, even if no concrete project is in sight, firms can benefit from the collective pool of blockchain-knowledge, and it allows individuals to form relevant professional relationships necessary for a simple and straightforward exchange of expertise. If a company, which is part of a blockchain consortium, decides to pursue a respective project in the future, it should be sufficiently equipped with the knowledge-related capabilities required for a high probability to successfully complete and implement the innovative project into existing operational processes (McDowell et al., 2018). Thus, this should increase the probability of enhanced future business value. Consequently, an increasing number of firms engaging in blockchain prototyping decide to do so in the form of a consortium (Zavolokina et al., 2020). This form of blockchain development could signal higher confidence in the initiative to investors, as more than one company presumably believes in the additional value of the project (Klöckner et al., 2022). Moreover, the presence of a variety of prestigious and well-known brands might lead to increased public attention and trust in commitment to the initiative. Applying the RBV lens, pursuing a blockchain project together with a partner firm or a consortium also offers a wider range of individual organizational, human, and technological capabilities necessary for the success of a blockchain initiative. From the organizational perspective, engaging in a consortium offers increased efficiencies and reduced costs through sharing the workload and decreasing overhead costs (Zavolokina et al., 2020). Finally, it usually means having more technological resources available. Therefore, we hypothesize:

H1: Consortia announcements or partnership announcements related to blockchain projects exhibit higher stock market returns than announcements about single company blockchain initiatives.

RBV literature on the value of IS shows that IT resources are essential for the effective extraction of business value for the firm (Melville et al., 2004). Moreover, RBV research also emphasizes the importance of the ability to implement new IT in a way that supports the firms' individual core competencies. This highly depends on the company's IS capabilities (Ravichandran & Lertwongsatien, 2005). As organizations from the IT industry are expected to have more IT capabilities enabled through the high degree of IT knowledge and organizational agility in the IT industry (Felipe et al., 2020), IT companies could be better equipped to ultimately benefit from innovative technologies in the form of an increase in business- and market value (Dos Santos et al., 1993). In the case of blockchain, companies need to deal with the experimentation and possible implementation of a decentralized and inter-organizational technology which requires a high degree of IT affinity (Klöckner et al., 2022). Moreover, tech companies might also possess more technological resources and knowledge in the form of human capital to deal with the goal of establishing a blockchain system. Additionally, big data topics in combination with data privacy concerns are emerging and become especially important for the tech industry (T. Zhang et al., 2017). As blockchain technology is in part inherently designated for data protection issues, IT companies could benefit more than other industries from the implementation of blockchain systems, which in turn could generate more business- and market value (Y. Zhang et al., 2022). Lastly, literature on the market value of other emerging technologies such as big data and artificial intelligence shows that market returns depend on the industry classification of the companies observed, with IT and manufacturing companies usually benefiting more than organizations from other industries (Lui et al., 2022; Tony et al., 2016). We also expect this to apply for the announcement of blockchain initiatives and hence posit:

H2: Companies from the Tech- and IT industry exhibit higher stock market returns related to blockchain announcements than firms from non-Tech and non-IT industries.

The outcome of investments in emerging technologies are considered uncertain as it is not guaranteed that the implementation will lead to more effective or efficient business processes (Bhattacherjee, 1998). It is estimated that over 90% of corporate blockchain projects will fail due to unclear use cases and the immaturity of the technology (Disparte, 2019). Thus, a company declaring that it will explore the opportunities of blockchain technology for the first time should, on average, be expected to not succeed with its implementation ambitions. Consequently, if a firm continues to publish information about an ongoing project, its success rate could be considered significantly higher, as companies usually do not publish news about failed or unfinished projects. The significant impact of increasing experience is also observable when examining reactions to corporate mergers and acquisitions (M&As) where firms with prior M&A experience benefit from higher abnormal returns than companies without prior M&As (Haleblian & Finkelstein, 1999). Companies that continue publishing statements regarding the same topic or project could signal confidence in the possible future value of the blockchain use case mentioned. From the investors' perspective, each subsequent announcement might also signal a higher degree of commitment to the blockchain project. The more a blockchain initiative progresses, the more resources should have been spent, making it harder for managers and decision makers to abandon a project. Moreover, the more time passes and the longer a firm is involved in a blockchain technology initiative, the more knowledge and experience the organizations involved should gain. From the RBV perspective, this enhances the firms' capabilities necessary for a successful blockchain implementation. Therefore, investors might infer a higher chance of success for blockchain projects with subsequent updates for shareholders. Thus, we hypothesize:

H3: The first announcement regarding a blockchain project exhibits lower stock market returns than subsequent blockchain announcements for the same blockchain project.

Past research has shown that IT investments have a significant effect on either the idiosyncratic- or systematic risk of a company. The capital market theory states that idiosyncratic risk is the individual risk of a company which can be reduced through diversification (Sharpe, 1964) and has mainly been measured through stock return volatility (Aggarwal et al., 2011; Dewan & Ren, 2011). On the other hand, systematic risk cannot be diversified and is considered as the type of risk for which an investor requires additional compensation. Besides debt relevant aspects, this also affects the respective company in the form of higher equity costs (Sharpe, 1964). Investments in emerging technologies are inherently risky as the successful implementation into operational business processes is generally doubtful and in many cases do not meet the managements' expectations (Hunter et al., 2005). If significant parts of a firm's investments flow into the financing of an unsuccessful IT project, the firm ultimately did not allocate its capital in the most efficient way. This could lead to lower-than-expected profitability and as such, investors might require more compensation to justify this type of increased risk. From the perspective of debt, this has already been shown by Kim et al. (2017) who demonstrate that risky IT investments lead to increases in corporate bond yield spreads. Additionally, the existence of information asymmetries between shareholders and the company making a blockchain announcement could also lead to a higher systematic market risk. Investors might not be aware of the informational intent of a firm's blockchain announcement. For instance, in the past many firms took advantage of existing blockchain hype periods by making blockchain announcements such as corporate name changes (Sharma & Paul, 2021) or general statements on blockchain exploration, leaving shareholders with the impression that the company was seriously considering the new technology, when in reality only superficial changes and little efforts were made. Therefore, investors might classify the long-term operational value of the blockchain system to be implemented as uncertain. Moreover, some investors might not possess enough knowledge about blockchain technology to realistically assess its potential benefits. As the concept of blockchain is a relatively new phenomenon and many investors confuse the value of cryptocurrencies with the value of corporate blockchain use cases (Cahill et al., 2020; Cheng et al., 2019), shareholders might not be able to differentiate between the volatile cryptocurrency markets and industrial blockchain value. Therefore, we propose:

H4: Corporate blockchain announcements lead to an increase in systematic risk.

The uncertain outcome of investments in emerging technologies such as blockchain makes them inherently risky. As such, the resources required as well as the final results of projects in early stages are deemed as especially uncertain (Disparte, 2019). On the other hand, cases in which blockchain projects are advancing might signal an increasing amount of capital invested as well as the commitment of decision makers to the initiative. Moreover, the additional value and in some instances also additional use cases that have not been envisioned at the beginning of the project might be clearer in later stages of a project. After gaining sufficient blockchain capabilities by being involved for a significantly long time with implementing a blockchain prototype, companies should be confident enough to estimate its expected additional business value. Therefore, early-stage projects proclaimed through an initial public announcement should be considered as riskier by investors than blockchain projects in their final stages. Consequently, we hypothesize:

H5: First blockchain announcements lead to a higher increase in systematic risk than subsequent blockchain announcements.

Companies that singlehandedly explore the opportunities of new technologies depend on internal capabilities such as human resources and knowledge available as well as a functioning and mature technological infrastructure. On the other hand, if organizations conduct a new project together with partners, they benefit in the form of a shared pool of knowledge as well as a broader basis of technological equipment, human capital and supplementary expertise (Zavolokina et al., 2020). This enables the respective firm to have resources available which otherwise could not be created or enabled internally. Beyond the distribution of existing knowledge, inter-organizational collaboration also promotes ways of developing new knowledge (Hardy et al., 2003). This is especially important for tasks and technologies of heightened complexity (Juell-Skielse et al., 2017). Research on inter-organizational collaboration has shown that the positive effects of organizational partnerships increase with more complex and novel tasks or technologies (Lundin, 2007). As blockchain systems represent a novel and complex technology, their exploration in inter-organizational settings should be especially beneficial. Additionally, use case explorations of blockchain by individual companies might become more difficult and riskier as the inherent strengths of blockchain technology mostly manifest in multilateral data sharing or data transfer situations by providing properties such as decentralization and auditability of data (Klöckner et al., 2022; Risius & Spohrer, 2017). Therefore, we hypothesize:

H6: Single company blockchain announcements lead to a higher increase in systematic risk than consortia announcements.

3.4 Data and Research Methodology

3.4.1 Estimation Method – Event Study

We apply the event study methodology (Brown & Warner, 1980) in combination with a multivariate regression analysis to examine the stock market reaction of corporate blockchain announcements and the impact of mediating variables. For the event study we rely on the Fama-French five-factor model (FFM5) which is described as:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1i}(r_{m,t} - r_{f,t}) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}RMW_t + \beta_{5i}CMA_t + \varepsilon_{it}. \quad (3\text{-}1)$$

Hereby, $r_{i,t}$ is the return of stock *i* for period *t*, $r_{f,t}$ captures the risk-free rate, $r_{m,t}$ is the market return and SMB_t represents the difference in returns of a diversified portfolio of small stocks and a portfolio of large stocks which is also called the size factor. HML_t is defined as the difference in returns of a portfolio of shares with a high book-to-market ratio and a portfolio of shares with a low book-to-market ratio, RMW_t captures the difference in returns of portfolios with high and low profitability and CMA_t is the difference in returns between a portfolio of firms with low investments and a portfolio with high investments (Fama & French, 2015). Lastly, ε_{it} represents the error term. All relevant factor data are retrieved from the K.-French website (French, 2022).

Next, abnormal returns (ARs) of stock *i* at time *t* are estimated as:

$$AR_{i,t} = r_{i,t} - r_{f,t} - [\hat{\alpha}_i + \hat{\beta}_i(r_{m,t} - r_{f,t}) + \hat{\beta}_i SMB_t + \hat{\beta}_i HML_t + \hat{\beta}_i RMW_t + \hat{\beta}_i CMA_t]. \quad (3\text{-}2)$$

As in previous literature, we utilize an estimation window including 255 trading days, starting 300 days before and ending 45 days prior to the event (Chatterjee et al., 2001; Y. Zhang et al., 2022). Then, we sum the event specific ARs to receive cumulative ARs (CAR) during the event window t_1 and t_2:

$$CAR_{i,t_1;t_2} = \sum_{t_1}^{t_2} AR_{i,t} \ , \quad (3\text{-}3)$$

We also follow previous research and use event windows of three days [-1;+1], five days [-2;+2] and two weeks [-5;+5] around the event. Lastly, we calculate cumulative average ARs (CAARs):

$$CAAR_{i,t_1;t_2} = \frac{1}{n} \sum_1^n CAR_{i,t_1;t_2}, \quad (3\text{-}4)$$

where n captures the number of events.

Statistical significance for the results of the event study is verified through two types of tests. First, we apply the Patell Z-test as well as the standardized cross-sectional test as parametric tests. The Corrado rank test and Generalized Sign test represent our non-parametric tests to assure statistical significance of CAARs in cases where the sample is not normally distributed. We also perform Welch t-tests and Mann-Whitney U tests to determine whether the CAARs and median CARs of the respective subsamples are significantly different from each other. Moreover, we also apply Wilcoxon rank-sum tests to test for statistical significance of median CARs.

In the next step, we perform multivariate regression analyses to examine the impact of the measures defined in the subsampling analysis on the CARs of the overall data set.

3.4.2 List of Measures

We test H1, H2 and H3 via subsampling analyses and via a multivariate regression and therefore rely on various measure definitions. We use those measures to split our dataset into two separate groups for each of the hypotheses tested. We also apply these measures for the risk analysis of H5 and H6.

We define *consortia and partnership announcements* as all news that either mention the joining or involvement of a consortia or the involvement of two or more firms in a blockchain project. *Single announcements* are all blockchain news that only mention a single company.

Secondly, we applied four-digit SIC codes and defined all companies from the Computer Programming, Data Processing, and other Computer Related Services as *Tech- and IT Companies*. Moreover, we also included all companies falling into the SIC-category of Industrial and Commercial Machinery and Computer Equipment in the category of *Tech- and IT Companies*. We define all other firms as *Non-Tech Companies*.

Lastly, *first blockchain announcements* are all initial corporate blockchain news regarding a specific project. If there is at least one announcement belonging to a certain blockchain initiative, then all following announcements for the same project are defined as *subsequent blockchain announcements*.

3.4.3 Estimation Method – Risk Modelling

Whereas systematic risk can also be approached from the cost of debt-perspective, our study focuses on the cost of equity component. It represents the firm's costs - or the amount that equity holders demand - to compensate for the systematic risk and is generally calculated by an interest rate surcharge on the risk-free rate (Hinz et al., 2015). The mathematical foundation for calculating the cost of equity has been described via the Capital Asset Pricing Model (CAPM) (Sharpe, 1964):

$$r_i = r_f + \beta_i(r_m - r_f). \qquad (3\text{-}5)$$

In this model, r_f represents the risk-free rate, r_m the market return and β_i is the systematic risk of company i. The beta factor also shows how sensitive an individual stock reacts to movements in market returns. We assume that a change in the systematic risk of a company is shown by significant changes in its beta factor (Hinz et al., 2015). We also follow the approach of Hinz et al. (2015) and calculate the individual beta factors via the following formula:

$$\beta_i = \frac{cov(r_i, r_m)}{var(r_m)}. \qquad (3\text{-}6)$$

It is the ratio of the covariance of individual stock returns r_i with the market return r_m, and the variance of the market return r_m.

We calculate the beta factors on a one-year rolling basis for each company of our data sample by holding the covariance as well as the variance component constant over a period of 200 trading days. In the next step, we calculate the mean- as well as the median beta factor of the period 120 days prior and 120 days after the respective event. We also control for the bias through the blockchain announcement itself by excluding the period of 21 days around the announcement from the calculation of mean- and median values (Hinz et al., 2015). This implies that we are only able to analyse the period between January 1, 2014 and December 31, 2020 as a total of 320 trading days is not examinable due to the 1-year beta-calculation window (200 trading days) and the 120-day window for mean-estimations. Thus, the final dataset for the risk analysis consists of a total of 424 events. For testing H5 and H6, we also calculate pre- and post-beta factors for each subsample. We then determine the pre-post deltas and calculate via a Welch t-test and a Wilcoxon Rank-Sum test (z-test) whether they are significantly different from each other.

3.4.4 Data Collection

We collected corporate blockchain announcements via the database Nexis Uni and Google search. Hereby we followed previous literature and utilize a predefined set of companies (Borah & Tellis, 2014; Klöckner et al., 2022). We selected the firms from the S&P500 as well as the STOXX Europe 600 index as all their constituents are large sized companies. This indicates a high trading volume, which is a necessary precondition for the methodology applied, because lower trading volumes of firms would not support the efficient market assumption (Klöckner et al., 2022). We chose to focus on announcements between January 1, 2014 and June 30, 2022, as public attention on the topic of blockchain was not significant prior to 2014 (Cahill et al., 2020). As in prior IS market value research (Barua & Mani, 2018; Teo et al., 2016) we utilize the news outlets PR Newswire, Business Wire and the investor-relations news websites of the companies included in our sample firm pool. The phrases applied during the search were “blockchain” and “cryptocurrency” in combination with each company name.

Our initial search concluded with 15,924 announcements. We excluded unrelated articles as well as duplicates and also eliminated announcements where confounding effects might be existent (Konchitchki & O'Leary, 2011). This resulted in a final sample which included 672 announcements from 277 different organizations. Whenever we observed varying announcement dates from different sources regarding the same blockchain announcement, we chose the earlier date (Wilcox et al., 2001), and announcements published on non-trading dates were moved to the next possible trading day (MacKinlay, 1997). In the last step, we collected daily stock price data as well as daily MSCI World index data from Refinitiv Workspace. We use the index data for the calculation of market returns $r_{m,t}$. Fama-French Factors as well as the risk-free rate are retrieved from the Dartmouth college database (French, 2022). Table 3.1 provides a summary of the sample, presenting information on announcement years, industry distribution, and country distribution.

Country	Freq.	Industry	Freq.	Year	Freq.
United States	334	Financials	220	2022	123
Germany	103	Technology	121	2021	127
France	58	Industrials	100	2020	83
United Kingdom	43	Consumer Discretionary	80	2019	131
Netherlands	30	Consumer Staples	44	2018	118
Spain	28	Health Care	24	2017	65
Switzerland	18	Telecommunications	22	2016	21
Italy	13	Utilities	21	2015	3
Sweden	10	Basic Materials	20	2014	1
Austria	9	Energy	14		
Belgium	5	Real Estate	6		
Denmark	5				
Finland	5				
Ireland	3				
Norway	3				
Isle of Man	2				
Luxemburg	1				
Poland	1				
Portugal	1				

Table 3.1: Sample Summary Statistics.

3.5 Results

3.5.1 Event Study

Table 3.2 shows the results for testing H1 where the dataset is split into consortium- and partnership announcements and single-firm announcements. Event study results for the consortium- and partnership panel show positive significant results overall. The three-day event window CAAR of 0.47% is significant for both parametric tests at the 5% level and the five-day event window CAAR of 0.78% shows significance at the 1% level for the Patell-, standardized cross-sectional- and the Generalized Sign test. The single-firm analysis exhibits no significant results with CAARs of 0.14% (three-day window), 0.21% (five-day window) and 0.00% (two-week window). Subsequent Welch t-tests show that the CAAR delta for the five-day event window is statistically significant at the 5% level. Additionally, according to Mann-Whitney U tests the differences in median CARs are statistically significant for the five-day- and two-week event window. To ensure the robustness of our findings, we conducted additional event studies by varying the estimation window and the market model employed. These supplementary analyses are presented in Table 6.4 and Table 6.5 of the Appendix. The results consistently demonstrate that our main findings remain robust when employing different estimation windows and market models.

Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Wilcoxon**	**Obs.**	**Pos:Neg**
Panel A1: Consortium/Partnership									
[-1;+1]	0.47%	0.12%	2.57**	2.46**	0.53	1.60	1.62	305	172:133
[-2;+2]	0.78%	0.43%	3.08***	2.89***	0.95	2.97***	2.70***	305	184:121
[-5;+5]	0.43%	0.86%	0.64	1.01	1.34	0.26	2.01**	305	178:127
Panel B1: Single Firm									
[-1;+1]	0.14%	0.04%	1.13	1.01	1.34	0.26	0.55	367	186:181
[-2;+2]	0.21%	0.09%	1.11	1.11	1.05	0.58	0.41	367	189:178
[-5;+5]	0.00%	0.07%	-0.53	-0.45	-0.93	0.69	0.59	367	190:177

Event Window	**Delta CAAR**	**Delta Median CAR**	**Welch t-Test**	**Mann-Whitney U Test (z)**
[-1;+1]	0.33%	0.08%	1.51	0.76
[-2;+2]	0.57%	0.34%	2.19**	1.95*
[-5;+5]	0.43%	0.79%	0.92	1.93*

*p<10%, **p<5%, ***p<1%

Table 3.2: Event Study Results for H1.

Table 3.3 shows Panel A2 with the event study results for the subsamples of tech firms and non-tech firms. For the three-day event window, we do not find significant returns even though the CAAR is positive at 0.22%. For the five-day event window, results become significant for both parametric tests at the 5% level with a CAAR of 0.65%. The CAAR of 0.93% for the two-week event window remains significant for all tests except for the Corrado test and the Wilcoxon test. Panel B2, which shows results for our sample of non-tech firms, exhibits no statistical significance for the three- and five-day event windows. Nevertheless, we find statistical significance for the negative CAAR of -0.43% for the two-week event window. The Patell test is significant at the 1% level, the standardized cross-sectional test at the 5% level and the Corrado test at the 10% level. Only the Generalized Sign test shows no significance for either event window when analysing the non-tech firm data sample. The CAAR deltas of the five-day- and two-week event window are statistically significant at the 5%- and 1% level. Moreover, Mann-Whitney U tests show that the difference between median CARs are statistically significant at the 5% level for the two-week event window.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Wilcoxon	Obs.	Pos:Neg
Panel A2: Tech Firms									
[-1;+1]	0.22%	0.17%	1.24	1.19	0.46	0.24	-0.28	156	80:76
[-2;+2]	0.65%	0.46%	2.11**	2.01**	1.48	1.36	1.17	156	87:69
[-5;+5]	0.93%	1.13%	1.82*	1.96**	0.68	1.69*	1.27	156	89:67
Panel B2: Non-Tech Firms									
[-1;+1]	-0.14%	-0.12%	-1.18	-0.93	-1.10	-1.04	-0.59	516	251:265
[-2;+2]	-0.09%	0.07%	-0.87	-0.81	-0.87	0.70	-0.48	516	271:245
[-5;+5]	-0.43%	-0.11%	-2.60***	-2.16**	-1.78*	0.61	-0.15	516	270:246

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.36%	0.29%	1.28	0.17
[-2;+2]	0.74%	0.39%	2.04**	1.38
[-5;+5]	1.36%	1.24%	2.61***	2.28**

*p<10%, **p<5%, ***p<1%

Table 3.3: Event Study Results for H2.

Table 3.4 presents the results of the analysis for H3. In Panel A3, CAARs for the First Announcements-dataset can be observed. None of the CAARs for the three event windows are statistically significant. On the other hand, CAARs for Panel B3, representing the subsample of subsequent blockchain announcements, are partially significant. Whereas results for the three-day event window with a CAAR of 0.42% remain insignificant, the CAAR of 0.94% at the five-day event window is significant for both parametric tests at the 5% level. Moreover, it shows significance for the Generalized Sign test at the 1% level. Statistical significance becomes weaker again for the two-week event window (CAAR = 0.08%) with only the Generalized Sign test being significant at the 10% level. Consequently, the CAAR- and median CAR delta of the five-day (-2;+2) event window is statistically significant at the 5% level.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Wilcoxon	Obs.	Pos:Neg
Panel A3: First Announcement									
[-1;+1]	-0.07%	-0.06%	-0.68	-0.50	-0.82	-0.49	-0.10	587	293:294
[-2;+2]	0.02%	0.04%	-0.10	-0.10	-0.26	0.25	0.30	587	302:285
[-5;+5]	-0.15%	0.12%	-1.59	-1.30	-1.12	0.66	0.48	587	307:280
Panel B3: Subsequent Announcement									
[-1;+1]	0.42%	0.31%	1.37	1.35	0.91	1.00	0.15	85	47:38
[-2;+2]	0.94%	1.43%	1.96**	2.10**	1.40	2.78***	2.13**	85	55:30
[-5;+5]	0.08%	0.69%	-0.19	-0.23	0.47	1.89*	0.39	85	51:34

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.49%	0.37%	1.47	1.03
[-2;+2]	0.92%	1.39%	2.21**	2.32**
[-5;+5]	0.23%	0.57%	0.40	0.21

*p<10%, **p<5%, ***p<1%

Table 3.4: Event Study Results for H3.

3.5.2 Multivariate Regression Analysis

We performed a multivariate regression analysis to subsequently examine the magnitude of the effects observed in the univariate event study. In Table 3.5, we first provide an overview of correlations between all variables under consideration. Correlation coefficients among the covariates exhibit no value above 0.31, which suggests that multicollinearity does not introduce bias into our regression results (Kutner et al., 2005).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) CAR	1								
(2) ROE	0	1							
(3) Free_Float	0.15*	0.12*	1						
(4) Cash_Assets	0.03	0.06	0.05	1					
(5) Debt_Equity	0	-0.13*	0.03	0.04	1				
(6) Net_Income	0.02	0.12*	0.14*	0.1*	0.02	1			
(7) Tech	0.09*	0.03	0.12*	0.02	0.07	0.14*	1		
(8) First_Ann	-0.1*	-0.03	-0.03	0.04	0.02	0.02	-0.05	1	
(9) Consortium	0.1*	0.03	0.03	-0.08*	0.04	-0.15*	0.07	0	1
(10) MCap_log	-0.03	0.01	0.01	-0.06	0.02	0	0.02	0	-0.03

*p<5%.

Table 3.5: Correlation Matrix, n=672.

The following model describes the multivariate regression:

$$CAR_i = \alpha_i + \beta_1 Consortium_i + \beta_2 First\ Announcement_i + \beta_3 Tech\ Firm_i + \beta_4 ROE_i + \beta_5 Free\ Float_i + \beta_6 \frac{Cash}{Assets_i} + \beta_7 EBIT_i + \beta_8 Net\ Income_i + \beta_9 MCap\_log_i + \beta_{10} Time_i + \epsilon_i. \quad (3\text{-}7)$$

We performed our analysis based on the five-day (-2;+2) event window CARs as the most significant results from the subsampling analysis can be found in this event window. $Consortium$, $First\ Announcement$ and $Tech\ Firm$ are dummy variables equaling one if (1) the respective announcement mentions the involvement of other firms in the blockchain project, (2) is an initial announcement of a specific blockchain initiative or (3) is an announcement by a tech-firm, and else equal zero. As it is necessary to control for firm specific financial and operating performance, we relied on various control variables already applied in previous research. Previous research recommends to focus on valuation-, profitability- as well as leverage metrics, thus we included the indicators *Return on Equity (ROE), Free Float, Cash to Assets, Debt to Equity, Net Income* and logarithmized market capitalization ($MCap\_log$) (Bassen et al., 2019). These indicators were retrieved from the Refinitiv Workspace database. As some values were unavailable for the time of the announcement, our sample for the multivariate regression was reduced to 670 announcements. For robustness reasons, we calculated four different models with different variations of the dummy variables *tech-firm*, *first announcement* as well as *consortium- or partnership announcement*. We also include time-fixed effects. Table 3.6 provides an overview of descriptive statistics of the respective explanatory variables.

n = 672					
Variable	Min	Median	Mean	Max	SD
ROE	-0.869	0.150	0.206	0.866	0.209
Free Float	0.217	0.992	0.904	1.000	0.170
Cash to Assets	0.003	0.069	0.088	0.478	0.073
Debt to Equity	0.002	0.944	1.286	5.629	1.031
Net Income	-0.612	0.139	0.154	0.579	0.124
MCap_log	3.238	4.480	4.530	6.244	0.655
Tech	0	0	0.231	1	0.426
First_Announcement	0	1	0.887	1	0.345
Consortium	0	1	0.467	1	0.500

Table 3.6: Descriptive Statistics of Explanatory Variables.

Table 3.7 shows the results of the multivariate regression analysis. Supporting H1, all models demonstrate statistically significant results at the 5% level for the positive impact of consortium-related announcements on CARs. Moreover, results for the dummy variable *Tech-Firm* are statistically significant at the 10% level in two of three models. Hence, we find support for H2. Lastly, in H3 we suggest that initial blockchain announcements exhibit significantly lower stock market returns than subsequent announcements. Providing support for H3, we observe a significant negative impact of initial blockchain announcements at the 5%- and 1% level on the respective stock market returns across all models.

To ensure the robustness of our analysis, we extended our investigation to consider the potential impact of the type of blockchain specification (Klöckner et al., 2022). To achieve this, we categorized the blockchain announcements based on the technical blockchain applications in use. We created an additional dummy variable denoted as *Permissioned*. This variable takes a value of 1 for announcements that mention the usage of permissioned blockchains, such as the Hyperledger Fabric platform, the R3 Corda platform, or the Quorum protocol, and 0 otherwise. Incorporating the *Permissioned* dummy variable into our multivariate regression models allowed us to examine its influence on the cumulative abnormal returns induced by blockchain announcements. We provide results of this extension in Table 6.6 in the Appendix. Remarkably, our analysis did not reveal a significant effect of the *Permissioned* dummy variable across all four models considered. Furthermore, we found that the hypothesized effects of the previously analysed factors remained unchanged in comparison to the original models. This indicates that the inclusion of the *Permissioned* variable does not introduce any bias or alter the conclusions drawn from our initial analysis.

Parameter	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	Estimate	Estimate	Estimate	Estimate
Consortium	-	0.013 (2.29**)	0.014 (2.47**)	0.013 (2.32**)
First Announcement	-0.020 (-2.51**)	-	-0.021 (-2.62***)	-0.020 (-2.54**)
Tech Firm	0.012 (1.76*)	0.011 (1.67*)	-	0.010 (1.54)
ROE	-0.003 (-0.71)	-0.003 (-0.75)	-0.003 (-0.82)	-0.003 (-0.83)
Free Float	0.062 (3.70***)	0.062 (3.67***)	0.063 (3.78***)	0.060 (3.62***)
Cash to Assets	0.027 (0.71)	0.030 (0.76)	0.034 (0.87)	0.033 (0.86)
Debt to Equity	0.000 (-0.15)	0.000 (-0.31)	0.000 (-0.16)	0.000 (-0.26)
Net Income	-0.004 (-0.18)	0.004 (0.16)	0.010 (0.45)	0.005 (0.23)
MCap_log	0.001 (0.30)	0.001 (0.33)	0.001 (0.35)	0.001 (0.35)
Intercept	-0.091 (-1.24)	-0.093 (-1.26)	-0.095 (-1.30)	-0.092 (-1.26)
Time-fixed	Yes	Yes	Yes	Yes
Adjusted R^2	2.18%	2.03%	2.63%	2.83%
F Statistic (p-value)	1.93 (0.015)	1.86 (0.021)	2.13 (0.006)	2.15 (0.005)

*p<10%, **p<5%, ***p<1%, n=672.

Table 3.7: Impact of consortium-, initial- and tech firm blockchain announcements on abnormal returns.

3.5.3 Risk Analysis

Table 3.8 presents the results of the systematic risk analysis. For each announcement, we calculated mean beta factors for the 120-day period prior to the announcement and 120 days after the announcement, which leads to individual pre-and post-beta factors. Then, we calculated the mean as well as the median value of these factors. The mean post-beta factor is 1.017 and thus slightly higher than the pre-beta factor of 1.013. Nevertheless, a two-sample and two-sided t-test indicates that they are not significantly different from each other. The median post-beta factor of 1.025 is also higher than the median pre-beta factor of 1.005. A Wilcoxon signed rank test (z-test) shows that this result is also not statistically significant. These results do not support H4.

	Pre	Post	Delta	t-value / z-value	Observations
Total sample Mean	1.013	1.017	0.004	-0.23	424
Total sample Median	1.005	1.025	0.020	-0.72	424

*p<10%, **p<5%, ***p<1%

Table 3.8: Changes in systematic risk through blockchain announcements.

Table 3.9 presents the results of testing H5. For initial announcements, the post-average beta (1.027) is slightly higher than the pre-average beta (1.021), but this difference is statistically insignificant. This also applies to the analysis of the pre-median beta value of 1.004 and post-median beta value of 1.025. Results for the analysis of following blockchain announcements show that the post-average beta (0.948) is smaller than the pre-average beta (0.961). On the other hand, the post-median beta of 1.021 is higher than the pre-median beta of 1.006. Both deltas are statistically insignificant. Therefore, the difference between the mean-/median delta of the initial announcement-sample and the mean-/median delta of the following announcements-sample is also not significantly different from zero. Thus, we do not find support for H5.

	Pre	Post	Delta	t-value / z-value	Observations
First Announcements Mean	1.021	1.027	0.007	-0.24	371
First Announcements Median	1.004	1.025	0.021	-0.97	371
Following Announcements Mean	0.961	0.948	-0.013	0.19	53
Following Announcements Median	1.006	1.021	0.015	-0.70	53

	Delta First	Delta Following	t-value / z-value
Mean	0.007	-0.013	0.85
Median	0.021	0.015	1.14

*p<10%, **p<5%, ***p<1%

Table 3.9: Differences in systematic risk changes between initial- and subsequent announcements.

In Table 3.10, results for testing H6 are shown. For the subsample with consortium or partnership-related blockchain announcements, we observe an insignificantly higher post-average beta (1.013) than the pre-average beta (1.007). The post-median beta value of 1.025 for this dataset is also higher than the pre-median beta value of 1.004, but the delta is also statistically insignificant. Results for single-company announcements show a post-average beta of 1.024 and a pre-average beta of 1.021. The delta of 0.003 is not significantly different from zero. The median beta delta is 0.015 and non-significant with a pre-median beta of 1.005 and a post-median beta of 1.020. Consequently, the last part of Table 3.10 shows that both mean- and median deltas of the consortium-announcement subsample and the solo-announcement subsample are not significantly different from each other. Therefore, H6 is not supported.

	Pre	**Post**	**Delta**	**t-value / z-value**	**Observations**
Consortium Announcements Means	1.007	1.013	0.005	-0.16	243
Consortium Announcements Medians	1.004	1.025	0.021	-0.63	243
Single Announcements Means	1.021	1.024	0.003	-0.06	181
Single Announcements Medians	1.005	1.020	0.015	-0.17	181

	Delta Consortium	**Delta Single**	**t-value / z-value**
Mean	0.005	0.003	0.17
Median	0.021	0.015	0.24

*p<10%, **p<5%, ***p<1%

Table 3.10: Differences in systematic risk changes between single firm- and consortium-related announcements.

3.6 Discussion

We utilized an international dataset of blockchain announcements to analyse the impact of various mediating factors on stock market value and the impact of blockchain news on market risk. We first performed three different subsampling analyses. Event study results of the first analysis show a significantly higher CAAR value for the consortium-related subsample than for the single-firm subsample. This suggests that shareholders might value blockchain announcements referring to a consortium or partner-firm more than single-firm blockchain statements. The statistical significance of the consortium-dummy variable in the multivariate regression also supports this finding. The results indicate that investors could have more confidence in the value added through blockchain if firms combine resources as well as IT capabilities with other companies when approaching blockchain use cases. Second, we show that the stock market differs in its reactions to blockchain news by tech- and non-tech companies. Our empirical analyses show that blockchain announcements by tech-firms lead to a more positive stock market reaction. Hence, investors could be aware that tech-heavy organizations might possess a greater range of resources and capabilities to be able to successfully finish a blockchain initiative. The stock market might recognize that blockchain technology is especially designed for issues heavily present in the tech industry, first and foremost data protection and data privacy issues (Y. Zhang et al., 2022). Third, the regression analysis provides support for the hypothesis that initial blockchain announcements exhibit lower abnormal stock market returns than subsequent blockchain news. This validates the assumption that shareholders perceive the first news regarding a new blockchain project as especially risky. Moreover, this underpins the observation made in practice that most of the blockchain projects by companies fail (Disparte, 2019), as our data sample possesses far less subsequent announcements than initial announcements. Subsequent announcements show significant positive abnormal returns. This shows that investors might value the effort as well as the increasing capabilities and resources committed to the continuation and further development of a blockchain project.

By utilizing the same dataset of blockchain announcements, we also analyse the effect of this type of corporate news on the systematic risk of companies. By calculating mean- and median rolling betas, we first examine the overall data sample and find an insignificant increase for both mean- and median rolling betas when comparing the time periods of 120 days before and 120 days after the blockchain announcements. Therefore, we do not find support for H4. Overall, shareholders do not appear to presume additional market risk when a firm announces a blockchain initiative. Market participants might assume that companies will not risk a significant portion of their resources for exploring a relatively unknown emerging technology. Thus, the impact on the company's systematic risk should also remain irrelevant. Moreover, the dataset indicates that many firms only take initial steps of blockchain exploration and seldom signal a higher degree of commitment to longer-term integration into operational processes. Therefore, the possible impact of a blockchain system could be smaller than other IT implementations such as business intelligence systems, which have been shown to have a significant impact on equity risk (Rubin & Rubin, 2013). The analysis of the mean beta deltas of the subsample of initial blockchain announcements and the respective values of the following blockchain announcements subsample shows that those are also not significantly different from each other. Consequently, we must reject H5. One possible explanation could be that even though a following announcement might signal a higher chance of successfully finishing the blockchain project, investors might recognize that the diversification of investments and research projects by most firms should reduce the overall impact of such announcements on the company's market risk. This could also explain the insignificant results for all hypotheses related to the examination of systematic risk. In this case, the overall impact of blockchain announcements on systematic risk, irrespective of their subsample affiliation, should be non-significant. Existing research on IT-related market risk impact also reinforces this argument. Only fundamentally impactful technologies such as ERP systems (Parra et al., 2015), business intelligence systems (Rubin & Rubin, 2013) or heavily impactful IT related events such as data breaches (Hinz et al., 2015) were found to have a significant impact on systematic risk. Thus, the impact of currently marginally relevant technologies is only reflected in short-term abnormal returns but not in the longer-term systematic risk analysis.

3.7 Theoretical Implications

Our study provides several implications for research on blockchain business- and market value by unveiling several factors that influence stock market reactions to blockchain announcements. First, we empirically demonstrate how companies benefit in terms of additional market value when focusing on announcements which include at least one other company or a consortium. This finding extends the discussion around the value of blockchain in multiorganizational settings (e.g., Choudary et al., 2019; Klöckner et al., 2022). We apply the RBV lens to argue that blockchain capabilities appear to be rare and should be more valuable in cases where several firms are part of a blockchain project. Firms can combine and complement unique capabilities which are necessary to identify the proper value proposition of the respective blockchain use case. Prominent examples are cases where organizations hire IT consulting firms for identifying and implementing blockchain technology. Investors appear to recognize and value the additional technological blockchain know-how of external consultants and could believe that such projects possess a higher chance of succeeding (Klöckner et al., 2022). Additionally, being part of a blockchain consortium could act as a signal of confidence for the stock market, with a whole group of companies possibly believing in the value of the blockchain project addressed. Second, we extend blockchain value literature by showing that blockchain technology announcements lead to more positive stock market reactions for firms from the IT sector. By applying the RBV perspective we argue that blockchain delivers more value if the technology supports individual core competencies. As members of the IT industry should possess more IT capabilities and competencies than non-IT firms (Felipe et al., 2020), they could also benefit more when approaching a blockchain project. Moreover, the RBV-view corroborates the finding that blockchain capabilities should be hardly imitable and can support specific issues such as data privacy and data protection which should be more omnipresent in the IT industry (Y. Zhang et al., 2022). Third, we extend prior conceptual work on blockchain value (Chong et al., 2019) by demonstrating that subsequent blockchain announcements lead to more positive stock market returns than initial blockchain news. The capability-perspective supported through RBV could serve as an explanation for the observed additional value of subsequent blockchain announcements. We argue that investors might appreciate companies adhering to a blockchain initiative and voluntarily deciding to keep their investors updated on their progress. Blockchain capabilities should increase over time, possibly leading to a higher probability of a successful and valuable implementation. Moreover, we complement prior research on the impact of new IT on market risk (e.g., Dewan & Ren, 2011; Rubin & Rubin, 2013). The non-significant findings of the impact of blockchain announcements on market risk indicate that shareholders appear to recognize this type of corporate news in the holistic context of the wide range of investments and ventures that large public companies usually carry out. Investors might even consider the exploration of emerging technologies such as blockchain as mandatory to not fall behind the curve. Another possible reason for the non-significant effect on market risk could include the longer-term view of the risk analysis in comparison to the short-term event study executed. Shareholders might be more concerned about potential short-term gains and less focused on its impact on longer-term systematic risk. As we followed previous research (Hinz et al., 2015) and chose a calculation-window of 120 days before and after the event, there exists also the possibility of other events that could have opposing effects on risk changes induced by corporate blockchain news.

3.8 Practical Implications

This study also possesses various implications for practitioners. We show that blockchain partnership announcements lead to higher positive abnormal stock market returns than announcements involving only a single company. This finding should give executives confidence in pursuing blockchain projects together with other firms or joining a blockchain consortium. Furthermore, we provide empirical evidence of higher positive market effects of blockchain projects in the IT industry. Thus, decision makers of tech-firms should especially consider exploring different blockchain use cases and engage in strategic blockchain partnerships. IT firms should also focus on investigating how their unique IT capabilities can be utilized or enhanced by the blockchain technology in question. Moreover, we demonstrate that sticking to a blockchain project and signaling endurance to investors is rewarded by the stock market. Hence, this suggests that executives should carefully evaluate which blockchain projects to be a part of and then committing enough resources to be able to successfully pursue the project and benefit from continuous updates in the form of abnormal market returns. Our results should also encourage managers and executives to pursue blockchain initiatives with no realistic threads of increased market risk in sight.

3.9 Limitations and Future Research

Our empirical study has several limitations. First, we choose stock market performance as our measure for financial performance and we do not focus on other measures of firm performance. Future studies might be able to shed light on the impact of blockchain technology on operational performance in the form qualitative analyses such as case studies (Klöckner et al., 2022). Second, the event study only focuses on short-term market reactions from blockchain announcements. It is not guaranteed that positive short-term returns also lead to long-term future financial performance improvements of firms (Teo et al., 2016). Thus, additional empirical studies could focus on the examination of blockchain's long-term effects on financial firm performance, for instance by applying measures such as Tobin's Q (Chung et al., 2020) or buy-and-hold abnormal returns (BHAR) (Klöckner et al., 2022). By focusing on systematic market risk, we also neglected the possible impact of blockchain announcements on the idiosyncratic risk of companies. As such, future research could explore how corporate blockchain news affect company-specific risk measures such as earnings volatility. Moreover, our data sample neglects announcements from companies located in emerging markets. Future research could explore if success factors of announcements from firms in these markets differ from the relevant factors in European and US markets. Lastly, our analysis is only centered around large and publicly listed firms. The results of our study might look different for smaller organizations. Analyses of blockchain's impact on firm performance of private companies could also enrich the enhancing stream of research on the value of blockchain technology.

4 ESG on the chain: Unveiling the impact of blockchain use cases on short-term stock performance

4.1 Introduction

The popularity of corporate blockchain applications is determined to grow at a rapid pace. Reports of successful adoptions are manifold and reach from Maersk and Walmart's introduction of "TradeLens" (Jensen et al., 2019) to Nasdaq's decentralized trading platform "Linq"[6]. Academic research also identifies blockchain technology as one of the most valuable emerging technologies in the financial sector (Chen et al., 2019). Beyond applications in the field of finance, blockchain use cases emerged dominantly in the field of supply chain- and operations management (Choudary et al., 2019). Various pilot projects show that blockchain offers efficient ways to ensure traceability of food and other goods (Hastig & Sodhi, 2020), detect counterfeits (Pun et al., 2021) and simplify interorganizational data sharing (Z. Wang et al., 2021). Moreover, certification processes (Bauer et al., 2022) as well as environmental-, social- and governance (ESG) related issues (Saberi et al., 2019) represent fields where blockchain exploration is accelerating. Hereby, blockchain systems can contribute to environmentally friendly supply chains by tracking carbon emissions and facilitating the adoption of circular economy business models (Varriale et al., 2020). By utilizing decentralized ledgers, firms can verify responsible resource harvesting and fair compensation for workers, particularly in sourcing materials or products from developing countries (Kshetri, 2022).

Nevertheless, fragmented practical evidence is still the current foundation for most blockchain value definitions (Klöckner et al., 2022). In contrast, the profound research on the value of information technology (IT) has highlighted the existence of a significant positive relationship between introducing new IT and firm value (e.g., Dehning & Richardson, 2002; Dos Santos et al., 1993). Beyond the general examination of IT investments and firm performance, past research also investigated the impact of specific new technologies on company value. For example, Dehning et al. (2004) report increased stock valuations after the introduction of e-commerce systems and Teo et al. (2016) show that capital markets react positively to announcements of firms introducing new business analytics technology. With respect to the relationship between blockchain announcements and financial firm performance, studies show uniformly positive stock market returns to blockchain announcements (Ali et al., 2023; Cahill et al., 2020; Klöckner et al., 2022). Yet, to the best of our knowledge, existing research neither provides differentiated insights into effects on market performance of prominent blockchain use cases, nor centers analyses around the possible impact of ESG-related blockchain initiatives. Moreover, there still exists uncertainty around the question whether firms only benefit from blockchain news when announcing a concrete project, or whether vague statements

[6] https://ir.nasdaq.com/news-releases/news-release-details/nasdaq-linq-enables-first-ever-private-securities-issuance. Accessed 11.05.2023.

or news such as joining a blockchain consortium are sufficient to induce positive stock market reactions. Lastly, past research provides evidence that firms benefit from the participation of external IT service providers when introducing new IT. We aim to shed light on the question whether this also applies to a disruptive-, but still immature digital technology like blockchain. Overall, our research is guided by the following questions:

1. *How do project-concreteness and the support of external service providers impact stock market reactions to blockchain announcements?*
2. *What types of stock market reactions are observed for different blockchain use cases, particularly those related to ESG issues?*

Most scholars apply the event study methodology (MacKinlay, 1997) when intending to analyse the relationship of IT investments and firm market value. It is especially suited for determining short-term market reactions in the form of abnormal returns (AR). The method can offer initial hints on the future business value of corporate blockchain initiatives (Klöckner et al., 2022). In this context, we execute an event study based on an international sample of 679 announcements from 291 firms and conduct subsampling analyses to answer the first research question. To highlight the factors impacting the stock market reactions as well as for robustness reasons, we subsequently perform multivariate regression analyses on the cumulative ARs (CAR) calculated.

The initial subsampling analysis indicates that concrete blockchain project announcements lead to more positive stock market reactions than unrelated blockchain news. The multivariate regression analysis supports this finding. The second subsampling analysis hints to superior stock performance of internal blockchain projects in comparison to initiatives with IT service provider support. The regression analysis also reveals a significant impact on stock returns in cases where no external service providers are involved. Moreover, our results in both univariate- and multivariate analyses suggest that announcements related to traceability-, finance- and trading issues lead to significant positive stock market reactions. Furthermore, blockchain initiatives that are related to ESG relevant topics exhibit positive stock market returns. A post-hoc analysis also reveals that these ESG-related blockchain announcements yield superior market reactions compared to non-ESG-related news. Hence, we complement the current discussion on factors influencing shareholder value during corporate blockchain news and outline the significant impact of ESG blockchain use cases on stock performance.

The rest of the paper is structured as follows. First, we provide an overview of already existing research on the relationship between blockchain technology announcements and stock performance. Then, we derive our hypotheses and describe the data collection process. Consequently, we provide a detailed description of the methodology applied and present our results. At the end, we discuss implications for research and practice, and present limitations to the study as well as future research paths.

4.2 Related Work

An emerging stream of research analyses the impact of blockchain technology on firms' stock values. For example, Cheng et al. (2019) explore the relationship between speculative blockchain announcements and stock performance and find that investors overreact to these types of corporate blockchain news. Additionally, the authors show that the reaction is stronger when the price of Bitcoin is higher. Cahill et al. (2020) also examine stock market reactions to blockchain announcements. They empirically demonstrate that shareholders react positively to corporate blockchain news and, similarly to Cheng et al. (2019), that investors' reactions are positively correlated to the price of Bitcoin. Autore et al. (2021) collect announcements between 2008 and 2019 of firms mentioning investments in blockchain technology and find that initial reactions lead to an average stock increase of 13% around the announcement day. Nonetheless, this increase reverses over the following three months. They also present evidence for higher stock returns in cases where blockchain projects are already at a mature stage (Autore et al., 2021). Zhang et al. (2022) find positive stock market reactions to blockchain initiatives in the Chinese market. Moreover, they present evidence that the presence of chief information officers (CIO) with extensive research and development (R&D) backgrounds as well as supportive governmental policies enhance those positive reactions. Klöckner et al. (2022) analyse the impact of supply chain related blockchain announcements on a firm's market value. The researchers find that reactions are weaker in cases where blockchain is used to track physical objects or to share sensitive data. Moreover, they demonstrate that the involvement of external IT service providers does not enhance investors' reactions, and a firm's innovativeness does not serve as a proxy for increased stock market returns. Governmental data protection laws as well as R&D intensity also impact the value associated to blockchain projects (Klöckner et al., 2022). Based on a dataset of blockchain announcements by Chinese firms, Liu et al. (2022) show that news referring to operational-level projects exhibit lower stock market returns than strategic level blockchain initiatives. On the other hand, similarly to Klöckner et al. (2022), the authors do not find supporting evidence for a significant moderating impact of a firm's innovativeness. In their paper, Ali et al. (2023) analyse reactions to blockchain news in US markets between 2016 and 2019. The authors apply the event study methodology and find abnormal positive stock market reactions. They also demonstrate that shareholders react even more positively when the announcement mentions cost- or time-saving implications because of the blockchain system implemented. Furthermore, smaller companies benefit more from blockchain news than larger firms. Lastly, the authors do not find evidence for positive longer-term effects on operational firm performance. Sharma et al. (2023) apply the dynamic capabilities lens and determine the relationship between blockchain initiatives and firm performance. In contrast to the other studies that all apply the event study methodology, the authors use the ratio of market value to replacement value as a measure of financial performance, also known as “Tobin’s Q”. They find that corporate blockchain adoptions lead to increases in Tobin’s Q. Other measures such as return on equity (ROE) or return on assets (ROA) are not impacted.

Past research has not yet made a clear distinction between different blockchain use cases. Klöckner et al. (2022) focus on traceability-blockchains, but the authors do not oppose their findings to other blockchain use cases such as finance-related blockchain projects. Moreover, existent research on the market value of blockchain has neglected the relevance of ESG-related blockchain announcements. Occasional ESG news might be a part of strategic-level blockchain projects mentioned by Liu et al. (2022), but the isolated effect of ESG-blockchain news remains unknown. Hence, our research aims at (1) enhancing to knowledge about the explicit effects of different blockchain use cases and (2) shedding light on the effect of ESG-related blockchain initiatives on stock performance by also exposing possible differences to non-ESG related blockchain news.

4.3 Hypotheses Development

When observing announcements that proclaim the development of an organizational blockchain project, past research has shown that this novel technology has the potential to increase the level of automating transactions (Kumar et al., 2018), providing a failure-proof data-management infrastructure (Weking et al., 2020) or making intermediaries between trading partners obsolete (Risius & Spohrer, 2017). If companies are able to successfully complete a blockchain project and therefore consider to implement such a system into their operational processes, they should be able to make improvements in the areas of data-accountability, data-security and increased efficiency (Koksal, 2019). Companies such as Nestlé provide initial anecdotal evidence of the advantages of blockchain. The firm meets customer demands by applying a blockchain system to enable the traceability of African coffee[7]. Moreover, executing a blockchain project can enable or improve business model innovation processes by companies. Corporate blockchain experts expect that the co-integration of blockchain technology with other technologies such as artificial intelligence (AI) will facilitate the rise of new digital technologies such as independent interconnected machinery or autonomous decision-making systems (Schlecht et al., 2020). This, in turn, should enable additional revenue streams leading to additional business value and ultimately to positive stock market effects (Klöckner et al., 2022).

On the other hand, corporate blockchain announcements cover a broad range of topics. As such, not all announcements declare the pursuit of a blockchain project with the goal to develop a minimum viable product (MVP). Beyond others, blockchain-related news can state the launch of blockchain accelerator

[7] https://www.nestle.com/media/news/nestle-blockchain-zoegas-coffee-brand. Accessed 05.05.2023.

programs[8], introducing the possibility of paying with cryptocurrencies[9] or declaring the joining of a blockchain consortium such as *Hyperledger*[10]. Cheng et al. (2019) show that US firms might actively try to take advantage of the current hype around the topic of blockchain by including vague statements about blockchain in disclosures of important corporate events required by the U.S. Securities and Exchange Commission (SEC), also called “8-K filings”. Hence, statements which do not mention the planned or finished execution of a blockchain project might be used for marketing purposes or to appeal uninformed investors. While concrete blockchain projects offer a tangible roadmap for implementation and potential benefits, non-project related blockchain announcements lack the same level of specificity. This lack of clarity could result in uncertainty among investors regarding the actual impact on the potential additional business value of blockchain. Non-project related announcements might be perceived as mere opportunistic attempts to leverage the buzz around blockchain without necessarily contributing to substantial value creation. For instance, various firms have declared the release of digital art in the form of non-fungible tokens (NFTs) based on blockchain technology. These releases are pursued as a form of marketing campaign (Chohan & Paschen, 2023), but the operational business value, which forms the core of most corporate blockchain applications, should be uncertain in such instances. Consequently, the realization of blockchain-induced added value should be more doubtful for non-project related blockchain announcements than for blockchain specifications already planned or in the middle of implementation. Hence, we hypothesize:

H1: Announcements of concrete corporate blockchain projects lead to more positive stock market reactions than non-project related blockchain announcements.

Many companies willing to implement blockchain do not develop such systems by themselves but rely on other firms or on already existing blockchain-frameworks. Swiss Bank UBS, which offers their customers access to the blockchain-based trade finance platform we.trade[11], or Procter&Gamble, which implemented a traceability system running on blockchain developed by blockchain-software provider SigmaLedger[12], are prominent examples of such external adoption approaches. External technology sourcing is a significant part of an organization’s competitive strategy and therefore relevant for the creation of additional business

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[8] E.g., “IBM and Columbia University Launch Two Accelerator Programs for Blockchain Startups (https://newsroom.ibm.com/2018-11-19-IBM-and-Columbia-University-Launch-Two-Accelerator-Programs-for-Blockchain-Startups. Accessed 11.03.2023.)

[9] E.g., “700,000 Expedia Hotels Can Now Be Paid With Cryptocurrencies via Travala” (https://news.bitcoin.com/700000-expedia-travala-hotels-cryptocurrencies/. Accessed 11.03.2023.)

[10] E.g., “Hyperledger Adds Alibaba Cloud, Citi, Deutsche Telekom, we.trade and 12 more New Members at Hyperledger Global Forum”(https://www.prnewswire.com/news-releases/hyperledger-adds-alibaba-cloud-citi-deutsche-telekom-wetrade-and-12-more-new-members-at-hyperledger-global-forum-300763940.html. Accessed 11.03.2023.)

[11] https://www.ubs.com/global/en/media/display-page-ndp/en-20191017-ubs-wetrade-live.html. Accessed 11.03.2023.

[12] https://www.businesswire.com/news/home/20211103005493/en/SigmaLedger%E2%80%99s-CuBE-a-Universal-Solution-for-Coupons-and-Rewards-Adopted-by-PG-and-Walgreens. Accessed 12.03.2023.

value (Jones et al., 2001). Furthermore, in many instances internal research and development efforts (R&D) are not sufficient to sustain a competitive advantage. Consequently, firms often rely on external technology sourcing to maintain a certain level of innovativeness and operational efficiency (Vanhaverbeke et al., 2002). Instead of internally initiating the development of an emerging technology, firms even pursue mergers and acquisition activities mainly with the purpose of acquiring novel technological resources and new knowledge bases (Ahuja & Katila, 2001). Moreover, the rapid pace of technological progress as well as the difficulty of solely relying on and managing the costs of internal developments increases the attractiveness of externally investing in new technology (Veugelers, 1997). Consequently, past research shows that external digital technology sourcing has a positive impact on a firm's innovativeness and firm performance (Droge et al., 2004). By relying on already existing blockchain-structures, organizations avoid overcommitment, save time and have an efficient way to examine the operational benefits of the technology. Therefore, we hypothesize:

H2: Announcements of externally developed blockchain systems lead to higher positive stock market reactions than internally developed blockchain systems.

Past research already emphasized the importance of differentiating between the various groups of blockchain use cases when analysing the effect of blockchain technology announcements on the market value of firms (Klöckner et al., 2022). One major stream of research explores existing use cases in the area of supply chain management and traceability (e.g., Hastig & Sodhi, 2020; Sodhi & Tang, 2019). Hereby, blockchain is being explored for tracking objects such as luxury goods, cars, food or commodities such as cobalt or diamonds (Bauer et al., 2022; Choi, 2019; Sodhi & Tang, 2019). Tracing products via blockchain can lead to cost reductions for products prone to counterfeits because manufacturers can reduce the amount of differential pricing necessary to signal authenticity (Pun et al., 2021). Moreover, data traced and stored via distributed ledger technology can hardly be tampered. Blockchain technology is not able to solve the so called *garbage in, garbage out*-problem (Babich & Hilary, 2020; Klöckner et al., 2022) which refers to the data-input quality. Nonetheless, in cases where upfront data quality assurance processes exist, blockchain should provide the opportunity of increased data security (Babich & Hilary, 2020). Furthermore, in supply chains consisting of two or more suppliers, initial suppliers often lack the incentive to increase product quality because they cannot be identified as the source of inferior quality and product defects. The effects of this issue, in literature also referred to as *double moral hazard* (Baiman et al., 2000), could be reduced through blockchain systems who can increase traceability in serial supply chains, already beginning at the initial supplier (Cui et al., 2023). Higher product quality should lead to increased customer satisfaction and ultimately to higher profitability (Anderson et al., 1994). These effects in summary should have a direct impact on the perceived business value of companies applying blockchain in a supply chain context. Consequently, shareholders and investors should recognize these circumstances. We posit:

H3: Announcements of traceability blockchain projects lead to positive stock market reactions.

Corporate blockchain technology has found another prominent application area in the realm of financial transactions. Blockchain can facilitate financial flows in supply chains through simplified and secure verification processes of transactions (Dong & Qiu, 2022). By increasing supply chain transparency through blockchain, firms can also increase the likelihood of receiving more favorable financing conditions (Chod et al., 2020). Moreover, the usage of blockchain-based smart contracts can also reduce debt financing costs for firms due to a higher degree of transparency and automated commitments (X. Wang, 2022). Other blockchain applications in the field of finance exist in various institutional trading settings. Hereby, firms such as IBM either build financial platforms for trading securities[13] or utilize the technology for the settlement of various kinds of lending and payment processes (White, 2017). In these use cases the prescribed goal is also the reduction of costs as well as settlement times. For instance, the exploration of blockchain-based intraday repo transactions by Morgan Stanley, which describes a selling- and rebuying transaction between financial institutions, revealed significantly shorter transaction- and settlement times leading to a higher degree of intraday liquidity[14]. Moreover, past research has shown that financial counterparty risk can be reduced through the inherent decentralizing and immutability characteristics of blockchain (Ross et al., 2019). Overall, this should enhance the business value and thereby also the market value of blockchain for financial- and trading activities by both financial- and non-financial firms.

H4: Announcements of blockchain projects related to financial transactions lead to positive stock market reactions.

Certification processes constitute another area of corporate blockchain use cases. Blockchain-based verification and identification processes have been explored in areas such as luxury-good tracking (Choi, 2019), car-selling (Bauer et al., 2022) or cybersecurity (Neisse et al., 2019). Blockchain technology offers the possibility to build ledgers of trusted and immutable data in a decentralized manner (Sarker et al., 2021) by enabling corporate multi-party constellations to securely and efficiently exchange historical product data and also making this data available to customers (Bauer et al., 2022). Consequently, this should lead to decreasing information asymmetries between different parties as well as for end-customers who are interested in the origin of a product (Cocco et al., 2021). On the other hand, even though blockchain should theoretically mitigate data security risks due to not having a single point of failure, its potential security risks are still not out of discussion. For example, the immutability of data is often portrayed as an advantage in theory, but in practice this can often lead to critical conflicts with data privacy requirements (Babich &

[13] https://www.prnewswire.com/news-releases/sbi-securities-works-with-ibm-to-test-blockchain-technology-for-bond-trading-platform-300349033.html. Accessed 17.05.2023.
[14] https://www.nasdaq.com/press-release/j.p.-morgan-executes-intraday-repo-transaction-using-blockchain-2020-12-10. Accessed 17.05.2023.

Hilary, 2020; Klöckner et al., 2022). Moreover, especially in corporate blockchain systems where several entities have direct access to the digital ledger, the possibility of either unintended or unauthorized data access arises. This leads to an increased risk of sensitive data leaks (Feng & Shanthikumar, 2018; Klöckner et al., 2022). These risks should be especially relevant for blockchain use cases related to certification processes as in these circumstances the authenticity, reliability and security of data is of particular importance (Babich & Hilary, 2019). Data privacy issues should be less relevant in cases such as food traceability or tracking of raw material data where few or no certification processes take place. Lastly, even sophisticated blockchain systems are not free from the risk of data breaches. Various malicious attacks on blockchain systems between 2011 and 2018 led to cumulative losses of over $2 billion for its users (Madnick, 2019). Hence, shareholders could be reluctant and doubt the progressivity of the technology with regards to reliable verification processes. Consequently, we hypothesize:

H5: Announcements of blockchain projects related to certification processes do not lead to positive stock market reactions.

In addition to its impact on operational processes, another current application area of enterprise blockchains is the field of sustainability-linked use cases (Parmentola et al., 2022). Scholars consider blockchain as valuable in the context of so called “green supply chains” where firms can utilize the technology to trace, store and share environmentally critical data such as carbon emissions or the sourcing of sustainable materials (Saberi et al., 2019). As such, blockchain systems can also facilitate the introduction of circular economy business models (Varriale et al., 2020). Moreover, blockchains are able to tackle corporate ethical issues. Via decentralized ledgers, firms that source materials or products from developing countries are able to verify that resources are harvested responsibly and that workers receive a fair compensation (Kshetri, 2022). This area of application gains further significance when considering global governmental regulations concerning mineral sourcing[15]. Furthermore, distributed ledger technologies can facilitate environmentally efficient logistics through real-time data exchanges and enabling supply chain optimizations (Philipp et al., 2019). Research has shown that shareholders value companies that are engaged in tackling ESG issues (e.g., Eccles et al., 2014; Krüger, 2015). Additionally, firms with higher ESG indicators tend to benefit in the form of a lower cost of capital (Chava, 2014). Consequently, ESG-related blockchain initiatives should have beneficial effects for investors. We posit:

H6: ESG-related blockchain projects lead to positive stock market reactions.

[15] See European Commission (2017): “The EU’s new conflict minerals regulation” (https://trade.ec.europa.eu/doclib/docs/2017/march/tradoc_155423.pdf. Accessed 03.06.2023.)

4.4 Data

The data collection process for this study involved utilizing Nexis Uni (previously known as Lexis-Nexis) to collect announcements of blockchain initiatives. Nexis Uni is a comprehensive database that provides daily worldwide press news. The study focused on public firms that announced their intention to implement blockchain technology, following established approaches that rely on a predefined set of firms from the S&P500 index and the STOXX Europe 600 index (Borah & Tellis, 2014). These indexes were selected because all their constituents are either large-cap or mid-cap sized, indicating a high trading volume of the firms' stocks (Klöckner et al., 2022).

Public attention to blockchain technology is considered to have been weak prior to 2014 (Cahill et al., 2020), and therefore, the study focused on announcements made between January 1, 2014, and December 31, 2022. To obtain relevant blockchain announcements from the sample firm pool, a structured approach was followed. Based on earlier studies that utilized event studies with news headlines, the study focused on the search of the news sources PR Newswire and Business Wire (Barua & Mani, 2018), as well as investor-relations news websites of the respective companies. The search process involved combining each company name with the terms “blockchain” or “cryptocurrency”.

Our initial data sample is comprised of a total of 16,249 announcements. To ensure that only announcements related to the study's purpose were included, news unrelated to blockchain, duplicates as well as statements on general outlooks on blockchain technology were eliminated. Finally, announcements that could have a confounding effect, such as financial earnings announcements, executive changes, or merger and acquisition (M&A) announcements that occurred during the event window were eliminated (Konchitchki & O’Leary, 2011). The final sample comprised 679 announcements from 291 unique firms overall. Of those, 271 announcements belonged to specific blockchain projects. The rest were non-project specific announcements such as joining a blockchain consortium.

Next, all respective stock price data of the companies filtered were collected from Refinitiv Workspace. The MSCI World index was chosen as our market benchmark for the combined data sets as publicly listed companies from the US and Europe represent more than 50% of the worldwide market capitalization of publicly traded stocks (Worldbank, 2022). For the US and European data sets, the market benchmarks are the S&P500 index and the STOXX Europe 600 index, respectively. Additionally, Fama-French factors were retrieved from the Dartmouth College database website. In case of differing announcement dates among different sources, the earlier date was chosen. Announcements on non-trading days were moved to the next trading day (MacKinlay, 1997).

4.5 Measures

We coded each blockchain announcement along different dimensions. To test H1, we define $Blockchain\ Project$ as 1 if the announcement refers to a concrete blockchain project, and 0 otherwise. $Internal$ is defined as 1 if the announcement refers to a blockchain project executed without mentioning the involvement of external aid, and else 0. The binary variables $Traceability$, $Finance$, $Certification$, and ESG refer to H3-H6 and are 1 if the blockchain announcement refers to traceability-, finance and trading-, certification- and ESG-related projects, respectively. Two independent coders were responsible for the categorization of measures, reaching a sufficient inter-rater reliability (percent agreement > 85%) for the variables. Occurring differences in coding outcomes were discussed and resolved by the authors. Table 4.1 presents examples for each measure.

Measure	Example
Project	BASF introduces innovative pilot blockchain project to improve circular economy and traceability of recycled plastics.
Non-Project	Ferrari Wants to Take Its Real-World Wow Factor to the Metaverse.
Internal	LVMH Blockchain Opens New Era For Authentic Luxury.
With IT-Service Provider	Seagate And IBM Work Together To Help Reduce Global Hard Drive Counterfeiting With Blockchain Technology.
Traceability	From barley to bar: AB InBev trials blockchain with farmers to bring supply chain transparency all the way to beer drinkers.
Finance	Mastercard and R3 Partner to Develop New Blockchain-Powered Cross-Border Payments Solution.
Certification	Iberdrola, the first company to use blockchain to certify shareholdings in the General Shareholders' Meeting.
ESG	BASF and arc-net collaborate to use blockchain technology for livestock sustainability.

Table 4.1: Measure Categorization Examples.

4.6 Methodology

Our quantitative analysis is comprised of a univariate analysis, consisting of an event study as well as a subsampling analysis, and a multivariate regression.

4.6.1 Event Study

We start our analysis by applying the event study methodology (MacKinlay, 1997). We utilize the Fama-French five factor model (FFM5) to describe the expected return $r_{i,t}$ of firm *i* on day *t*:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1i}(r_{m,t} - r_{f,t}) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}RMW_t + \beta_{5i}CMA_t + \varepsilon_{it}. \quad (4\text{-}1)$$

Here, r_f is the risk-free rate and r_m captures the return of the market portfolio. SMB represents the size factor which measures the excess return of small stock companies over large stock companies. HML is the growth factor describing differences in returns of value stocks and growth stocks. RMW captures differences in high- and low profitability stocks whereas CMA is a factor for measuring the impact of the stock performance of firms with a low degree of investments versus firms with a high degree of investments (Fama & French, 2015). In the next step we calculate ARs as the difference between actual and expected returns:

$$AR_{i,t} = r_{i,t} - r_{f,t} - \left[\hat{\alpha}_i + \hat{\beta}_i\left(r_{m,t} - r_{f,t}\right) + \hat{\beta}_i SMB_t + \hat{\beta}_i HML_t + \hat{\beta}_i RMW_t + \hat{\beta}_i CMA_t\right]. \quad (4\text{-}2)$$

We determine CARs as the sum of a firm's event specific ARs during the event windows t_1 and t_2:

$$CAR_{i,t_1;t_2} = \sum_{t_1}^{t_2} AR_{i,t}. \quad (4\text{-}3)$$

Lastly, we calculate the average cumulative abnormal return (CAAR) as the average of all CARs of all n events:

$$CAAR_{i,t_1;t_2} = \frac{1}{n}\sum_{1}^{n} CAR_{i,t_1;t_2}. \quad (4\text{-}4)$$

For testing H1 and H2 we perform subsampling analyses. The goal is to (1) compare reactions to blockchain announcements of specific projects to non-project related blockchain announcements and (2) further analysing the subsample of project announcements by determining possible differences in announcements of internally versus externally executed blockchain projects. We calculate differences-in-mean- and differences-in-median tests in the form of Welch-t- and Mann-Whitney U-tests. Moreover, we follow previous research and choose an estimation window between 120 before the event and 15 days before the event (Schweikl et al., 2022).

We apply the Patell- as well as the Adjusted Standardized Cross-Sectional (Adjusted StdCSect) test as the two parametric tests to examine if CAARs are statistically different from zero. Nevertheless, parametric tests assume a normal distribution of ARs. As we need to ensure that our results are not driven by non-normally distributed returns and outliers, we also perform two non-parametric tests, namely the Corrado test (Corrado & Zivney, 1992) and the Generalized Sign test (Cowan, 1992).

4.7 Event Study Results

Table 4.2 shows the event study results for H1 where the data set is split into project related announcements and non-project related announcements. Panel A1 shows positive CAARs for blockchain project announcements for all three event windows, ranging from 0.46% (-1;+1) to 0.86% (-5;+5). For each event window, all tests show statistical significance at the 1% level. Panel B1 presents lower CAARs, which are also unsignificant for the Patell z-test as well as the Adjusted StdCSect test. The three-day event window CAAR of -0.05% is statistically significant at the 10% level for both the Corrado- as well as the Generalized Sign test. The five-day event window CAAR lies at 0.18% and shows statistical significance at the 1% level for the Corrado test and 5% significance for the Generalized Sign test. Lastly, the CAAR of -0.04% at the two-week event window is statistically significant at the 5% level (Corrado) as well as at the 1% level (Generalized Sign). In the next step, the Welch t-test shows that for all three event windows, the respective CAARs of Panel A1 and B1 are significantly different from each other. The Mann-Whitney U test demonstrates statistical significance for the two-week event window, signifying a notable difference between the median CARs in this context.

We also performed robustness checks to validate the results of our event study. First, we adjusted the estimation window by choosing a (-200,-50) time horizon (Schweikl et al., 2022). Moreover, the choice of the FFM5 model could have an impact on our results. Therefore, we also performed an analysis based on the market model. Results of the two robustness tests are presented in Table 6.7 and Table 6.8 in the Appendix. Our findings remain robust to both the alternative estimation window as well as the alternative expected return model.

Panel A1: Blockchain Project Announcements (-120 to -15)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Obs.**	**Pos:Neg**
[-1;+1]	0.46%	0.32%	3.68***	3.64***	3.38***	3.56***	393	232:161
[-2;+2]	0.74%	0.59%	4.18***	3.69***	3.96***	3.35***	393	230:163
[-5;+5]	0.86%	1.01%	3.05***	2.76***	3.51***	4.36***	393	240:153
Panel B1: Non-Project related Announcements (-120 to -15)								
[-1;+1]	-0.05%	0.19%	0.47	0.52	1.76*	1.73*	286	161:125
[-2;+2]	0.18%	0.42%	1.64	1.55	2.94***	2.46**	286	168:118
[-5;+5]	-0.04%	0.07%	0.18	0.20	2.28**	2.98***	286	173:113

Event Window	**Delta CAAR**	**Delta Median CAR**	**Welch t-Test**	**Mann-Whitney U Test (z)**
[-1;+1]	0.51%	0.13%	2.26**	0.98
[-2;+2]	0.56%	0.17%	1.87*	0.44
[-5;+5]	0.90%	0.96%	1.87*	1.98**

*p<10%, **p<5%, ***p<1%

Table 4.2: Event study results for the subsamples of project- and non-project related announcements.

Results for testing H2 are presented in Table 4.3 where we divided the sub-dataset of project announcements (n=354) into externally- and internally developed blockchain initiatives. Panel A2 features results of announcements of externally developed blockchains. The CAAR of 0.51% for the three-day event window is significant at the 10% level for the Corrado test and significant at the 5% level for the Generalized Sign test. The five-day event window CAAR (0.72%) shows statistical significance at the 5% level for the Corrado test whereas the two-week event window CAAR (0.21%) remains statistically insignificant for all tests. Panel B2 presents event study results of announcements of internally developed blockchains. For all three event windows, CAARs are statistically significant at the 1% level for both parametric- and non-parametric tests. The following Welch t- and Mann-Whitney U-tests show that the CAAR- and median CAR deltas between Panel A2 and B2 of the three- and five-day event windows are statistically insignificant whereas the deltas of the two-week event window (0.94%) shows statistical significance at the 5%- and 10% level.

Panel A2: Announcements of externally developed blockchain (-120 to -15)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Obs.**	**Pos:Neg**
[-1;+1]	0.51%	0.55%	1.32	1.49	1.82*	2.14**	102	62:40
[-2;+2]	0.72%	0.66%	1.47	1.47	2.46**	1.15	102	57:45
[-5;+5]	0.21%	0.51%	0.35	0.36	1.32	0.95	102	56:46
Panel B2: Announcements of internally developed blockchain (-120 to -15)								
[-1;+1]	0.51%	0.25%	3.25***	3.15***	3.18***	2.91***	252	149:103
[-2;+2]	0,80%	0.61%	3.57***	3.31***	3.50***	3.04***	252	150:102
[-5;+5]	1.15%	1.31%	3.16***	3.08***	3.57***	4.17***	252	159:93

Event Window	**Delta CAAR**	**Delta Median CAR**	**Welch t-Test**	**Mann-Whitney U Test (z)**
[-1;+1]	0.00%	0.30%	0.00	0.71
[-2;+2]	0.08%	0.05%	0.87	0.33
[-5;+5]	0.94%	0.80%	2.21**	1.93*

*p<10%, **p<5%, ***p<1%

Table 4.3: Event study results for the subsamples of externally- and internally developed blockchain projects.

Table 4.4 features event study results for H3-H6. Panel 3 shows results for the subsample event study of announcements of traceability-related blockchain initiatives. The CAAR of 1.00% for the three-day event window is statistically significant at the 1% level for both parametric tests as well as the Corrado test. Moreover, the Generalized Sign test shows significance at the 10% level. For the five-day event window, the CAAR of 1.21% is significant at the 1% level for both the Adjusted StdCSect test and the Corrado test.

The Patell- and Generalized Sign test are significant at the 5%- and 10% level, respectively. Lastly, the CAAR for the five-day event window (1.40%) shows statistical significance at the 5% level for both the Adjusted SdtSect- and Corrado test. The Generalized Sign- and the Patell z-test are also statistically significant at the 1%- and 10% level.

Panel 4 presents positive and statistically significant CAARs for the subsample of finance-related blockchain project announcements for all three event windows. The three-day event window CAAR of 0.56% as well as the two-week event window CAAR of 1.51% are statistically significant at the 5% level for both parametric- and non-parametric tests. Moreover, the five-day event window CAAR (1.11%) shows significance at the 1% for all tests except for the Generalized Sign test, which is significant at the 5% level.

Results of the event study subsampling analysis for H5 are presented in Panel 5. The three-day event window CAAR of 0.50% for announcements of blockchain projects related to certification-issues is significant at the 10% level for both the Adjusted StdCSect test as well as the Corrado test. The five-day event window shows a higher CAAR of 1.94% which features statistical significance at the 1% level for both parametric tests as well as the Corrado test. Lastly, we observe a CAAR of 0.83% for the two-week event window with a statistically significant Corrado test at the 5% level.

Ultimately, Panel 6 shows CAARs of the subsample of ESG-related blockchain announcements. Here, none of the parametric tests shows statistical significance. The three-day event window CAAR (0.85%) is significant at the 5% level for both non-parametric tests. The five-day event window CAAR of 1.20% only shows statistical significance at the 5% level for the Corrado tests. Finally, we measure a two-week event window CAAR of 2.48%. For this observation, the Corrado test and the Generalized Sign test are both significant at the 1%- and 10% level, respectively.

Panel 3: Announcements of Traceability Blockchain Projects (-120 to -15)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Obs.**	**Pos:Neg**
[-1;+1]	1.00%	0.54%	2.76***	2.67***	2.82***	1.65*	86	51:35
[-2;+2]	1.21%	0.97%	2.50**	2.75***	2.81***	1.65*	86	51:35
[-5;+5]	1.40%	0.89%	1.82*	2.18**	2.21**	2.94***	86	57:29
Panel 4: Announcements of Finance Blockchain Projects (-120 to -15)								
[-1;+1]	0.56%	0.24%	2.01**	2.18**	2.09**	2.44**	118	72:46
[-2;+2]	1.11%	0.80%	3.25***	2.95***	3.02***	2.07**	118	70:48
[-5;+5]	1.51%	1.34%	2.40**	2.45**	2.29**	2.62**	118	73:45
Panel 5: Announcements of Certification Blockchain Projects (-120 to -15)								
[-1;+1]	0.50%	0.40%	1.40	1.82*	1.84*	1.44	48	29:19
[-2;+2]	1.94%	0.94%	3.22***	3.33***	3.30***	2.60**	48	33:15
[-5;+5]	0.83%	1.49%	1.43	1.27	2.28**	1.44	48	29:19
Panel 6: Announcements of ESG Blockchain Projects (-120 to -15)								
[-1;+1]	0.85%	0.45%	0.87	0.70	2.18**	2.16**	19	14:5
[-2;+2]	1.20%	0.28%	0.66	0.50	2.38**	0.78	19	11:8
[-5;+5]	2.48%	2.59%	1.18	1.05	3.22***	1.70*	19	13:6

*p<10%, **p<5%, ***p<1%

Table 4.4: Event study results for the subsamples of blockchain use cases.

4.8 Multivariate Regression Results

We further test whether the findings of the univariate event studies can be confirmed via a multivariate regression analysis. We initially present the correlation matrix of the dependent- and independent variables in Table 6.9 in the Appendix. The results indicate that our regression results do not suffer from biases induced by multicollinearity. We conduct several multivariate regression analyses on the CARs of the five-day event window. The general regression model has the following form:

$$CAR_i = \alpha_i + \beta_1 Blockchain\ Project_i + \beta_2 Internal_i + \beta_3 Traceability_i + \beta_4 Finance_i + \beta_5 Certification_i + \beta_6 ESG_i + \beta_7 ROE_i + \beta_8 Free\ Float_i + \beta_9 \frac{Cash}{Assets_i} + \frac{Debt}{Equity_i} + \beta_{11} Net\ Income_i + \beta_{12} MCap\_log_i + \beta_{13} Time_i + \epsilon_i. \tag{4-5}$$

The first six dependent variables are the binary variables referring to the six hypotheses tested. As suggested by previous literature, we also include control variables in the form of firm-specific leverage-, profitability- and valuation-related metrics (Bassen et al., 2019). Hence, we retrieved the dependent variables *Return on Equity (ROE), Free Float, Cash to Assets, Debt to Equity*, *Net Income* and the logarithmized market capitalization ($MCap\_log$) from the Refinitiv Workspace Database. Moreover, we include time-fixed effects. Table 4.5 summarizes the descriptive statistics of the explanatory variables.

Observations = 679

Variable	Min	Median	Mean	Max	SD
ROE	-0.869	0.150	0.204	0.866	0.207
Free Float (%)	0.217	0.992	0.895	1.000	0.168
Cash to Assets	0.003	0.069	0.087	0.478	0.072
Debt to Equity	0.002	0.944	1.273	5.629	1.021
Net Income	-0.612	0.139	0.153	0.579	0.123
Mcap_log	3.238	4.480	4.530	6.244	0.654
Blockchain Project	0	1	0.526	1	0.499
Internal	0	0	0.183	1	0.387
Traceability	0	0	0.127	1	0.347
Finance	0	0	0.174	1	0.393
Certification	0	0	0.071	1	0.258
ESG	0	0	0.028	1	0.174

Table 4.5: Descriptive Statistics.

Table 4.6 presents the results of the multivariate regressions performed. In H1 we argue that concrete project-related blockchain announcements lead to higher abnormal returns than non-project related announcements. In support of the first hypothesis, Model 1 shows statistical significance at the 1% level for the variable *Project*. This suggests increasing abnormal stock market returns for firms that announce a concrete blockchain project. On the other hand, we do not find support for H2 where we explain that the inclusion of external IT service providers should lead to increased abnormal stock market returns, as the beta-coefficient of the variable *Internal* is positive and statistically significant at the 1% level. This finding suggests that internally developed blockchain projects lead to increased abnormal returns in comparison to projects that include external guidance. Shareholders do not appear to assign more potential value to blockchain initiatives which are executed by hiring external service providers. We interpret that shareholders associate additional costs or risks with the involvement of third parties. One such risk could be the so called "black-box effect" (Babich & Hilary, 2020) which means that firms need to trust the IT systems implemented and have less opportunities to understand underlying protocols (Klöckner et al., 2022). This also makes it harder to implement changes after finishing the project. Consequently, unwanted dependencies on the service provider in charge could arise, which might also lead to additional future costs (Klöckner et al., 2022). Consequently, we reject H2. In support of H3, the beta-factor of the dummy-variable $Traceability$ is positive and statistically significant at the 5% level. Academic research as well as practitioners already identified the field of supply chain management as a major beneficiary of blockchain applications (e.g., Chod et al., 2020; Hastig & Sodhi, 2020). Hence, investors seem to value blockchain projects settled in the field of logistics. Traceability-related corporate blockchain statements also constitute the second largest group of use cases in our sample of announcements (n=86), which emphasizes the relative importance of this type of blockchain application. We observe similar effects for the binary variable $Finance$. Its beta-coefficient is positive and statistically significant at the 5% level. This implies that executing blockchain projects in a finance-context enhances the positive stock market reaction to blockchain announcements. In our dataset of subsamples of blockchain project announcements, this use case is the largest group (n=118). As blockchain technology originated as an alternative for the centralized financial system (Nakamoto, 2008), this finding confirms the importance of trading- and finance-related blockchain applications. Shareholders seem to value that blockchains offer numerous opportunities to facilitate financial transaction flows and thereby provide opportunities to mitigate counterparty risks (Ross et al., 2019). Moreover, many finance-related blockchain projects such as Nasdaq's proprietary trading platform Linq already proved to be successful under real market conditions[16]. The beta-factor of the dummy variable $Certification$ is not statistically significant. This supports H5, which emphasizes that blockchain projects related to certification processes should not lead to increased positive stock market reactions to corporate blockchain news. We interpret that investors recognize the *garbage in, garbage out*-problem (Babich & Hilary, 2020), which makes the additional value of blockchain technology for certification processes highly uncertain. Human manipulation prior to entering the blockchain is still possible, which currently makes additional quality assurance steps necessary. This leads to additional costs, making the return on these types of blockchain investments doubtful. We also find support for H6, as the beta-coefficient of the binary variable ESG, representing ESG-related blockchain announcements, is statistically significant at the 10% level. It implies that shareholders are especially sensitive to blockchain-related ESG news. As such, companies can benefit from addressing ESG issues with blockchain technology in the form of increasing transparency and accountability via immutable and environmentally relevant information.

For robustness reasons, we follow previous research by taking into account the potential impact arising from the specific type of blockchain specification in use (Klöckner et al., 2022). In general, blockchains can be differentiated into permissioned- and public blockchains. In permissioned blockchains, access to the network is restricted, making them especially appealing for corporations sharing sensitive data. On the other hand, public blockchains such as Ethereum are public to anyone who decides to participate. Hence, we classify the blockchain announcements by introducing an additional binary variable *Permissioned* which equals 1 when announcements explicitly mention the deployment of a permissioned blockchain such as Hyperledger Fabric or Corda, and else 0. Results of including this dummy variable are presented in Table 6.10 of the Appendix. The beta-coefficient of the *Permissioned* variable remains insignificant across all six

[16] https://ir.nasdaq.com/news-releases/news-release-details/nasdaq-linq-enables-first-ever-private-securities-issuance. Accessed 04.06.2023.

models. Moreover, all hypothesized effects remain unchanged. Therefore, our results are consistent with the original findings and not biased by a possible impact of the technological specification of the blockchain in use.

Parameter	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Blockchain Project	0.021 (3.71***)	-	-	-	-	-
Internal	-	0.019 (2.67***)	-	-	-	-
Traceability	-	-	0.017 (2.10**)	-	-	-
Finance	-	-	-	0.016 (2.15**)	-	-
Certification	-	-	-	-	0.014 (1.30)	-
ESG	-	-	-	-	-	0.027 (1.66*)
ROE	-0.002 (-0.65)	-0.003 (-0.71)	-0.004 (-1.02)	-0.002 (-0.51)	-0.003 (-0.68)	-0.002 (-0.65)
Free Float (%)	0.067 (3.97***)	0.067 (3.98***)	0.066 (3.95***)	0.066 (3.94***)	0.065 (3.85***)	0.067 (3.97***)
Cash to Assets	0.050 (1.24)	0.047 (1.17)	0.052 (1.28)	0.048 (1.18)	0.052 (1.29)	0.050 (1.24)
Debt to Equity	0.000 (-0.05)	0.000 (-0.10)	0.000 (-0.14)	0.000 (0.01)	0.000 (-0.05)	0.000 (-0.05)
Net Income	0.003 (0.15)	0.004 (0.17)	0.006 (0.29)	-0.007 (-0.30)	0.003 (0.12)	0.003 (0.15)
MCap_log	-0.001 (-0.21)	0.000 (-0.15)	0.000 (-0.09)	0.000 (-0.09)	0.000 (-0.07)	-0.001 (-0.21)
Intercept	-0.004 (-0.05)	-0.004 (-0.06)	-0.005 (-0.07)	-0.003 (-0.04)	-0.003 (-0.05)	-0.004 (-0.05)
Time-fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	3.63%	2.66%	2.26%	2.30%	1.86%	2.02%
F Statistic (p-value)	2.68 (0.001)	2.22 (0.005)	2.03 (0.012)	2.05 (0.011)	1.84 (0.026)	1.92 (0.019)

*p<10%, **p<5%, ***p<1%, n=679.

Table 4.6: Multivariate Regression Results.

4.9 Post-hoc Analysis

The initial objective of our study lies in the exploration of impacts of different corporate blockchain use cases on the market performance of firms. Thereby, we find robust evidence for the positive impact of ESG-related blockchain announcements. Consequently, the question arises whether ESG-related- and non-ESG related blockchain announcements show different stock market reactions. To conduct this analysis, we summarized all blockchain announcements that were not identified as ESG-related news and performed a separate event study. In the second step we compared the respective CAARs and median CARs of both subsamples via Welch t-tests and Mann-Whitney U tests. Table 4.7 shows the results of this analysis. For all three event-windows, CAARs of ESG blockchain announcements are higher than CAARs for non-ESG blockchain news. The difference in CAARs and median CARs are statistically significant at the 10% level for the two-week event window. This suggests that shareholders assign greater value to blockchain projects that prioritize ESG considerations compared to initiatives that do not set their focus on these factors.

Panel 6: ESG Blockchain Announcements (-120 to -15)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Obs.**	**Pos:Neg**
[-1;+1]	0.85%	0.45%	0.87	0.70	2.18**	2.16**	19	211:182
[-2;+2]	1.20%	0.28%	0.66	0.50	2.38**	0.78	19	215:178
[-5;+5]	2.48%	2.59%	1.18	1.05	3.22***	1.70*	19	214:179
Panel 6: Non-ESG Blockchain Announcements (-120 to -15)								
[-1;+1]	0.34%	0.21%	2.71***	2.75***	2.14**	1.74*	660	144:142
[-2;+2]	0.50%	0.41%	3.01***	2.92**	2.69***	3.26***	660	161:125
[-5;+5]	0.28%	0.65%	0.81	0.81	1.01	2.75***	660	146:140

Event Window	**Delta CAAR**	**Delta Median CAR**	**Welch t-Test**	**Mann-Whitney U Test (z)**
[-1;+1]	0.51%	0.24%	0.72	1.43
[-2;+2]	0.70%	0.13%	0.70	0.03
[-5;+5]	2.20%	1.94%	1.69*	1.73*

Table 4.7: Post-hoc ESG vs. non-ESG blockchain announcements.

4.10 Discussion

4.10.1 Implications for Research

We complement and extend research on the corporate value of blockchain technology in several ways. First, we show that shareholders react significantly more positively to project-related blockchain announcements than to non-project related news. Stock markets appear to expect more future value of blockchain initiatives that aim to develop a specific blockchain application than of unspecific news such as joining a consortium. The uncertainty that accompanies vague or speculative announcements could create ambiguity among shareholders. It might cast doubt on the corporation's ability to translate the general interest in blockchain into measurable additional business value when firms do not communicate a commitment to achieving tangible outcomes. Additionally, decision makers of companies could try to take advantage of the general hype around the topic of blockchain technology by publishing general statements with the goal to appear more innovative. In contrast to the second hypothesis, our empirical results also show that public equity markets seem to assign more value to projects that do not include external help. On the one hand, external technology sourcing is a significant part of a company's competitive strategy to maintain innovativeness and operational efficiency (Vanhaverbeke et al., 2002). On the other hand, the work of external IT service providers might be difficult to monitor, and later adjustments could be harder to implement. Additionally, the amount of additional costs and future dependence on external system maintenance might leave room for further uncertainty. These conclusions hint to the same findings of Klöckner et al., (2022) who show that for a dataset of supply chain related blockchain announcements the involvement of IT service providers leads to weaker ARs. Beyond that, we complement the research of Klöckner et al. (2022) by finding significant support for positive stock market reactions to traceability-related corporate blockchain news. Moreover, we extend blockchain research such as Babich & Hilary (2019) and Pun et al. (2021) by showing that blockchain's positive effects on cost reductions, preventing counterfeiting, and enabling more efficient data security are also recognized by investors.

Existing research on finance-related blockchain applications states that blockchains can simplify financial transactions, cut down durations- and costs of financial settlements and reducing counterparty risk in trading (Dong & Qiu, 2022; X. Wang, 2022; White, 2017). We substantiate these qualitative findings by empirically demonstrating that shareholders seem to attribute value to these types of projects. Our dataset shows that this use case, with 118 announcements, represents the largest field of corporate blockchain applications. This displays the continuing importance of blockchain use cases in the field of finance, which is not surprising given the fact that blockchain technology originally stems from replacing the existing currency system (Nakamoto, 2008).

Furthermore, we augment blockchain value research which critically assesses the data security and data privacy aspects of blockchain. We complement the findings of Klöckner et al. (2022) by showing that shareholders do not uniformly recognize the additional value of blockchain for certification processes in corporate environments. Input data for distributed ledgers still requires additional confirmation processes, as a blockchain in itself does not ensure correctness of data (Babich & Hilary, 2020; Klöckner et al., 2022). Moreover, investors might be aware of possible security risks or the existing potential for conflicts with data privacy requirements (Klöckner et al., 2022). With this finding, we extend existing knowledge on current borders of blockchain value and substantiate the uprise of critical blockchain analyses.

Prior academic work also suggests that corporate blockchain applications can enable green supply chains (Varriale et al., 2020), facilitate the ethical sourcing of food and raw materials, and enhance carbon emission tracking (Saberi et al., 2019). We extend research on the value of blockchain in an ESG context by showing that ESG-related blockchain projects lead to positive abnormal stock market returns. Moreover, our study is one of the first ones to underscore the supplementary worth attributed by shareholders to blockchain projects within an ESG framework, in contrast to initiatives lacking ESG affiliation. Lastly, our study validates previous conclusions that underscore shareholders' propensity to appraise companies actively addressing ESG concerns (Krüger, 2015).

4.10.2 Implications for Practice

Our findings also have relevant practical implications. We identify various circumstances under which blockchain announcements can lead to significant positive stock market reactions. Therefore, we help managers to maximize the potential value of blockchain initiatives under consideration. When pursuing blockchain initiatives, executives should not hastily decide to hire external IT service providers. Decision makers might be better off with first evaluating costs and potential benefits and ensuring the necessary knowledge-transfer to enable self-sufficient maintenance of blockchains in the future. Moreover, we encourage managers to execute blockchain projects that are either related to supply chain activities or to finance-related systems. Moreover, we emphasize the particular importance of ESG-related blockchain initiatives. Not only do executives benefit from positive shareholder reactions to ESG blockchain news, but these types of announcements also lead to more positive stock market reactions than announcements not related to ESG-relevant topics. This should encourage managers to put more focus on ESG-related use cases when exploring blockchain technology. On the other hand, firms should be cautious to focus on initiatives that solely intend to solve certification issues. It may be necessary to consult data privacy- as well as cybersecurity experts to evaluate potential risks. Finally, practitioners should be aware that blockchains for certification processes do not solve the "black-box effect" (Klöckner et al., 2022).

4.11 Limitations and Future Research

We recognize that our research is limited in several ways which leaves room for future research paths. First, our observations are based on a data sample of US- and EU-based firms. Even though these two regions in sum constitute the majority of the worldwide economic landscape, we cannot automatically assume equal results for firms from emerging countries. Hence, we encourage future research to analyse the factors of blockchain value from this study and potential new factors in the context of developing and emerging countries. Second, we only performed a broad clustering of blockchain use cases into four distinct categories. The sectors chosen are by no means exhaustive and future research might benefit from a more particular use case clustering. For example, finance-related blockchain announcements might be further divided into use cases like accepting cryptocurrencies for payments, building blockchain-based trading platforms, or using Initial Coin Offerings (ICOs) as investment vehicles (Cong et al., 2021). Third, the basis for our results is the short-term event study and we do not provide evidence of longer-term market value by blockchain. Initial indication of significant positive longer-term effects are provided by Lui & Ngai (2019) and Klöckner et al. (2022). Nevertheless, these studies do not consider factors of long-term value. Thus, scholars could explore factors or use cases like the ones applied in this study, to examine their impact on longer-term market returns. Lastly, our research does not consider the exclusive impact of ESG on stock performance. Past research has found that investors do not react to an ESG announcement per se, but that the particular interest and circumstance surrounding the ESG topic- and technology is essential for the stock market reaction (Serafeim & Yoon, 2022). Hence, the inclusion of blockchain technology in an ESG announcement should have an additional unique impact on the stock market reaction. Nevertheless, we do not consider the magnitude of this effect in our analysis. Future research could analyse potential differences of stock market reactions to announcements of other technologies in combination with ESG, such as artificial intelligence- or digital twin ESG announcements.

5 References

Aggarwal, Dai, & Walden. (2011). The More, the Merrier? How the Number of Partners in a Standard-Setting Initiative Affects Shareholder's Risk and Return. *MIS Quarterly: Management Information Systems*, *35*(2), 445.

Agrawal, D., Bharath, S. T., & Viswanathan, S. (2005). Technological Change and Stock Return Volatility: Evidence from eCommerce Adoptions. *SSRN Electronic Journal*.

Ahuja, G., & Katila, R. (2001). Technological acquisitions and the innovation performance of acquiring firms: a longitudinal study. *Strategic Management Journal*, *22*(3), 197–220.

Ali, H. S., Jia, F., Lou, Z., & Xie, J. (2023). Effect of blockchain technology initiatives on firms' market value. *Financial Innovation*, *9*(1), 1-35.

Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer Satisfaction, Market Share, and Profitability: Findings From Sweden. *Journal of Marketing*, *58*(3), 53–66.

Asness, C. S., Moskowitz, T. J., & Pedersen, L. H. (2013). Value and Momentum Everywhere. *Journal of Finance*, *68*(3), 929–985.

Autore, D. M., Clarke, N., & Jiang, D. (2021). Blockchain speculation or value creation? Evidence from corporate investments. *Financial Management*, *50*(3), 727–746.

Babich, V., & Hilary, G. (2020). Distributed Ledgers and Operations: What Operations Management Researchers Should Know About Blockchain Technology. *Manufacturing & Service Operations Management*, *22*(3), 223–240.

Baiman, S., Fischer, P. E., & Rajan, M. V. (2000). Information, Contracting, and Quality Costs. *Management Science*, *46*(6), 776–789.

Barua, A., Kriebel, C. H., & Mukhopadhyay, T. (1995). Information Technologies and Business Value: An Analytic and Empirical Investigation. *Information Systems Research*, *6*(1), 3–23.

Barua, A., & Mani, D. (2018). Reexamining the market value of information technology events. *Information Systems Research*, *29*(1), 225–240.

Bassen, A., Schiereck, D., & Schüler, P. (2019). The success of the activist investor Guy Wyser-Pratte in Continental Europe. *International Journal of Entrepreneurial Venturing*, *11*(1), 24–46.

Bauer, I., Parra-Moyano, J., Schmedders, K., & Schwabe, G. (2022). Multi-Party Certification on Blockchain and Its Impact in the Market for Lemons. *Journal of Management Information Systems*, *39*(2), 395–425.

Beck, R., Müller-Bloch, C., & King, J. L. (2018). Governance in the blockchain economy: A framework and research agenda. *Journal of the Association for Information Systems*, *19*(10), 1020–1034.

Bharadwaj, A., Keil, M., & Mähring, M. (2009). Effects of information technology failures on the market value of firms. *Journal of Strategic Information Systems*, *18*(2), 66–79.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management Science*, *45*(7), 1008–1024.

Bhattacherjee, A. (1998). Management of emerging technologies: Experiences and lessons learned at US West. *Information and Management*, *33*(5), 263–272.

Böhme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, Technology, and Governance. *Journal of Economic Perspectives*, *29*(2), 213–238.

Bolt, W., & Van Oordt, M. R. C. (2020). On the Value of Virtual Currencies. *Journal of Money, Credit and Banking*, *52*(4), 835–862.

Borah, A., & Tellis, G. J. (2014). Make, buy, or ally? Choice of and payoff from announcements of alternate strategies for innovations. *Marketing Science*, *33*(1), 114–133.

Bose, I., & Leung, A. C. M. (2019). Adoption of identity theft countermeasures and its short- And long-term impact on firm value. *MIS Quarterly: Management Information Systems*, *43*(1), 313–327.

Bossler, L. F., & Kroenung, J. (2022). Exploring the Current State of Research on Blockchain and Cryptocurrency – Analyzing Enablers, Inhibitors, and Indeterminate Factors. *Wirtschaftsinformatik 2022 Proceedings*.

Bowman, A., & Steelman, Z. R. (2019). Organizational signaling of blockchain investments: A patent filing event study. *25th Americas Conference on Information Systems*, 1–6.

Bracci, E., Tallaki, M., Ievoli, R., & Diplotti, S. (2022). Knowledge, diffusion and interest in blockchain technology in SMEs. *Journal of Knowledge Management*, *26*(5), 1386–1407.

Brown, S. J., & Warner, J. B. (1980). Measuring security price performance. *Journal of Financial Economics*, *8*(3), 205–258.

Buchholz, K. (2022). *Where Cryptocurrency Is Most Heavily Used*. Statista. https://www.statista.com/chart/26757/cryptocurrency-adoption-world-map/. Accessed 29.11.2022.

Bughin, J., Windhagen, E., Smit, S., Mischke, J., Sjatil, P. E., & Gürich, B. (2019). *Innovation in Europe - Changing the game to regain a competitive edge*. https://www.mckinsey.com/~/media/mckinsey/featured insights/innovation/reviving innovation in europe/mgi-innovation-in-europe-discussion-paper-oct2019-vf.pdf. Accessed 13.09.2023.

Cahill, D., G. Baur, D., (Frank) Liu, Z., & W. Yang, J. (2020). I am a blockchain too: How does the market respond to companies' interest in blockchain? *Journal of Banking and Finance*, *113*, 105740.

Cardenas, J., Nicholas-Donald, A., Coronado, A. S., Parra, F., & Mahmood, M. A. (2012). The economic impact of security breaches on publicly traded corporations: An empirical investigation. *Americas Conference on Information Systems*, *18*, 1393–1400.

Chainalysis. (2021). *The 2021 Global Crypto Adoption Index: Worldwide Adoption Jumps Over 880% With P2P Platforms Driving Cryptocurrency Usage in Emerging Markets*. https://blog.chainalysis.com/reports/2021-global-crypto-adoption-index/. Accessed 06.02.2023.

Chatterjee, D., Pacini, C., & Sambamurthy, V. (2002). The shareholder-wealth and trading-volume effects of information-technology infrastructure investments. *Journal of Management Information Systems*, *19*(2), 7–42.

Chatterjee, D., Richardson, V. J., & Zmud, R. W. (2001). Examining the Shareholder Wealth Effects of Announcements of Newly Created CIO Positions. *MIS Quarterly: Management Information Systems*, *25*(1), 43–70.

Chava, S. (2014). Environmental externalities and cost of capital. *Management Science*, *60*(9), 2223–2247.

Chen, M. A., Wu, Q., & Yang, B. (2019). How Valuable Is FinTech Innovation? *Review of Financial Studies*, *32*(5), 2062–2106.

Chen, Y., Richter, J. I., & Patel, P. C. (2021). Decentralized Governance of Digital Platforms. *Journal of Management*, *47*(5), 1305–1337.

Cheng, S. F., De Franco, G., Jiang, H., & Lin, P. (2019). Riding the Blockchain Mania: Public Firms' Speculative 8-K Disclosures. *Management Science*, *65*(12), 5449–5956.

Cho, S., Lee, K., Cheong, A., No, W. G., & Vasarhelyi, M. A. (2021). Chain of Values: Examining the Economic Impacts of Blockchain on the Value-Added Tax System. *Journal of Management Information Systems*, *38*(2), 288–313.

Chod, J., Trichakis, N., Tsoukalas, G., Aspegren, H., & Weber, M. (2020). On the financing benefits of supply chain transparency and blockchain adoption. *Management Science*, *66*(10), 4378–4396.

Chohan, R., & Paschen, J. (2023). NFT marketing: How marketers can use nonfungible tokens in their campaigns. *Business Horizons*, *66*(1), 43–50.

Choi, T. M. (2019). Blockchain-technology-supported platforms for diamond authentication and certification in luxury supply chains. *Transportation Research Part E: Logistics and Transportation Review*, *128*, 17–29.

Chong, A. Y. L., Lim, E. T. K., Hua, X., Zheng, S., & Tan, C. W. (2019). Business on chain: A comparative case study of five blockchain-inspired business models. *Journal of the Association for Information Systems*, *20*(9), 1308–1337.

Choudary, S. P., Alstyne, M. W. Van, & Parker, G. G. (2019). Platforms and blockchain will transform logistics. *Harvard Business Review (1)*, 2–5.

Chung, S., Animesh, A., Han, K., & Pinsonneault, A. (2020). Financial Returns to Firms' Communication Actions on Firm-Initiated Social Media: Evidence from Facebook Business Pages. *Information Systems Research*, *31*(1), 258–285.

Cocco, L., Tonelli, R., & Marchesi, M. (2021). Blockchain and self sovereign identity to support quality in the food supply chain. *Future Internet*, *13*(12), 301.

Cong, L. W., Li, Y., & Wang, N. (2021). Tokenomics: Dynamic Adoption and Valuation. *The Review of Financial Studies*, *34*(3), 1105–1155.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: A review and assessment. *Journal of Management*, *37*(1), 39–67.

ConsenSys. (2020). *ConsenSys Acquires Quorum® Platform from J.P. Morgan*. https://consensys.net/blog/press-release/consensys-acquires-quorum-platform-from-jp-morgan/. Accessed 08.05.2023.

Corrado, C. J. ., & Zivney, T. L. (1992). The Specification and Power of the Sign Test in Event Study Hypothesis Tests Using Daily Stock Returns. *Journal of Financial and Quantitative Analysis*, *27*(3), 465–478.

Cowan, A. R. (1992). Nonparametric event study tests. *Review of Quantitative Finance and Accounting*, *2*(4), 343–358.

Cox, D. F. (1967). The Sorting Rule Model of the Consumer Product Evaluation Process. In *Risk Taking and Information Handling in Consumer Behavior* (pp. 324–369). Harvard University Press.

Cui, Y., Hu, M., & Liu, J. (2023). Value and Design of Traceability-Driven Blockchains. *Manufacturing & Service Operations Management, 25*(3), 1099-1116.

Dehning, B., & Richardson, V. J. (2002). Returns on Investments in Information Technology: A Research Synthesis. *Journal of Information Systems*, *16*(1), 7–30.

Dehning, B., Richardson, V. J., Urbaczewski, A., & Wells, J. D. (2004). Reexamining the value relevance of E-Commerce initiatives. *Journal of Management Information Systems*, *21*(1), 55–82.

Dehning, B., Richardson, V. J., & Zmud, R. W. (2003). The Value Relevance of Announcements of Transformational Information Technology Investments. *MIS Quarterly: Management Information Systems*, *27*(4), 637–656.

Dewan, S., & Ren, F. (2007). Risk and return of information technology initiatives: Evidence from electronic commerce announcements. *Information Systems Research*, *18*(4), 370–394.

Dewan, S., & Ren, F. (2011). Information technology and firm boundaries: Impact on firm risk and return performance. *Information Systems Research*, *22*(2), 369–388.

Disparte, D. A. (2019). *Why Enterprise Blockchain Projects Fail*. Forbes. https://www.forbes.com/sites/dantedisparte/2019/05/20/why-enterprise-blockchain-projects-fail/?sh=1c40b2264b96. Accessed 23.04.2022.

Dobija, D., Klimczak, K. M., Roztocki, N., & Weistroffer, H. R. (2012). Information technology investment announcements and market value in transition economies: Evidence from Warsaw Stock Exchange. *Journal of Strategic Information Systems*, *21*(4), 308–319.

Dong, L., & Qiu, Y. (2022). Blockchain-Enabled Deep-Tier Supply Chain Finance. *Manufacturing & Service Operations Management*.

Dos Santos, B., KG, P., & DC, M. (1993). The impact of information technology investment announcements on the market value of the firm. *Information Systems Research*, *4*(1), 1–23.

Drechsler, K., Wagner, H.-T., & Reibenspiess, V. (2019). Risk and Return of Chief Digital Officers ' Appointment – An Event Study. *40th International Conference on Information Systems*, 1–17.

Droge, C., Jayaram, J., & Vickery, S. K. (2004). The effects of internal versus external integration practices on time-based performance and overall firm performance. *Journal of Operations Management*, *22*, 557–573.

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, *60*(11), 2835–2857.

Elitzur, R., & Gavious, A. (2003). Contracting, signaling, and moral hazard: A model of entrepreneurs, “angels,” and venture capitalists. *Journal of Business Venturing*, *18*(6), 709–725.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics*, *116*(1), 1–22.

Felipe, C. M., Leidner, D. E., Roldán, J. L., & Leal-Rodríguez, A. L. (2020). Impact of IS Capabilities on Firm Performance: The Roles of Organizational Agility and Industry Technology Intensity. *Decision Sciences*, *51*(3), 575–619.

Feng, Q., & Shanthikumar, J. G. (2018). How Research in Production and Operations Management May Evolve in the Era of Big Data. *Production and Operations Management*, *27*(9), 1670–1684.

French, K. (2022). *Kenneth R. French Data Library*. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Accessed 06.06.2023.

Fridgen, G., Urbach, N., Radszuwill, S., & Utz, L. (2018). Cross-organizational workflow management using blockchain technology – towards applicability, auditability, and automation. *Proceedings of the Annual Hawaii International Conference on System Sciences*, *51*, 3507–3516.

Gaur, V., & Gaiha, A. (2020). Building a Transparent Supply Chain Blockchain can enhance trust, efficiency, and speed. *Harvard Business Review*, *98*(3), 94–103.

Gupta, V., & Knight, R. (2017). *How Blockchain Could Help Emerging Markets Leap Ahead*. Harvard Business Review. https://hbr.org/2017/05/how-blockchain-could-help-emerging-markets-leap-ahead. Accessed 23.06.2023.

Haleblian, J., & Finkelstein, S. (1999). The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly*, *44*(1), 29–56.

Han, K., Oh, W., Im, K. S., Chang, R. M., Oh, H., & Pinsonneault, A. (2012). Value Cocreation and Wealth Spillover in Open Innovation Alliances. *MIS Quarterly: Management Information Systems*, *36*(1), 291–315.

Hardy, C., Phillips, N., & Lawrence, T. B. (2003). Resources, knowledge and influence: The organizational effects of inter Organizational collaboration. *Journal of Management Studies*, *40*(2), 321–347.

Hastig, G. M., & Sodhi, M. S. (2020). Blockchain for Supply Chain Traceability : Business Requirements and Critical Success Factors. *Production and Operations Management*, *29*(4), 935–954.

Hinz, O., Nofer, M., Schiereck, D., & Trillig, J. (2015). The influence of data theft on the share prices and systematic risk of consumer electronics companies. *Information and Management*, *52*(3), 337–347.

Hofstetter, R., de Bellis, E., Brandes, L., Clegg, M., Lamberton, C., Reibstein, D., Rohlfsen, F., Schmitt, B., & Zhang, J. Z. (2022). Crypto-marketing: how non-fungible tokens (NFTs) challenge traditional marketing. *Marketing Letters, 33*(4), 705–711.

Hulland, J., & Wade, M. (2004). The Resource-Based View and Information Systems Research: Review, Extension,and Suggestions for Future Research. *MIS Quarterly: Management Information Systems*, *28*(1), 107–142.

Hunter, S. D., Kobelsky, K., & Richardson, V. J. (2005). Information Technology and the Volatility of Firm Performance. *SSRN Electronic Journal*.

Jensen, T., Hedman, J., & Henningsson, S. (2019). How TradeLens delivers business value with blockchain technology. *MIS Quarterly Executive*, *18*(4), 221–243.

Jones, G. K., Lanctot, A., Corporation, D., & Teegen, H. J. (2001). Determinants and performance impacts of external technology acquisition. *Journal of Business Venturing*, *16*(3), 255–283.

Juell-Skielse, G., Lönn, C. M., & Päivärinta, T. (2017). Modes of collaboration and expected benefits of inter-organizational E-government initiatives: A multi-case study. *Government Information Quarterly*, *34*(4), 578–590.

Kim, K., Mithas, S., & Kimbrough, M. (2017). Information technology investments and firm risk across industries: Evidence from the bond market. *MIS Quarterly: Management Information Systems*, *41*(4), 1347–1367.

Klöckner, M., Schmidt, C. G., & Wagner, S. M. (2022). When Blockchain Creates Shareholder Value: Empirical Evidence from International Firm Announcements. *Production and Operations Management*, *31*(1), 46–64.

Kobelsky, K., Hunter, S., & Richardson, V. J. (2008). Information technology, contextual factors and the volatility of firm performance. *International Journal of Accounting Information Systems*, *9*(3), 154–174.

Koksal, I. (2019). The Benefits Of Applying Blockchain Technology In Any Industry. *Forbes*.

Kolb, J., Hornung, J., Kraft, F., & Winkelmann, A. (2018). Industrial Application of Blockchain Technology – Erasing the Weaknesses of Vendor Managed Inventory. *Twenty-Sixth European Conference on Information Systems*, 1–15.

Konchitchki, Y., & O'Leary, D. E. (2011). Event study methodologies in information systems research. *International Journal of Accounting Information Systems*, *12*(2), 99–115.

Kouhizadeh, M., & Sarkis, J. (2018). Blockchain Practices, Potentials, and Perspectives in Greening Supply Chains. *Sustainability*, *10*(10), 1–16.

Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics*, *115*(2), 304–329.

Kshetri, N. (2022). Blockchain systems and ethical sourcing in the mineral and metal industry: a multiple case study. *International Journal of Logistics Management*, *33*(1), 1–27.

Kumar, S., Mookerjee, V., & Shubham, A. (2018). Research in Operations Management and Information Systems Interface. *Production and Operations Management*, *27*(11), 1893–1905.

Kutner, M. H., Nachtsheim, C. J., Neter, J., & Li, W. (2005). *Applied linear statistical models*. McGraw-Hill Irwin.

Lacity, M. C. (2018). Addressing key challenges to making enterprise blockchain applications a reality. *MIS Quarterly Executive*, *17*(3), 201–222.

Lane, V., & Jacobson, R. (1995). Stock Market Reactions to Brand Extension Announcements: The Effects of Brand Attitude and Familiarity. *Journal of Marketing*, *59*(1), 63.

Laycock, R. (2022). *Der Krypto-Index von Finder*. https://www.finder.com/de/der-kryptowahrungs-adoptionsindex-von-finder. Accessed 17.04.2023.

Li, X., & Wang, C. A. (2017). The technology and economic determinants of cryptocurrency exchange rates : The case of Bitcoin. *Decision Support Systems*, *95*, 49–60.

Liang, T. P., Kohli, R., Huang, H. C., & Li, Z. L. (2021). What Drives the Adoption of the Blockchain Technology? A Fit-Viability Perspective. *Journal of Management Information Systems*, *38*(2), 314–337.

Liu, W., Wang, J., Jia, F., York, T., School, M., & Choi, T.-M. (2022). Blockchain Announcements and Stock Value: A Technology Management Perspective. *International Journal of Operations & Production Management*, *42*(5), 713-742.

Lui, A. K. H., Lee, M. C. M., & Ngai, E. W. T. (2022). Impact of artificial intelligence investment on firm value. *Annals of Operations Research*, *308*(1–2), 373–388.

Lui, A. K. H., & Ngai, E. W. T. (2019). The Long Term Effect of Blockchain Adoption on Firm Value. *Americas Conference on Information Systems*, *25*, Emergent Research Forum (ERF) Paper.

Lumineau, F., Wang, W., & Schilke, O. (2023). Blockchain Governance—A New Way of Organizing Collaborations? *Organization Science*, *32*(2), 500–521.

Lundin, M. (2007). When Does Cooperation Improve Public Policy Implementation? *The Policy Studies Journal*, *35*(4), 629–652.

MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, *35*(1), 13–39.

Madnick, S. (2019). Blockchain Isn't as Unbreakable as You Think. *MIT Sloan Management Review*, *61*(2), 65–70.

Makarov, I., & Schoar, A. (2020). Trading and arbitrage in cryptocurrency markets. *Journal of Financial Economics*, *135*(2), 293–319.

Mazzoni, M., Corradi, A., & Di, V. (2022). Performance evaluation of permissioned blockchains for financial applications: The ConsenSys Quorum case study. *Blockchain: Research and Applications*, *3*(1), 1–12.

McDowell, W. C., Peake, W. O., Coder, L., & Harris, M. L. (2018). Building small firm performance through intellectual capital development : Exploring innovation as the " black box ." *Journal of Business Research*, *22*(6), 557–573.

MediLedger. (2020). *Leaders from 24 companies in the US Pharmaceutical Supply Chain collaborate to submit the MediLedger DSCSA Pilot Project Final Report to the FDA, proposing blockchain for an interoperable track and trace system for US prescription drugs*. PRNewswire. https://www.prnewswire.com/news-releases/leaders-from-24-companies-in-the-us-pharmaceutical-supply-chain-collaborate-to-submit-the-mediledger-dscsa-pilot-project-final-report-to-the-fda-proposing-blockchain-for-an-interoperable-track-and-trace-system-for-us-prescription-301008871.html. Accessed 14.09.2023.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value. *MIS Quarterly: Management Information Systems*, *28*(2), 283–322.

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. *Decentralized Business Review*.

Neisse, R., Hernandez-Ramos, J. L., Matheu, S. N., Baldini, G., & Skarmeta, A. (2019). Toward a Blockchain-based Platform to Manage Cybersecurity Certification of IoT devices. *2019 IEEE Conference on Standards for Communications and Networking, 9*, 1–6.

Parmentola, A., Petrillo, A., Tutore, I., & De Felice, F. (2022). Is blockchain able to enhance environmental sustainability? A systematic review and research agenda from the perspective of Sustainable Development Goals (SDGs). *Business Strategy and the Environment*, *31*(1), 194–217.

Parra, F., Gemoets, L., Hall, L. L., & Mahmood, M. A. (2015). Impact of enterprise system implementations on enterprise risk. *2015 Americas Conference on Information Systems*, 1–11.

Pawczuk, L., Walker, R., & Tanco, C. C. T. (2021). Deloitte's 2021 Global Blockchain Survey - A new age of digital assets. *Deloitte Insights*, 2–48. https://www2.deloitte.com/content/dam/insights/us/articles/2019-global-blockchain-survey/DI_2019-global-blockchain-survey.pdf. Accessed 04.05.2023.

Philipp, R., Prause, G., & Gerlitz, L. (2019). Blockchain and Smart Contracts for Entrepreneurial Collaboration in Maritime Supply Chains. *Transport and Telecommunication*, *20*(4), 365–378.

PRNewswire. (2021). Pepsi Announces First-Ever Brand NFT with "Pepsi Mic Drop" Collection [Press release]. *PRNewswire*. https://www.prnewswire.com/news-releases/pepsi-announces-first-ever-brand-nft-with-pepsi-mic-drop-collection-301440901.html. Accessed 29.01.2023.

PRNewswire. (2022). *Global Blockchain Technology Market Expected to Reach $1.4 Trillion by 2030*. PR Newswire Association LLC. https://www.prnewswire.com/news-releases/global-blockchain-technology-market-expected-to-reach-1-4-trillion-by-2030--301479438.html. Accessed 22.04.2023.

Pun, H., Swaminathan, J. M., & Hou, P. (2021). Blockchain Adoption for Combating Deceptive Counterfeits. *Production and Operations Management*, *30*(4), 864–882.

Ravichandran, T., & Giura, S. I. (2019). Knowledge transfers in alliances: Exploring the facilitating role of information technology. *Information Systems Research*, *30*(3), 726–744.

Ravichandran, T., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems*, *21*(4), 237–276.

Regner, F., Schweizer, A., & Urbach, N. (2019). NFTs in practice - Non-fungible tokens as core component of a blockchain-based event ticketing application. *40th International Conference on Information Systems*.

Ren, F., & Dewan, S. (2015). Industry-Level Analysis of Information Technology Return and Risk: What Explains the Variation? *Journal of Management Information Systems*, *32*(2), 71–103.

Risius, M., & Spohrer, K. (2017). A Blockchain Research Framework: What We (don't) Know, Where We Go from Here, and How We Will Get There. *Business and Information Systems Engineering*, *59*(6), 385–409.

Ross, O., Jensen, J., Ross, O., & Jensen, J. R. (2019). Assets under Tokenization: Can Blockchain Technology Improve Post-Trade Processing? *40th International Conference on Information Systems*.

Rossi, M., Mueller-Bloch, C., Thatcher, J. B., & Beck, R. (2019). Blockchain research in information systems: Current trends and an inclusive future research agenda. *Journal of the Association for Information Systems*, *20*(9), 1388–1403.

Rubin, E., & Rubin, A. (2013). The impact of Business Intelligence systems on stock return volatility. *Information and Management*, *50*(2–3), 67–75.

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, *57*(7), 2117–2135.

Sabherwal, R., & Sabherwal, Sa. (2005). Knowledge Management Using Information Technology: Determinants of Short-Term Impact on Firm Value. *Decision Sciences*, *36*(4), 531–567.

Sarkees, M. (2011). Understanding the links between technological opportunism, marketing emphasis and firm performance: Implications for B2B. *Industrial Marketing Management*, *40*(5), 785–795.

Sarker, S., Henningsson, S., Jensen, T., & Hedman, J. (2021). Use Of Blockchain As A Resource For Combating Corruption In Global Shipping: An Interpretive Case Study. *Journal of Management Information Systems*, *38*(2), 338–373.

Schlecht, L., Schneider, S., & Buchwald, A. (2020). Creating value through blockchain technology: A Delphi study. *28th Eurpean Conference on Information Systems*.

Schlecht, L., Schneider, S., & Buchwald, A. (2021). The prospective value creation potential of Blockchain in business models: A delphi study. *Technological Forecasting and Social Change*, *166*, 120601.

Schryen, G. (2013). Revisiting IS business value research: What we already know, what we still need to know, and how we can get there. *European Journal of Information Systems*, *22*(2), 139–169.

Schweikl, S., Schinnen, M., & Obermaier, R. (2022). When the Machine Stops: The Impact of Information Technology Failure on Firm Value. *30th European Conference of Information Systems*.

Serafeim, G., & Yoon, A. (2022). Which Corporate ESG News Does the Market React To? *Financial Analysts Journal*, *78*(1), 59–78.

Sharma, P., & Paul, S. (2021). Game of names: Blockchain premium in corporate names. *Managerial and Decision Economics*, *42*(5), 1059–1078.

Sharma, P., Paul, S., & Sharma, S. (2020). What's in a name? A lot if it has "blockchain." *Economics Letters*, *186*, 108818.

Sharma, P., Shukla, D. M., & Raj, A. (2023). Blockchain adoption and firm performance: The contingent roles of intangible capital and environmental dynamism. *International Journal of Production Economics*, *256*, 108727.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. *The Journal of Finance*, *19*(3), 425–442.

Sheel, A., & Nath, V. (2019). Effect of blockchain technology adoption on supply chain adaptability, agility, alignment and performance. *Management Research Review*, *42*(12), 1353–1374.

Sodhi, M. S., & Tang, C. S. (2019). Research Opportunities in Supply Chain Transparency. *Production and Operations Management*, *28*(12), 2946–2959.

Son, I., Lee, D., Lee, J. N., & Chang, Y. B. (2014). Market perception on cloud computing initiatives in organizations: An extended resource-based view. *Information and Management*, *51*(6), 653–669.

Spence, B. M. (2002). Signaling in Retrospect and the Informational Structure of Markets. *The American Economic Review*, *92*(3), 434–459.

Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending With Group Image: The Psychology of Stereotype and Social Identity Threat. *Advances in Experimental Social Psychology*, *34*, 379–440.

Stiglitz, J. E. (2000). The Contributions of the Economics of Information to Twentieth Century Economics. *The Quarterly Journal of Economics*, *115*(4), 1441–1478.

Subramani, M., & Walden, E. (2001). The Impact of E-Commerce Announcements on the Market Value of Firms. *Information Systems Research*, *12*(2), 135–154.

Tang, C. P., Huang, T. C. K., & Wang, S. T. (2018). The impact of Internet of things implementation on firm performance. *Telematics and Informatics 35(7)*, 2038-2053.

Teo, T. S. H., Nishant, R., & Koh, P. B. L. (2016). Do shareholders favor business analytics announcements? *Journal of Strategic Information Systems*, *25*(4), 259–276.

Tian, F., & Xu, S. X. (2015). How do enterprise resource planning systems affect firm risk? Post-implementation impact. *MIS Quarterly: Management Information Systems*, *39*(1), 39–60.

Tony, C. K. H., Wang, T., & Tsai, Y. T. (2016). Market reactions to big data implementation announcements. *Pacific Asia Conference on Information Systems - Proceedings*.

Triple-A. (2021). *Win new customers: Insights into cryptocurrency adoption across Europe and America*. https://triple-a.io/white-paper-cryptocurrency-adoption-across-europe-and-america-2021/. Accessed 27.03.2023.

Vanhaverbeke, W., Duysters, G., & Noorderhaven, N. (2002). External Technology Sourcing Through Alliances or Acquisitions : An Analysis of the Application- Specific Integrated Circuits Industry. *Organization Science*, *13*(6), 714–733.

Varriale, V., Cammarano, A., Michelino, F., & Caputo, M. (2020). The unknown potential of blockchain for sustainable supply chains. *Sustainability*, *12*(22), 1–16.

Veugelers, R. (1997). Internal R&D expenditures and external technology sourcing. *Research Policy*, *26(3)*, 303–315.

Wang, X. (2022). The Value of Smart Contract in Trade Finance. *Manufacturing & Service Operations Management*.

Wang, Z., Zheng, Z., Jiang, W., & Tang, S. (2021). Blockchain-Enabled Data Sharing in Supply Chains: Model, Operationalization, and Tutorial. *Production and Operations Management*, *30*(7), 1965–1985.

Weking, J., Mandalenakis, M., Hein, A., Hermes, S., Böhm, M., & Krcmar, H. (2020). The impact of blockchain technology on business models – a taxonomy and archetypal patterns. *Electronic Markets*, *30*(2), 285–305.

White, G. R. T. (2017). Future applications of blockchain in business and management : A Delphi study. *Strategic Change*, *26*(5), 439–451.

Wilcox, H. D., Chang, K. C., & Grover, V. (2001). Valuation of mergers and acquisitions in the telecommunications industry: A study on diversification and firm size. *Information and Management*, *38*(7), 459–471.

Worldbank. (2022). *Market capitalization of listed domestic companies*. https://data.worldbank.org/indicator/CM.MKT.LCAP.CD?most_recent_value_desc=true. Accessed 17.05.2022.

Yang, S. B., Lim, J. H., Oh, W., Animesh, A., & Pinsonneault, A. (2012). Using real options to investigate the market value of virtual world businesses. *Information Systems Research*, *23*(3 PART 2), 1011–1029.

Yermack, D. (2017). Corporate governance and blockchains. *Review of Finance*, *21*(1), 7–31.

Yuan, R., Xia, Y. Bin, Chen, H. B., Zang, B. Y., & Xie, J. (2018). ShadowEth: Private Smart Contract on Public Blockchain. *Journal of Computer Science and Technology*, *33*(3), 542–556.

Zack, M. H., Hall, H., Avenue, H., & Ma, B. (2005). The strategic advantage of knowledge and learning. *International Journal of Learning and Intellectual Capital*, *2*(1), 1–20.

Zavolokina, L., Ziolkowski, R., Bauer, I., & Schwabe, G. (2020). Management, governance, and value creation in a blockchain consortium. *MIS Quarterly Executive*, *19*(1), 1–17.

Zhang, T., Wang, W. Y. C., & Pauleen, D. J. (2017). Big data investments in knowledge and non-knowledge intensive firms: what the market tells us. *Journal of Knowledge Management*, *21*(3), 623–639.

Zhang, W., Li, Y., Xiong, X., & Wang, P. (2021). Downside risk and the cross-section of cryptocurrency returns. *Journal of Banking and Finance*, *133*(4), 1–18.

Zhang, Y., Chen, J., & Chen, J. (2022). Risk and Return of Blockchain Announcements in Chinese Stock Market – An Event Study. *43rd International Conference on Information Systems*.

Zmud, R. W., Shaft, T., Zheng, W., & Croes, H. (2010). Systematic Differences in Firm's Information Technology Signaling: Implications for Research Design. *Journal of the Association for Information Systems*, *11*(3), 149–181.

6 Appendix

6.1 Appendix to Chapter 2

Total sample (Market Model)							
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Observations**
[-1;+1]	0.31%	0.19%	2.62***	2.64***	2.67***	1.24	606
[-2;+2]	0.26%	0.24%	1.71*	1.64	2.36**	1.97**	606
[-5;+5]	0.13%	0.30%	0.04	0.03	1.49	1.16	606

*p<10%, **p<5%, ***p<1%

Table 6.1: Event Study Results for H1 with Adjusted Estimation Window of (-200;-50).

Total sample (-200 to -50)							
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Observations**
[-1;+1]	0.38%	0.30%	2.84***	3.04***	2.75***	2.52**	606
[-2;+2]	0.39%	0.44%	3.05***	2.93***	1.69*	3.70***	606
[-5;+5]	0.52%	0.62%	0.51	0.52	0.33	2.04**	606

*p<10%, **p<5%, ***p<1%

Table 6.2: Event Study Results for H1 with Market Model.

Parameter	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Finished Project	0.006 (1.92*)	-	-	-
Business Related	-	0.007 (2.16**)	-	-
US Firm	-	-	0.007 (1.96**)	-
Hype Period	-	-	-	0.015 (2.96***)
ROE	0.001 (0.33)	0.000 (0.05)	0.000 (0.02)	0.000 (0.08)
Free Float	0.021 (2.27**)	0.021 (2.21**)	0.016 (1.60)	0.022 (2.41**)
Cash to Assets	0.054 (2.21**)	0.053 (2.19**)	0.046 (1.90*)	0.048 (2.00**)
Debt to Equity	0.000 (0.00)	0.000 (0.12)	0.000 (-0.05)	0.000 (0.02)
Net Income	-0.002 (-0.15)	-0.002 (-0.17)	-0.002 (-0.19)	-0.003 (-0.25)
Market Cap (log)	0.001 (0.64)	0.001 (0.86)	0.001 (0.45)	0.001 (0.52)
Permissioned	-0.003 (-0.78)	-0.003 (-0.86)	-0.003 (-0.79)	-0.003 (-0.86)
Intercept	0.034 (0.87)	0.033 (0.85)	0.039 (1.01)	0.034 (0.88)
Time-fixed	Yes	Yes	Yes	Yes
Adjusted R^2	3.62%	3.79%	3.65%	4.51%
F Statistic (p-value)	2.31 (0.003)	2.37 (0.002)	2.32 (0.003)	2.65 (0.001)

*p<10%, **p<5%, ***p<1%, n=606.

Table 6.3: Multivariate Regression Results including the Control Variable "Permissioned".

6.2 Appendix to Chapter 3

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Wilcoxon	Obs.	Pos:Neg
Panel A1: Consortium/Partnership (Market Model)									
[-1;+1]	0.65%	0.30%	3.08***	3.11***	1.43	1.62	1.03	315	173:142
[-2;+2]	0.86%	0.38%	2.67***	2.20**	1.02	1.85**	2.18**	315	175:140
[-5;+5]	0.29%	-0.13%	-1.25	-1.01	-1.84**	-0.99	1.67	315	150:165
Panel B1: Single Firm (Market Model)									
[-1;+1]	0.25%	0.10%	1.64	1.63	2.21**	0.91	-0.92	367	193:174
[-2;+2]	0.35%	0.11%	1.49	1.64	2.36**	0.37	-0.16	367	188:179
[-5;+5]	0.07%	-0.14%	-0.57	-0.53	1.18	-0.60	-0.11	367	179:188

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.40%	0.20%	1.86*	1.13
[-2;+2]	0.51%	0.27%	1.71*	2.11**
[-5;+5]	0.22%	0.01%	0.46	0.22

*p<10%, **p<5%, ***p<1%

Table 6.4: Event Study Results for H1 with Market Model.

Event Window	CAAR	Median CAR	Patell (Z)	Adjusted StdCSect (Z)	Corrado (Z)	Generalized Sign (Z)	Wilcoxon	Obs.	Pos:Neg
Panel A1: Consortium/Partnership (-200;50)									
[-1;+1]	0.46%	0.07%	2.42**	2.70***	1.48	0.78	1.16	315	164:151
[-2;+2]	0.80%	0.50%	3.27***	3.04***	2.51**	2.87***	1.71*	315	182:133
[-5;+5]	0.48%	0.67%	0.99	0.90	1.07	2.64***	0.99	315	180:135
Panel B1: Single Firm (-200;50)									
[-1;+1]	-0.06%	-0.16%	1.00	0.90	1.18	0.55	-0.67	367	188:179
[-2;+2]	-0.47%	0.24%	1.39	1.26	1.42	1.52	-0.33	367	197:170
[-5;+5]	-1.78%	-0.14%	-0.42	-0.33	-0.30	0.34	-0.13	367	186:181

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.52%	0.23%	0.68	0.23
[-2;+2]	1.27%	0.26%	1.71*	1.69*
[-5;+5]	2.26%	0.81%	1.38	1.97**

*p<10%, **p<5%, ***p<1%

Table 6.5: Event Study Results for H1 with Adjusted Estimation Window (-200;-50).

Parameter	Model 1	Model 2	Model 3	Model 4
	Estimate	Estimate	Estimate	Estimate
Consortium	-	0.013 (2.31**)	0.014 (2.48**)	0.013 (2.34**)
First Announcement	-0.020 (-2.52**)	-	-0.021 (-2.62***)	-0.020 (-2.54**)
Tech Firm	0.011 (1.66*)	0.010 (1.57)	-	0.010 (1.44)
ROE	-0.002 (-0.58)	-0.002 (-0.63)	-0.003 (-0.69)	-0.003 (-0.71)
Free Float	0.061 (3.65***)	0.061 (3.61***)	0.062 (3.71***)	0.060 (3.56***)
Cash to Assets	0.027 (0.69)	0.029 (0.75)	0.033 (0.86)	0.033 (0.85)
Debt to Equity	0.000 (-0.05)	0.000 (-0.21)	0.000 (-0.06)	0.000 (-0.15)
Net Income	-0.004 (-0.18)	0.004 (0.16)	0.010 (0.44)	0.005 (0.23)
MCap_log	0.001 (0.37)	0.001 (0.39)	0.001 (0.42)	0.001 (0.42)
Permissioned	-0.010 (-1.50)	-0.010 (-1.53)	-0.011 (-1.63)	-0.010 (-1.54)
Intercept	-0.091 (-1.24)	-0.093 (-1.26)	-0.095 (-1.30)	-0.092 (-1.26)
Time-fixed	Yes	Yes	Yes	Yes
Adjusted R^2	2.37%	2.22%	2.87%	3.03%
F Statistic (p-value)	1.96 (0.012)	1.90 (0.016)	2.17 (0.004)	2.16 (0.004)

*p<10%, **p<5%, ***p<1%, n=672.

Table 6.6: Multivariate Regression Results with Control Variable "Permissioned".

6.3 Appendix to Chapter 4

Panel A1: Blockchain Project Announcements (-200 to -50)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Observations**	**Pos:Neg**
[-1;+1]	0.32%	0.20%	2.08**	2.01**	1.59	1.47	393	211:182
[-2;+2]	0.51%	0.32%	2.80***	2.49**	2.02**	1.87*	393	215:178
[-5;+5]	0.34%	0.46%	0.98	0.90	0.52	1.77*	393	214:179
Panel B1: Non-Project related Announcements (-200 to -50)								
[-1;+1]	-0.22%	0.03%	-1.09	-0.86	-0.93	0.21	286	144:142
[-2;+2]	-0.10%	0.03%	0.18	0.33	0.13	1.97**	286	161:125
[-5;+5]	-0.71%	0.11%	-1.94*	-1.78*	-1.61	0.41	286	146:140

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.54%	0.17%	2.35**	0.47
[-2;+2]	0.61%	0.29%	1.99**	1.11
[-5;+5]	1.05%	0.35%	2.14**	1.66*

*p<10%, **p<5%, ***p<1%

Table 6.7: Robustness Check with Estimation Window of (-200,50).

Panel A1: Blockchain Project Announcements (-120 to -15; Market Model)								
Event Window	**CAAR**	**Median CAR**	**Patell (Z)**	**Adjusted StdCSect (Z)**	**Corrado (Z)**	**Generalized Sign (Z)**	**Observations**	**Pos:Neg**
[-1;+1]	0.27%	0.09%	2.02**	1.96**	1.73	0.57	393	203:190
[-2;+2]	0.55%	0.35%	2.55**	2.28**	2.16**	2.45**	393	221:172
[-5;+5]	0.46%	0.71%	0.92	0.84	1.10	2.45**	393	221:172
Panel B1: Non-Project related Announcements (-120 to -15; Market Model)								
[-1;+1]	-0.14%	0.09%	-0.63	-0.41	-0.08	0.54	286	149:137
[-2;+2]	0.03%	0.22%	0.40	0.47	1.01	1.59	286	159:127
[-5;+5]	-0.37%	0.26%	-1.33	-1.16	-0.22	1.48	286	158:128

Event Window	Delta CAAR	Delta Median CAR	Welch t-Test	Mann-Whitney U Test (z)
[-1;+1]	0.41%	0.00%	1.81*	0.35
[-2;+2]	0.52%	0.13%	1.68*	0.65
[-5;+5]	0.83%	0.45%	1.68*	1.69*

*p<10%, **p<5%, ***p<1%

Table 6.8: Robustness Check with Market Model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)5-day CAR	1.00											
(2) ROE	0.00	1.00										
(3) Free_Float	0.14*	0.12*	1.00									
(4) Cash_Assets	0.02	0.06	0.05	1.00								
(5) Debt_Equity	0.00	-0.13*	0.03	0.04	1.00							
(6) Net_Income	0.01	0.12*	0.14*	0.1*	0.02	1.00						
(7) Certification	0.02	-0.02	-0.03	-0.04	-0.02	-0.07	1.00					
(8) ESG	0.04	-0.03	-0.11*	-0.02	-0.01	-0.08*	-0.05	1.00				
(9) Traceability	0.07	0.14*	-0.04	-0.05	0.01	-0.12*	-0.11*	-0.07	1.00			
(10) Finance	0.07	-0.05	-0.02	0.03	-0.02	0.13*	-0.13*	-0.07	-0.17*	1.00		
(11) External	0.06	0.01	-0.05	0.00	0.00	-0.06	0.11*	-0.06	0.26*	0.21*	1.00	
(12) Project	0.1*	0.03	-0.01	-0.07	-0.03	-0.08*	0.19*	0.1*	0.25*	0.27*	0.3*	1.00
(13) MCap_log	-0.01	0.01	0.02	0.06	-0.01	0.14*	-0.04	0.04	-0.04	0.01	0	-0.05

*$p < 0.05$, n=679.

Table 6.9: Correlation Matrix.

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Blockchain Project	0.021 (3.69***)	-	-	-	-	-
Internal	-	0.019 (2.67***)	-	-	-	-
Traceability	-	-	0.017 (2.10**)	-	-	-
Finance	-	-	-	0.017 (2.28**)	-	-
Certification	-	-	-	-	0.014 (1.29)	-
ESG	-	-	-	-	-	0.026 (1.66*)
ROE	-0.003 (-0.75)	-0.003 (-0.67)	-0.004 (-0.98)	-0.002 (-0.45)	-0.003 (-0.64)	-0.002 (-0.62)
Free Float	0.065 (3.87***)	0.066 (3.94***)	0.066 (3.91***)	0.065 (3.90***)	0.064 (3.81***)	0.066 (3.93***)
Cash to Assets	0.054 (1.34)	0.048 (1.20)	0.053 (1.31)	0.049 (1.21)	0.053 (1.32)	0.052 (1.27)
Debt to Equity	-0.000 (-0.01)	-0.000 (-0.11)	-0.000 (-0.15)	0.000 (0.01)	-0.000 (-0.06)	-0.000 (-0.06)
Net Income	0.007 (0.31)	0.004 (0.20)	0.007 (0.32)	-0.006 (-0.28)	0.003 (0.15)	0.004 (0.18)
MCap_log	0.000 (0.02)	-0.000 (-0.11)	-0.000 (-0.05)	-0.000 (-0.04)	-0.000 (-0.03)	-0.000 (-0.17)
Permissioned	-0.006 (-0.90)	-0.006 (-0.95)	-0.006 (-0.95)	-0.008 (-1.20)	-0.006 (-0.93)	-0.006 (-0.91)
Intercept	-0.005 (-0.07)	-0.004 (-0.06)	-0.005 (-0.07)	-0.003 (-0.04)	-0.003 (-0.05)	-0.004 (-0.05)
Time-fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	3.60%	2.65%	2.25%	2.36%	1.84%	1.99%
F Statistic (p-value)	2.56 (0.001)	2.14 (0.006)	1.96 (0.014)	2.01 (0.011)	1.78 (0.030)	1.85 (0.022)

*p<10%, **p<5%, ***p<1%, n=679.

Table 6.10:Multivariate Regression Results including Blockchain-type Variable.