STOCKHOLM SCHOOL OF ECONOMICS
Bachelor Thesis in Business and Economics

Do Dividends Matter?

An event study on dividend omission announcements and bank valuations during the COVID-19 crisis

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Abstract

Following the outbreak of the COVID-19 pandemic in 2020, the ECB issued a series of announcements urging banks not to pay out dividends. We investigate whether the stock market reacted rationally in response to these announcements. Our event study reveals that the market perceived the ECB's initial announcement in March as having a severe effect on banks' valuation, showing significant negative abnormal returns. We then examine whether the market differentiated between banks based on capital adequacy and find conclusive evidence that capital adequacy has high explanatory power for abnormal returns. At high level of statistical confidence, the results suggest that well-capitalised banks experienced less negative abnormal returns. In conclusion, the significant results show that the capital markets acted rationally and efficiently in assessing the implications of the dividend omission announcements.

Keywords: Dividends, capital adequacy, ECB, COVID-19

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1. Introduction

1.1 COVID-19 Effect on the Banking Sector and the ECB's response

In the spring of 2020, amid fear of COVID-19, equity capital markets experienced unprecedented volatility. The contrasting predicaments of sectors within the European economy led to huge disparities between companies and corporations. Some experienced a record-breaking uptick in demand, while others soon faced bankruptcy.

During this uncertainty and economic shock, it was considered crucial that credit institutions could continue to fulfil their role of funding households and businesses. As evident, now, in 2021, banks fulfilled their role in the struggling economy by effectively deploying technology and demonstrating unprecedented agility and resilience, which shows in their strong 2020 financial performance and the continuously rising valuation levels. (Shilling & Celner, 2020). However, in the spring of 2020, the outlook was grim. Lockdowns and decreased economic activity made regulators recall the devastating outcome of the global financial crisis in 2008, where the lack of oversight and control of the financial institutions played a major role (Acharya & Richardson, 2009). This time, regulators set out to act firmly and without hesitance. Policymakers around the world would show that they had learnt their lesson and that yesterday's mistakes were not to be repeated.

The European Central Bank (ECB) safeguards and supervises European banks to ensure that they continue to fulfil their role in the economy. During the economic shock of 2020, they argued that banks should conserve capital to retain their capacity to support the economy in an environment of heightened uncertainty caused by the COVID-19 pandemic.

On the 27th of March at 18:50 CET, the ECB recommended that at least until the 1st of October 2020, no dividends should be paid out by banks and that they should refrain from share buy-backs aimed at remunerating shareholders. The recommendation was made to boost banks' capacity to absorb losses and support lending to households, small businesses, and corporations. With the 2008 financial crisis fresh in mind, the banking sector expressed an early desire to help save rather than destabilise the global economy (IMF, 2021). As a result, most banks under direct supervision from the ECB complied with the imposed requirements and communicated this by issuing press releases between the 30th of March and the 28th of May, confirming collaboration. The only exceptions are banks that had no intention of paying out dividends at the time or had already paid them out prior to the ECB announcement.

On the 28th of July 2020, the ECB extended the recommendation until the 1st of January 2021 and communicated expectations from banks to exercise extreme moderation on variable

remuneration to further conserve capital in the ongoing crisis. The ECB also stated that it would allow banks enough time to replenish their capital and liquidity buffers in order to avoid acting pro-cyclically (ECB, 2020).

On the 15th of December 2020, the ECB issued a press release arguing that, despite improvements in macroeconomic conditions and a reduction in economic uncertainty, the level of uncertainty remained elevated, with a continuing impact on banks' ability to forecast their medium-term capital needs. According to them, the full impact of the COVID-19-related economic shock on the banking sector may not have yet materialised, with the risk of significant delay in the impact of the economic fallout on credit institutions' balance sheets. As a result, the ECB saw the need to further encourage credit institutions to refrain from making dividend distributions and share buy-backs, and that credit institutions should exercise extreme caution when deciding whether to pay out dividends or perform share buy-backs until the 30th of September 2021. Furthermore, they stated that it is critical that credit institutions' decisions on dividend distributions and share buybacks should be guided by their internal capital generation capacity on a forward-looking basis, and the upcoming impact of the economic fallout on the quality of their exposures and capital. In addition, the ECB said it would not be prudent of banks to make dividends and share buy-backs totaling more than 15 percent of their accumulated profit for the financial years 2019 and 2020, or more than 20 basis points in terms of the Common Equity Tier 1 ratio, whichever is lower (ECB, 2020).

The above-mentioned announcements provide an ideal setting for event studies that examine market rationality and efficiency concerning regulatory announcements in the context of bank dividends.

Table 1: *Chronological order of ECB and company announcements*

Date	**Time (CET)**	**Stoxx 600 Banks Europe *vs.* Stoxx 600 Europe (pp.)**	**Announcements**
March 27th, 2020	18:50:03	-4.6 pp.	ECB asks banks not to pay dividends until at least October 2020
March 30th, 2020 - May 28th, 2020	n/m	n/m	Individual banks press releases following the 27th of March ECB press release
July 28th, 2020	08:00:24	-0.4 pp.	ECB extends recommendation not to pay dividends until January 2021 and clarifies timeline to restore buffers
December 15th, 2020	19:00:00	-1.6 pp.	ECB asks banks to refrain from or limit dividends until September 2021

Source: ECB (2020), Company Press Releases and Capital IQ

Note: In column three: returns shown as Stoxx 600 Banks daily return less Stoxx 600 Europe returns

1.2 Research hypotheses

The aim of this study is to investigate whether the stock market responded rationally to the newly available information in connection to the ECB announcements. We conduct an event study focusing on the ECB's dividend announcements, i.e., the 27th of March, the 28th of July, the 15th of December, and the banks' individual announcements between the 30th of March and the 28th of May.

Negative returns are likely to be observed given the negative impact on the period's cash flows for investors and the banks' market value should be affected. (Sprecher & Pertl, 1983). Furthermore, the signalling effect of the ECB stating the need for increased capacity to absorb losses, allowing banks to operate under minimum capital buffer requirements, and prohibiting dividends, raises uncertainty and likely affects banks' and the banking sector's expected future development (Financial Times, 2020).

Explicitly, we anticipate negative returns following the initial announcement on the 27th of March. This announcement was the first time during the crisis that a dividend omission was communicated, and it occurred during the early stages of the pandemic when uncertainty and volatility were unusually high. We do not expect material movements following the second announcement as it was merely an extension of the restriction for two months, and the stock

market had by then formed a better view of the long-term implications the pandemic would have on the banking sector and the individual banks. Ahead of the third announcement, the ECB had already signalled it was planning to allow dividend payments in 2021 (Financial Times, 2020). As a result, it is reasonable to assume that it was not entirely new information to the stock market, and that parts of the effects were already priced in.

Furthermore, we anticipate that abnormal returns will be related to specific bank characteristics, most notably the level of capitalisation, also called capital adequacy. We anticipate correlation between abnormal returns and capital adequacy measures, most notably the delta between reported Common Equity Tier 1 (CET1) ratio and the minimum CET1 requirement. As a result, a ‘strong' or well-capitalised bank should be less adversely affected than a ‘weak' or less well-capitalised bank. If stronger banks are less negatively affected, as they are better positioned to absorb potential losses, it would indicate that markets act rationally. (Lindquist, 2004). In line with these hypotheses, we expect investors to have acted rationally to the event at hand.

1.3 Contribution

Extensive studies on market efficiency and rationality have been conducted. However, the investor behavior rationality relating to a specific regulatory event has not received equal amount of attention. The purpose of this study is to add to previous research in this field. In applying MacKinlay's (1997) methodology to a pan-European event, we contribute to the event study practice and provide some new ideas on how to methodologically investigate investor behavior. We also improve the market’s predictability in terms of how investors react to new regulatory information and how that reaction is influenced by underlying company characteristics, mainly the banks’ capital adequacy.

1.4 Research Questions and Course of Investigation

Two steps are taken in our research to investigate the rationality of investors in relation to the event. First, we investigate the significance of the banks’ abnormal returns. Second, we examine individual bank characteristics, with main focus on capital adequacy, and their linear correlation with share price reactions.

The first step in the study's outline is to investigate the statistical significance of abnormal returns after each of the three ECB announcements relating to dividends (Events 1-3). We also investigate each of the individual banks' announcements after the ECB announcement on the 27th of March (Event 4). We further introduce the bank sample, as well as the event study

specifications, such as the event and estimation windows. Next follows the standard event study methodology of rejecting the null hypothesis of non-significant abnormal returns, laying the foundation for investigating the proposed event. As a last step we conduct the statistical analysis, perform relevant robustness tests and discuss the results.

In the second part of our study, we examine whether the market differentiated between banks based on certain characteristics, focusing on capital adequacy ratios. We aim to make a distinction between 'stronger' and 'weaker' banks, i.e. higher and lower capital adequacy levels, based mainly on the reported CET1 ratio less the minimum regulatory CET1 requirement, and further complement this ratio with (i) the capital adequacy ratio, and (ii) a metric not based on risk-weighted assets, the equity ratio. The capital adequacy measures have been selected based on input from conducted interviews with sector experts.

Using a simple linear regression model, we aim to determine how bank capitalisation affects the stock price reaction. Following the hypotheses tests, we examine the statistical findings and their implications. Based on the hypothesis that strong banks should be less negatively affected, we aim to conclude whether the market acted rationally in relation to the events.

However, before that, we will introduce the theoretical background and framework of event study methodologies. We will also investigate measures to identify stronger and weaker banks, identifying the CET1 ratio as the preferred measure for capacity to absorb losses. In addition, we will provide a brief theoretical overview of market efficiency and argue for the definition of it that is used throughout the study.

Research question

"

Did the stock market react rationally to the ECB dividend omission announcements in 2020?

"

We study the research question above by analysing the following two inquiries:

(1) How did dividend omission announcements during the COVID-19 crisis affect the valuation of European banks?

(2) Did the market treat well-capitalised ('stronger') banks differently than banks with lower capitalisation ('weaker'), following the ECB's dividend omission announcements?

1.5 Topic Demarcation

The Eurozone's governing regulatory authority, the ECB, supervises and regulates the European banking sector with the assistance of national macroprudential authorities. Although the ECB regulation indirectly governs all European banks and, arguably, many more globally, it only directly applies to banks that are "directly supervised by the ECB". The number of banks under direct supervision amounted to 115 as of the 1st of March 2020. Our research excludes banks subject to indirect supervision, because they are not required to follow the ECB recommendations or directives. Even though the ECB's decision was enforced by all national macroprudential authorities, there are examples of banks that chose not to comply with the recommendations. For example, despite the recommendations of the Finnish Financial Supervisory Authority and, by extension, the ECB, Ålandsbanken, a relatively small Finnish bank indirectly supervised by the ECB, decided to pay dividends (Ålandsbanken, 2021).

2. Literature review

2.1 Introduction to Event Studies

Throughout this section, a theoretical background of event studies research will be provided, along with a description of the literature that proposes methods and statistical recommendations for event studies.

In short, the event study seeks to investigate and correlate a specific economic event with security prices (Thompson, 1985). The explanatory power of event studies can be derived from a significant abnormal return during a corporate event (Kothari & Warner, 2006). Event studies are a useful way of analysing the relationship between an event and stock valuations under the efficient market hypothesis (more on this in section 2.2). Extensive research has been conducted on the various methodologies of event studies, with two assumptions typically made when conducting the research. First, it is assumed that the event could not have been predicted prior to its occurrence, and second, the share price reaction is immediate after the event (MacKinlay, 1997).

Two broad types of event studies can be conducted, short-horizon and long-horizon studies. The latter is generally more complex and should be approached with caution because changes in volatility, cross-correlation in returns, and risk adjustments are common during the event period. Short-horizon event studies, by design, mitigate these issues and are thus easier to set up (Kothari & Warner, 2006).

2.2 Market Efficiency

Fama introduced the efficient market hypothesis in his paper "Efficient Capital Markets" published in 1970. Fama defined a market as "informationally efficient" if prices at any given time incorporate and fully reflect available information about future values (Fama 1970). According to Fama (1997), short-horizon event studies rely on the assumption that prices quickly reflect new information and can be observed within the event window. Fama differentiates three levels of market efficiency: weak, semi-strong, and strong. In contrast to the weak form, which only includes historical information, and the strong form, which also includes private information, the semi-strong form is most commonly used in event studies because it implies that *all publicly* available information is fully incorporated in prices *instantly*, and thus, as previously stated, can be observed within the event window.

2.3 MacKinlay Event Study Methodology

The first step in our investigation of abnormal returns is based on MacKinlay's (1997) methodology. The paper, “Event Studies in Economics and Finance,” is widely cited in the field. In it, MacKinlay (1997) provides an overview of various methods and models used in conducting event studies, as well as weighing and explaining the benefits and drawbacks of each. A structure for conducting an event study is also provided. MacKinlay (1997) divides the structure into six major steps. The first step is to define the event and properly mark out the time period, or window, that frames it. MacKinlay (1997) then argues that the researcher should create a portfolio of companies to be studied. The researcher should explain why these companies are relevant to the event. Furthermore, the researcher's task in the third step is to calculate the expected returns of the securities during the event window. The statistical properties and various models used in the expected return calculation will be discussed below.

MacKinlay (1997) divides models for calculating expected return into economic models, which includes economic constraints, and statistical models, which usually relate the return of a stock to the return of a market index. The Capital Asset Pricing Model, the Market Model, and the Constant Mean Return Model are three models for estimating expected return (Kothari and Warner, 2006). In recent decades, statistical models have been preferred in event study methodology (MacKinlay, 1997), and the market model is the preferred statistical model (Dyckman et al., 1984). MacKinlay (1997) expands on Dyckman et al. (1984) by arguing that the market model has high comparability value due to its widespread use among researchers, as well as the fact that the market model eliminates some of the biases of economic models, that arise due to the economic constraints. The constant mean return model, which defines the

market's expected return linearly, has its advantages as well. This is mostly due to its simplicity and proclivity to reduce the variance of abnormal returns as the variance of the benchmarked index is removed.

The fourth step in MacKinlay's (1997) methodical structure of event studies is to define the period preceding the event that will be used as an estimation window. The fifth step creates a framework for the researcher to use when testing for abnormal returns. At this point, a null hypothesis should also be introduced. Common in event studies are null hypotheses stating that the mean abnormal return during the event window equals zero. The final step is to analyse and interpret the study's findings, and to contextualise them (MacKinlay, 1997).

2.4 Dividend Omissions Effect on Bank Valuations

How would a rational and efficient market react to the banking sector's dividend omissions in 2020? To investigate, we rely on the following research.

With the publication of Miller and Modigliani's dividend irrelevance hypothesis in 1961, dividends and dividend policy has received a lot of attention in theoretical and empirical studies. In their study, Miller and Modigliani argue that a company's valuation is unaffected by its dividend policy in perfect capital markets. (Miller et al. 1961)

However, there are many market imperfections in real-life capital markets, such as information asymmetries, taxation, and transaction costs. As a result, numerous dividend policy theories have been created since 1961, including the agency cost hypothesis and the signalling hypothesis. The theories have aimed to introduce methods for estimating dividend pay-outs in volatile and imperfect financial markets.

Dividend signalling theory states that the market interprets dividends as a signal of insiders' views on the firm's potential profitability and risk, and that share prices reflect this. Dividend initiations and increases are thus positively correlated with share prices, and reversely, dividend omissions and decreases are negatively correlated (Pettit, 1972). Further, it has been shown that negative returns are likely to be observed if an event causes negative impact on the period's cash flows for investors. (Sprecher & Pertl, 1983).

R. Richardson Pettit argues in 1972 that announcements of dividend changes would be *immediately* reflected in the security's price, resulting in a one-time actual return that exceeds (if a dividend increase) or falls short of (if a dividend decrease) the expected security return.

As a result, we conclude that an efficient market would immediately react negatively with declining security prices following the dividend omissions announcements.

2.5 Relation between Regulations and Bank Valuation

In general, bank regulations emerge in part to prevent bank insiders from expropriating or misallocating bank capital, (Caprio, 2002). As a result, effective regulation could boost market valuations by increasing investor trust. Regulation could also potentially lower bank valuations by pushing bank risk below the level that equity holders would prefer. Particularly in the presence of deposit insurance regulations, which reduce excessive risk-taking by bank owners and protect depositors and economies. (Caprio, 2002) However, Koehn and Santomero (1980) argue that if regulations decrease a bank's value, it will instead incentivise risk-taking of the bank's owners.

2.6 CET1 and the Differentiation between Strong and Weak Banks

Center stage in the ECB's regulatory announcements during 2020 is the capacity and willingness of banks to lend to the real economy. Corporate debt issuance did become impaired as the COVID-19 crisis unfolded and other sources of external funding dried up. As a result, many businesses returned to banks for credit as bank loans often are the only source of financing for small and medium-sized businesses (Lewrick et al., 2020).

The strength and usability of banks' capital buffers determine whether they can prudently meet credit demand (Drehmann et al., 2020). Common Equity Tier 1 capital, referred to as CET1 was first implemented in 2014 as part of the Basel III legislation. The intention was to internationally standardise the monitoring of banks' capital buffers and by extension improve the protection of economies from financial crises. The Basel III framework tightens the capital requirements by limiting the type of capital that a bank may include in its different capital tiers and structures, while also setting regulatory requirement levels for the capital on the bottom of the capital structure. CET1 capital, according to Basel III, consists of a bank's core capital and includes common shares, stock surpluses resulting from the issue of common shares, retained earnings, common shares issued by subsidiaries and held by third parties, and accumulated other comprehensive income (AOCI). CET1 capital can be explained as the part of capital in banks that is immediately available to absorb losses (Lewrick et al., 2020).

From the regulator's perspective, different pillars are used to categorise bank capital requirements. Pillar 1 includes the Basel III minimum requirement, which amounts to 4.5 percent, calculated as CET1 as a percentage of the bank's risk-weighted assets (RWA) and applies to internationally active banks. In addition to Pillar 1 there is the "capital conservation buffer" (CCoB) of 2.5 percent, which, if used by banks, restricts their distributions. Further, banks that are systematically important (SIB) are subject to additional capital surcharges. The

bank's contribution to systemic risk is accounted for by "SIB buffers." They are set by national authorities and implemented for banks deemed systemically important. Furthermore, prior to the COVID-19 crisis, many jurisdictions had enabled the “countercyclical capital buffer” (CCyB). This buffer is designed to protect bank resilience and lending by being active in periods of excessive credit expansion with the ability to be released in the event of a crisis. (Lewrick et al., 2020)

Finally, for several reasons, able banks retain CET1 capital in excess of regulatory requirements willingly. Stronger capitalisation than required, called “management buffers", is associated with a higher credit rating which reduces the cost of borrowing, thus increasing profitability (Gambacorta & Shin, 2018). Banks may also use management buffers to explore new market ventures without raising capital from outside sources. In general, banks are reluctant to approach the regulatory requirement level because that is linked to the point of non-viability, which can lead to liquidation (Drehmann et al., 2020).

Regulatory reforms, such as Basel III, have accelerated the accumulation of bank capital. At the end of 2019, most banks' CET1 ratios were far above regulatory minimums. For example, the average CET1 capital ratio globally was 14.0 percent. Pillar 1 requirements together with CCoB accounted for 7.6 ppts for SIBs and 7.0 ppts for other banks. The CCyB accounted for 0.2 ppts while other supervisory and management buffers made up the rest 6.2 ppts. (Lewrick et al., 2020)

To conclude, banks are incentivised to keep their common equity tier 1 capital well above the minimum requirement. It is argued that the CET1 ratio relative to the regulatory minimum is an effective measure in assessing whether a bank is well capitalised or not. In our analysis of whether the market treats banks differently depending on how well capitalised they are, the above-described delta is used. The delta is addressed as CET1Δ.

The selection of the CET1Δ as a metric for how well capitalised banks are, was based on interviews with several sector experts within Financial Services covering banks. According to the experts, the CET1Δ is the single most important ratio to use in assessing short- to mid-term capital adequacy and capitalisation. During the interviews, two additional measures were identified by the experts, namely the equity ratio and the capital adequacy ratio. As confirmed in the interviews, these two measures do not fully represent how the market estimates a bank’s ability to absorb losses. Still, all three measures will be used in the analysis in section 4.

3. Were the ECB Announcements Significant to The Stock Market?

3.1 Sample Selection, Event Window and Data

The European Central Bank is the central bank of the 19 European Union countries included in the Eurozone, with an extended supervisory mandate reaching all members of the Banking Union, which since October 2020 includes all 27 EU member countries. Under the ECB's banking supervision stands the Single Supervisory Mechanism which supervises banks directly and indirectly. The directly supervised banks are described as "… the 115 significant banks of the participating countries. These banks hold almost 82 percent of banking assets in these countries.", while the indirectly supervised banks are defined as "Banks that are not considered significant are known as 'less significant' institutions. These continue to be supervised by their national supervisors, in close cooperation with the ECB." (ECB, 2020).

To conduct an event study with an, as large as possible, sample of the banks affected by the ECB announcements, we specify our data as follows. Since national guidelines differ from those on a European level, this study looks exclusively at banks under the ECB's direct supervision. This also increases the measurability of the immediate effect on the stocks' return following the ECB announcements, as national authorities have no say in the implementation of the policies in the directly supervised banks. A say that could delay the market's response to the announcements.

The number of banks under the ECB's direct supervision amounts to 115 as of January 2020. After removing banks in private ownership, the sample is further reduced to include *listed* entities only, which decreases the sample size from 115 to 42.

The sample is further narrowed down by screening for the individual banks' dividend policies and payments, excluding banks that have not been paying dividends in past years and that previously have communicated that they have no intention of paying dividends in 2020. In addition, banks that already paid 2019 dividends ahead of the 27th of March 2020 have been excluded from the sample. Lastly, any US or Asian entity, with European subsidies under direct supervision has been removed from the sample, as the main foreign entities were observed to pay dividends in 2020 despite the ECB's guidelines.

The table below outlines the sample criteria and the sample group totalling 30 listed banks. See appendix for banks that do not fulfil the criteria.

Table 2: *Selection of sample companies*

Company name	Abbreviation	Company ID	Headquartered in Europe	Planned dividend payments post 27 March 2020
KBC Group NV	KBC	1	v	v
Aareal Bank AG	ARL	2	v	v
Commerzbank AG	CBK	3	v	v
Deutsche Bank Aktiengesellschaft	DBK	4	v	v
Deutsche Pfandbriefbank AG	PBB	5	v	v
Swedbank AB (publ)	SWED A	6	v	v
AIB Group plc	A5G	7	v	v
Bank of Ireland Group plc	BIRG	8	v	v
Banco Bilbao Vizcaya Argentaria, S.A.	BBVA	9	v	v
Banco de Sabadell, S.A.	SAB	10	v	v
Banco Santander, S.A.	SAN	11	v	v
Liberbank, S.A.	LBK	12	v	v
Unicaja Banco, S.A.	UNI	13	v	v
BNP Paribas SA	BNP	14	v	v
Crédit Agricole S.A.	ACA	15	v	v
Société Générale Société anonyme	GLE	16	v	v
Banca Popolare di Sondrio S.C.p.A.	BPSO	17	v	v
Banco BPM S.p.A.	BAMI	18	v	v
BPER Banca SpA	BPE	19	v	v
Intesa Sanpaolo S.p.A.	ISP	20	v	v
Mediobanca Banca di Credito Finanziario S.p.	MB	21	v	v
UniCredit S.p.A.	UCG	22	v	v
AB Siauliu Bankas	SAB1L	23	v	v
Bank of Valletta p.l.c.	BOV	24	v	v
ING Groep N.V.	INGA	25	v	v
Addiko Bank AG	ADKO	26	v	v
BAWAG Group AG	BG	27	v	v
Raiffeisen Bank International AG	RBI	28	v	v
Nova Ljubljanska Banka d.d.	NLBR	29	v	v
Nordea Bank Abp	NDA SE	30	v	v

Of the 30 banks above, three banks (Nordea, Mediobanca and Santander) released communication related to the ECB's initial announcement *after* the second announcement in July. In addition, two banks (Unicaja and Banco Bilbao) did not release any communication, and instead distributed dividends by the end of 2020. Hence, the sample size for Event 4 below is reduced to 25 banks, as these banks did not release relevant or comparable communication between Events 1 and 2.

Since the COVID-19 outbreak, with regards to the ECB announcements concerning dividend pay-outs and share buy backs, we have identified four potential events where the share prices could have been affected and where the study aims to investigate whether the market reacted rationally (see table 1):

Event 1: The initial announcement – 27th of March 2020 at CET 18:50:03

Event 2: The second announcement – 28th of July 2020 at CET 08:00:24

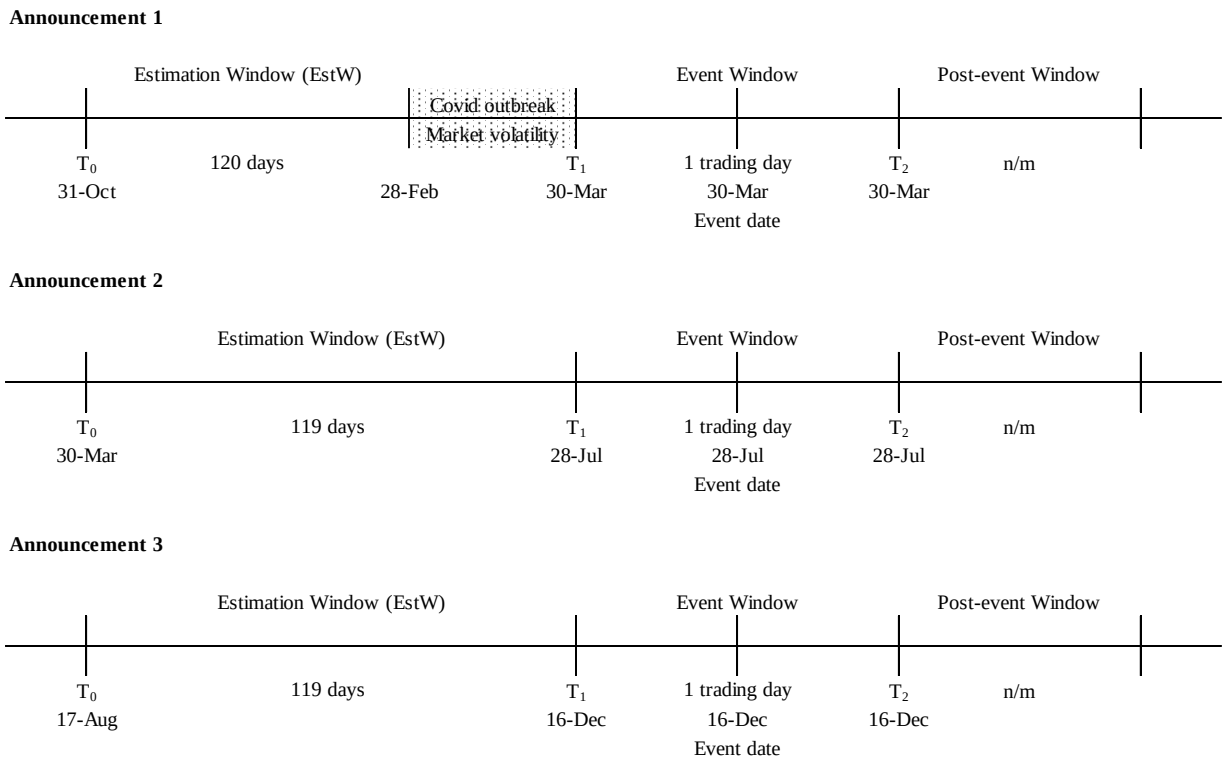
Event 3: The third announcement – 15th of December 2020 at CET 19:00:00

Event 4: The period between the first and second announcement when the individual banks communicated their commitment related to the initial announcement, ranging from 30th of March to the 28th of May.

The ECB has provided the exact time the press releases were made available to the market.

Hence, the next trading day will be used for Events 1 and 3, translating to the 30th of March and the 16th of December respectively. For Event 1-3, an aggregated portfolio consisting of the 30 sample banks is made to investigate the abnormal returns. With regards to Event 4, the abnormal return analysis is conducted for the individual banks, because banks reported on different dates.

Figure 1: *Timeline ECB announcement 1-3 (Events 1-3)*



The figures above illustrate the chosen estimation- and event window. To not encounter structural breaks within the industry, the estimation windows have been set to a significant length and is thus, for each of the announcements, about 120 days (MacKinlay, 1997). The almost unprecedented volatility experienced by markets in March last year supports the exclusion of the month from our estimation period. The window then better reflects returns and volatility under normal circumstances and provides a better basis for the intended analysis of abnormal returns.

In the fourth event, i.e., the period between the first and second announcement when the individual banks communicated their actions related to the initial announcement, the same methodology is applied as in the first event in March. For consistency, the estimation window is set between the same dates, from the 31st of October 2019 to the 28th of February 2020.

It is also crucial to select the proper event window over which the effects of an announcement are examined. An event window of one day is preferable, however the day before and after the announcement is often included. Since the exact date and time has been provided by the ECB, a one-day event window will suffice for Event 1-3. However, for event 4, the exact timing for most of the banks' press releases is unknown. Hence, the three-day event window applies. Should the announcement be made after markets close, stocks will reflect the new information on day two (MacKinlay, 1997). We also include the day before the announcement, to capture the possibility of information leaks (Subramani, 2001). With regards to Event 4, the three-day abnormal returns are then aggregated into cumulative abnormal returns.

3.2 Empirical Methodology and Specification of Regression Models

We construct a regression to test for *significant* abnormal returns during the event window. Capital IQ is used to obtain share prices for the sample and the chosen market index, STOXX Europe 600[1], which "represents large, mid and small capitalisation companies across 17 countries of the European region" (STOXX, 2021). The estimation window is used in estimating the market model parameters for each bank individually and for the aggregated portfolio, prior to calculating daily abnormal returns.

For any security *i* the market model is defined as

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{i\tau}$$

$R_{i\tau}$, is the return for any security *i* on day τ,
α_i, is the intercept of the linear model for any security *i*,
β_i, is the slope coefficient of the market model for any security *i*,
$R_{m\tau}$, is the benchmark index' (STOXX 600) return on day τ,
$\varepsilon_{i\tau}$, is the residual term for any security *i* on day τ.

[1] Includes European banks, some of which are included in the sample

The Abnormal Return for any security *i* on day τ is defined as

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \widehat{\beta}_\iota R_{m\tau}$$

$AR_{i\tau}$, is the abnormal return for any security *i* on day τ
$\hat{\alpha}_i$, is the estimated alpha intercept for any security *i*
$\hat{\beta}_i$, is the estimated beta parameter for any security *i*

The residuals (ε_{it}) in the market model equal the daily abnormal returns. For abnormal return standard deviation calculations and aggregation over time, the framework presented by MacKinlay (1997) is used. For Event 1-3, where the exact date and time of announcement can be identified, an event window of only one day is used. However, for Event 4 abnormal returns are aggregated over a three-day event window. Both methods allow for testing of the significance of the abnormal returns.

For firm *i* in the event window, the OLS estimators of the market model parameters for an estimation window of observations are as follow:

The estimated beta parameter for any security *i* is defined as:

$$\hat{\beta}_i = \frac{\sum_{\tau=T_{0+1}}^{T_1}(R_{i\tau} - \hat{\mu}_i)(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau=T_{0+1}}^{T_1}(R_{m\tau} - \hat{\mu}_m)^2}$$

The estimated alpha intercept for any security *i* is defined as:

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i\hat{\mu}_m$$

where

$$\hat{\mu}_i = \frac{1}{EstW}\sum_{\tau=T_0+1}^{T_1} R_{i\tau}$$

and

$$\hat{\mu}_m = \frac{1}{EstW} \sum_{\tau=T_0+1}^{T_1} R_{mt}$$

The standard deviation of the residuals of any security *i* is:

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{EstW - 2} \sum_{t=T_0+1}^{T_1} (R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2$$

Under the Ordinary least square (OLS) assumptions, the residuals have a zero mean with a variance equal to:

$$\sigma^2(\widehat{AR}_{i\tau}) = \sigma_{\varepsilon_i}^2 + \frac{1}{EstW} \left[1 + \frac{(R_{mt} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right]$$

The first part of this equation derives from the equation for the standard deviation of the residuals. The second part is used to adjust the market model coefficients for sampling error. However, according to MacKinlay (1997), a large estimation window (EstW) reduces the need for this. Hence, EstW is often chosen to be large enough to set the second component's contribution to zero. With our estimation window of 120 days, we believe this is a reasonable assumption.

Assumption of normally distributed abnormal returns:

$$AR_{i\tau} \sim N(0, \sigma^2(AR_{i\tau}))$$

We can use the distributional properties of the estimates measured under the estimation window during other periods since we assumed normally distributed abnormal returns in the estimation window and no change in mean or variance of the abnormal returns during the event window.

Cumulated abnormal returns of the three-day event window in Event 4 are as follow:

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}$$

with variance

$$CAR_i(\tau_1, \tau_2) \sim N(0, \sigma^2(\tau_1, \tau_2))$$

With the parameters described above, we conduct a significance test for each of the banks', and the aggregated portfolio, based on the abnormal returns during the event window. Multiple tests are performed to test the data and model robustness and filter out noise from the performed analysis.

3.3 Test of Assumptions under OLS and Additional Data Tests

Outliers (Grubb's tests)

A visual inspection is performed through the Grubb's test to dissect potential outliers in the estimation window. Firstly, we exclude March from the estimation window due to its high volatility and high number of outliers in the weeks leading up to the initial announcement on the 27th of March. Secondly, we do not detect any outliers for the market return and six outliers for the securities return (within the 120-day estimation windows). Following that, the Capital IQ database is used to determine whether these outliers are within normal levels of fluctuation or likely to result from a specific event. Since the outliers are related to extraordinary events, such as quarterly reports or communication of material non-public information, we exclude them from our estimation of the market model.

Normality

The Jarque-Bera test is used to determine the normality of the residuals. At a 95 percent confidence level, 14 of 30 individual stocks in the sample reject the normality assumption. I.e., 16 banks are normally distributed at a 95 percent significance level. Further, the residuals in the aggregated portfolios are normally distributed at the same confidence level. Given the high number of observations in our estimation window, 87 observations, we assume, in line with the central limit theorem, that all residuals are normally distributed. This allows us to use the distributional-based test for abnormal returns (see appendix).

Serial Correlation

When analysing stock price changes over time, there is a possibility of serial correlation. It occurs when the error terms in the time series transition from one period to the next. In other words, the error for one period, t_1, is related to the error for the following period, t_2. While

autocorrelation does not cause the coefficient to be biased, it can make estimating the standard deviation of the residuals inaccurate. This estimation is critical as the residuals are used as estimates for abnormal returns in the market model, and a correct estimation of their standard deviation is required for statistical inference.

We use the Breusch-Godfrey LM test for autocorrelation to test for serial correlation of the residuals with defined lags of 1, 2, 3, 5, and 10 days. At a 95 percent confidence level, only Swedbank and Mediobanca have residual autocorrelation with 3-day lags.

MacKinlay (1997) contends that aggregation can be performed with a sufficiently large sample regardless of the potential effects of residual autocorrelation. This holds since, over time, the true parameters are independent and with a large estimation window, the parameters will converge towards the true values. As a result, Swedbank and Mediobanca are treated as the other companies to calculate the standard deviation of the abnormal returns (see tables for autocorrelation in the appendix).

Heteroscedasticity

When calculating estimated returns using the market model, the relationship between the market's return and the stock's return is important to consider. Regarding heteroscedasticity, the regression coefficient remains consistent and unbiased, implying that as the sample size increases, it retains the essential property of converging to its true value as a normal BLUE estimator would.

Homoscedasticity has no bearing on the unbiased property, according to Gujarati (2003). Running a Newey-West heteroscedastic and autocorrelation consistent regression and ensuring that the coefficient remains constant demonstrates this. The standard deviation of the explanatory variable's coefficient may be over- or under-estimated, making statistical inference on that coefficient impossible. This is not a concern, though, as we are just interested in the model's predictive power, not the coefficient's inference. The abnormal returns, model residual, and standard deviation are instead used to make statistical inferences in the analysis.

Alternative Indices

McWilliams and Siegel suggested in 1997 that the market model should be run using other indices as well. As previously stated, we are using the market model with the STOXX 600 Europe as a benchmark index to calculate the abnormal return compared to the expected return. However, as the banking industry’s overall importance in relation to the general European economic activity, there is a risk of understating the banks' abnormal returns. We make an

approximation of the sample portfolio's projected returns with an alternative index to investigate whether this is the case. The MSCI world index is used to determine whether the high interdependence of banks and the European economy can lead to inaccurate abnormal return estimates. The estimated return figures for the MSCI world index are not substantially different, and neither are the abnormal returns (see appendix).

3.4 Hypothesis Testing

A negative abnormal return during the event windows would be consistent with theory (see section 2). We formulate the following null hypotheses and test the null hypotheses using the Student's t-test to investigate whether the four identified events had a significant impact on bank stock returns. Since theory predicts the occurrence of negative abnormal returns rather than positive returns, the test is one-tailed.

$$H_0: AR_i = 0$$

The null hypothesis, defined as 'the event had no negative impact on banks' returns', is tested on each security individually. Further, we test for this hypothesis by analysing events as described to conclude whether they lead to a significant impact on each bank's stock returns.

$$H_0: AR_{portfolio} = 0$$

The above-described null hypothesis applies to the portfolio of our bank sample, which includes the 30 banks listed in Table 2. It examines whether there was a substantial abnormal return for the aggregated portfolio of securities. It is put to the test by measuring the sample portfolio's average return as a daily average return across the sample securities. This is performed on an equal-weighted basis, with no adjustment for market capitalisation since we are only interested in the relative change in percent of each security, not the actual decrease in value.

Table 3: *Statistical result for portfolio in Event 1, 2 & 3*

Event	Date	Std. Dev.	R-square	AR	CAR	t-value	Significant
Event 1	30-Mar	0.6%	71.4%	(5.7%)	(7.9%)	(10.0)	**Yes**
Event 2	28-Jul	1.5%	69.8%	(0.1%)	(2.6%)	(0.1)	**No**
Event 3	15-Dec	1.5%	52.8%	0.6%	(1.5%)	0.4	**No**

Note: In column 8: the statistical significance level is tested at 5 percent

At a 5 percent significance level, the tests show that H_0 can be rejected for Event 1 in March. The null hypothesises H_0 for Event 2 and 3 cannot be rejected with confidence, implying that the events did not cause statistically significant abnormal returns. As a result, further analysis will be demarcated to Event 1 and the abnormal returns and statistical importance of individual banks under H_0 will be tested.

Table 4: *Statistical result for companies 1-30 at Event 1, on the 30th of March*

Name	**Std. Dev.**	**R-square**	**AR**	**t-value**	**Significant**
KBC Group NV	0.9%	59.3%	(10.7%)	(12.1)	**Yes**
Aareal Bank AG	1.2%	35.8%	(0.9%)	(0.7)	**No**
Commerzbank AG	2.0%	34.0%	(8.9%)	(4.4)	**Yes**
Deutsche Bank Aktiengesellschaft	2.1%	31.1%	(3.4%)	(1.6)	**No**
Deutsche Pfandbriefbank AG	1.0%	48.0%	(3.6%)	(3.5)	**Yes**
Swedbank AB (publ)	1.4%	35.2%	(4.2%)	(3.1)	**Yes**
AIB Group plc	2.5%	10.0%	(10.3%)	(4.1)	**Yes**
Bank of Ireland Group plc	2.1%	27.5%	(9.7%)	(4.5)	**Yes**
Banco de Sabadell, S.A.	1.5%	20.9%	(6.8%)	(4.7)	**Yes**
Banco Santander, S.A.	1.2%	52.2%	(5.8%)	(5.0)	**Yes**
Liberbank, S.A.	1.7%	18.5%	(9.3%)	(5.3)	**Yes**
BNP Paribas SA	0.9%	62.1%	(7.0%)	(7.7)	**Yes**
Crédit Agricole S.A.	0.9%	63.9%	(6.0%)	(6.6)	**Yes**
Société Générale Société anonyme	1.0%	59.4%	(6.7%)	(6.8)	**Yes**
Banca Popolare di Sondrio S.C.p.A.	2.1%	29.3%	(3.9%)	(1.9)	**No**
Banco BPM S.p.A.	1.8%	34.6%	(5.4%)	(3.0)	**Yes**
BPER Banca SpA	1.7%	29.0%	(1.5%)	(0.9)	**No**
Intesa Sanpaolo S.p.A.	0.9%	61.7%	(7.7%)	(8.7)	**Yes**
Mediobanca Banca di Credito Finanziario S.p	1.1%	43.8%	(4.7%)	(4.3)	**Yes**
UniCredit S.p.A.	1.6%	40.2%	(9.3%)	(6.0)	**Yes**
AB Siauliu Bankas	0.7%	43.9%	(0.8%)	(1.1)	**No**
Bank of Valletta p.l.c.	1.0%	0.2%	0.1%	0.1	**No**
ING Groep N.V.	1.0%	49.6%	(10.1%)	(9.8)	**Yes**
Addiko Bank AG	1.2%	15.7%	(0.6%)	(0.5)	**No**
BAWAG Group AG	1.3%	24.3%	(6.3%)	(4.8)	**Yes**
Raiffeisen Bank International AG	1.1%	43.9%	(5.5%)	(5.1)	**Yes**
Nova Ljubljanska Banka d.d.	0.9%	4.7%	(1.5%)	(1.7)	**No**
Nordea Bank Abp	1.0%	50.8%	(3.5%)	(3.4)	**Yes**
Unicaja Banco, S.A.	1.7%	17.1%	1.3%	0.8	**No**
Banco Bilbao Vizcaya Argentaria, S.A.	1.0%	53.1%	(7.4%)	(7.1)	**Yes**
AVERAGE				**(4.3)**	**Yes**

Note: In column 6: the statistical significance level is tested at 5 percent

The tests show that we can reject H_0 for 21 securities of the sample (n=30) at a 5 percent significance level while the null hypothesis cannot be rejected for the remaining nine. The

individual securities can be aggregated using the estimates defined below. Given N samples the aggregated abnormal returns for period τ is:

$$\overline{AR}_\tau = \frac{1}{N}\sum_{i=1}^{N} \widehat{AR}_{i\tau}$$

With a variance of

$$\text{var}(\overline{AR}_\tau) = \frac{1}{N^2}\sum_{i=1}^{N} {\sigma^2}_{\varepsilon_i}$$

The aggregated results also indicate statistical inference at the 5 percent significance level for Event 1.

Regarding Event 4, since the banks communicated their stance in relation to the initial announcement on different dates, abnormal returns and statistical significance levels are tested for the individual securities. Out of the 25 banks in the reduced sample, the null hypothesis can be rejected for ten banks at a 5 percent significance level. The null hypothesis cannot be rejected for the remaining 15 banks (see appendix). This does not constitute sufficient evidence for statistical significance at a 95 percent confidence level on a cumulative and aggregated basis. The cumulative abnormal returns are aggregated using the following formula:

$$\overline{CAR}_{(\tau_1,\tau_2)} = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau$$

With a variance of

$$\text{var}(\overline{CAR}_{(\tau_1,\tau_2)}) = \sum_{\tau=\tau_1}^{\tau_2} \text{var}(\overline{AR}_\tau)$$

Table 5: *Statistical result for Event 4*

Event 4	Market model				
t	Actual Return	Estimated Return	CAR	T-values	Statistically signif. (5%)
(1)	(2.4%)	(0.8%)	(1.5%)	(1.454)	No
-	(2.1%)	0.7%	(2.8%)	(1.833)	No
1	(1.9%)	0.3%	(2.2%)	(1.739)	No

3.5 Analysis of Statistical Result

For Event 1, negative abnormal returns were observed, which is consistent with the research hypothesis. This could be explained by the initial announcement being of high news value to the market as it was the first received communication concerning dividend omissions. Further, it was made in the early stages of the pandemic when uncertainty and volatility were high.

The market reaction following the second announcement (Event 2) was not found to be statistically significant; explanations include that it was merely a two-month extension of the initial omission in Event 1 and that the stock market now had had a chance to form a better view of the long-term implications of the pandemic for the banking industry. In early December there were signals of a relief of the dividend omissions. The market was potentially already reflecting this information ahead of the third announcement in December (Event 3) and the statistical insignificance is in line with the expected outcome as assumed in the research hypothesis (Financial Times, 2020).

The statistical insignificance in the cumulative abnormal returns for the individual banks' communication after the first announcement, Event 4, shows that the market already priced in that banks would not deviate from the ECB's recommendation, but instead chose to follow them.

When analysing the results of Event 1, two major observations can be made. The first point to make is about the direction of abnormal returns. Of the 30 sample companies, 28 have negative abnormal returns, averaging -5.8 percent. The remaining 2 banks had an average positive abnormal return of +0.7 percent. Furthermore, the request to conserve capital for future losses prompted banks to increase provisioning (Pirolo & Finch, 2021), a clear indication of higher expected credit losses and a negative signal for the sector in general.

The second point to make is the significant difference in abnormal returns between banks. During Event 1, the sample's abnormal returns ranged from -10.7 percent (KBC Group) to +1.3 percent (Unicaja Banco). This raises the question whether the market differentiated between banks. These findings serve as the foundation for the following section, which examines how the market reflected the level of capitalisation of various banks during Event 1.

4. Did the Market Differentiate Between Strong and Weak Banks?

Having concluded the significance and impact of the ECB's announcement on the market value of the European banks on the 27th of March (Event 1), the study now goes on by investigating whether the market differentiated between banks based on the level of capitalisation. We investigate using three different capital adequacy measures: The CET1Δ, the equity ratio and the capital adequacy ratio.

4.1 Sample Selection and Data

Abnormal returns of the same 30 individual bank stocks (see Table 2) are used in the regression. The CET1 data is sourced from annual reports as of 2019 and checked against the latest reported CET1 ratio as of 30th of March in the Capital IQ database. Equity ratios and capital adequacy ratios are also sourced from Capital IQ as of 30th of March.

4.2 Empirical Methodology and Regression Model Specification

It is expected that company characteristics defining how well capitalised a bank is, partly explain abnormal returns during the event window (Event 1). As stated in part 2, the delta between the CET1 minimum requirement ratio and the actual CET1 capital ratio of the banks (CET1Δ) is used as the main metric to estimate how well capitalised banks are. The CET1Δ should hold significant explanatory power on the abnormal returns of the banks, as it is expected that there is a link between the degree of impact and the risk during a widespread economic crisis as signalled by the ECB. We include two additional capital adequacy measures; (i) the equity ratio, defined as equity over total assets, a metric unaffected by the risk-weighted assets, and (ii) the capital adequacy ratio, defined as Tier 1 and Tier 2 capital over risk weighted assets. Both constituting alternative metrics to measure capitalisation levels. Although both metrics were mentioned as a weaker metric than CET1Δ, both the equity ratio and capital adequacy ratio were suggested and confirmed by two of the three interviewees. Still, the CET1Δ was mentioned as the key measure of interest to equity research analysts, with some reservations for using the equity and capital adequacy ratio – as these are not an ideal proxy for buffers available to absorb credit losses.

When the ECB announced the dividend omissions, the signal to the market was that a potential recession is imminent. If investors act rationally, it is only natural that the banks with the lowest capital buffers, or in other words, the highest risk of bankruptcy, will see a more severe reaction in their stock prices in a recession. To investigate, we construct three regression

models. Below we show the regression methodology with CET1Δ as the independent variable. We discuss the results for the three capital adequacy measures in section 4.3. The results for the equity ratio and the capital adequacy ratio are presented in the appendix.

We estimate the simple linear regression model as

$$AR_i = \alpha_0 + \beta_1 CET1\Delta_i + \varepsilon_i$$

α_0, is the intercept

β_1, is the slope coefficient

$CET1\Delta_i$, is the delta between the regulatory CET1 ratio requirement and reported CET1 ratio

ε_i, is the error term

The table below illustrates the setup for the regression run on banks' CET1Δ, capital adequacy ratio and equity ratio.

Table 6: *Setup of variables, company characteristics*

Company name	Abbreviation	Abnormal return(%)	CET1 delta (%)	Capital adequacy ratio (%)	Equity ratio (%)
KBC Group NV	KBC	(10.7%)	3.7%	20.6%	7.0%
Aareal Bank AG	ARL	(0.9%)	10.2%	29.9%	7.0%
Commerzbank AG	CBK	(8.9%)	2.8%	16.8%	6.6%
Deutsche Bank Aktiengesellschaft	DBK	(3.4%)	2.0%	17.4%	4.8%
Deutsche Pfandbriefbank AG	PBB	(3.6%)	5.7%	21.1%	5.7%
Swedbank AB (publ)	SWED A	(4.2%)	5.0%	21.8%	5.8%
AIB Group plc	A5G	(10.3%)	3.8%	23.3%	4.0%
Bank of Ireland Group plc	BIRG	(9.7%)	3.2%	18.6%	7.4%
Banco Bilbao Vizcaya Argentaria, S.A.	BBVA	(7.4%)	2.5%	15.9%	7.9%
Banco de Sabadell, S.A.	SAB	(6.8%)	2.1%	15.7%	5.8%
Banco Santander, S.A.	SAN	(5.8%)	2.0%	15.1%	7.3%
Liberbank, S.A.	LBK	(9.3%)	2.5%	16.1%	7.4%
Unicaja Banco, S.A.	UNI	(7.0%)	6.7%	16.9%	7.0%
BNP Paribas SA	BNP	(6.0%)	2.3%	15.5%	5.2%
Crédit Agricole S.A.	ACA	(6.7%)	3.8%	17.5%	4.0%
Société Générale Société anonyme	GLE	(3.9%)	2.8%	16.7%	5.1%
Banca Popolare di Sondrio S.C.p.A.	BPSO	(5.4%)	6.5%	18.6%	7.1%
Banco BPM Società per Azioni	BAMI	(1.5%)	5.0%	17.7%	7.1%
BPER Banca SpA	BPE	(7.7%)	4.9%	17.6%	6.7%
Intesa Sanpaolo S.p.A.	ISP	(4.7%)	4.9%	18.0%	6.9%
Mediobanca Banca di Credito Finanziario	MB	(9.3%)	4.6%	17.5%	12.7%
UniCredit SpA	UCG	(0.8%)	3.0%	17.7%	7.2%
AB Siauliu Bankas	SAB1L	0.1%	5.1%	18.5%	12.4%
Bank of Valletta p.l.c.	BOV	(10.1%)	6.1%	23.1%	8.6%
ING Groep N.V.	INGA	(0.6%)	2.8%	19.1%	6.1%
Addiko Bank AG	ADKO	(6.3%)	9.8%	17.7%	14.2%
BAWAG Group AG	BG	(5.5%)	3.1%	17.1%	8.4%
Raiffeisen Bank International AG	RBI	(1.5%)	4.6%	17.9%	9.0%
Nova Ljubljanska Banka d.d.	NLBR	(3.5%)	4.6%	16.3%	12.2%
Nordea Bank Abp	NDA SE	1.3%	3.2%	20.8%	5.7%

4.3 Regression Results and Analysis

The constructed regression model with CET1Δ provides a relatively high explanatory power. An adjusted R^2 of 41.4 percent is observed in the regression using abnormal returns as the dependent variable, and CET1Δ as the explanatory variable. The findings suggest that the CET1Δ variable can partly explain the variation in abnormal returns and overall, abnormal returns are positively correlated with a bank's CET1 buffer above the regulatory minimum. In other words, a higher CET1Δ made a stock react less negatively during Event 1. The *p*-value of 0.01 percent indicates a high level of statistical significance.

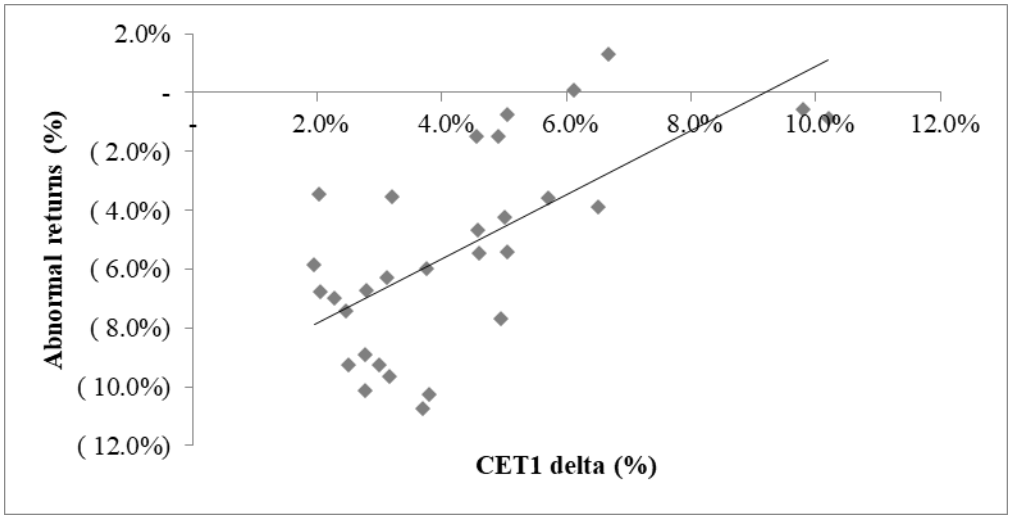
Table 7: *Statistical results of the regression model with CET1Δ as the independent variable*

Regression Statistics	
Multiple R	0.65863374
R Square	0.43379841
Adjusted R Square	0.41357692
Standard Error	0.02610718
Observations	30

	Coefficients	*Stand. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.1001155	0.01117526	-8.9586721	1.0288E-09	-0.1230069	-0.077224	-0.1230069	-0.077224
X Variable 1	0.01088951	0.0023511	4.63166829	7.5885E-05	0.0060735	0.01570551	0.0060735	0.01570551

As shown in the table above, the results are conclusive in explaining parts of the abnormal returns. The delta between the CET1 minimum requirement ratio and the actual CET1 capital ratio can explain the variation of abnormal returns of different banks with a 99 percent confidence level. This is in line with the research hypothesis, stronger banks were less affected by the ECB announcement. Below we provide a visual representation of the results.

Figure 2: *Graphic plot of banks' abnormal returns and CET1Δ*



Further, the performed regression with equity ratio as the independent variable, show lower explanatory power at an adjusted R^2 of 14.16 percent. The p-value of 0.023 suggests that the model holds at a 5 percent significance level. However, both the R^2 and p-value are at significantly lower levels comparing to using the CET1Δ as the independent variable (see appendix). As the equity ratio is a complementary metric and does not reflect the market standard for measuring capital adequacy, a lower explanatory power is expected.

The capital adequacy ratio has in interviews been stated as a more theoretical ratio, and although used as an important regulatory measure by the ECB, the market is more concerned with the CET1 ratio, as it better represents the available cash to absorb credit losses (ECB, 2021). The regression results with the capital adequacy ratio as the independent variable, shows an insignificant correlation between capital adequacy and abnormal returns. The model has a low explanatory power of an adjusted R^2 of 0.9 percent and lack statistical significance with a p-value of 0.27 (see appendix).

4.4 Tests of Assumptions under OLS and Additional Data Tests

Autocorrelation, Homoscedasticity and Collinearity

The regressions performed in this section are not based on time-series data. As a result, tests of neither autocorrelation nor heteroscedasticity of residuals are needed. Furthermore, because the regressions are based on a single factor model with only one independent variable, the test for collinearity can be ruled out.

Normality

To make inferences about the regression results performed with CET1Δ as the independent variable, normally distributed residuals are needed. The normality assumption is tested using the Jarque-Bera normality test of the residuals. It is concluded that the residuals are normally distributed, with a 1 percent significance level of not incorrectly rejecting the H_0 under the normality assumption. The residuals also display a platykurtic distribution with kurtosis of 2.19, suggesting slightly less concentrated observations around the mean and a slightly longer left tail than the standard distribution with a skewness of 0.08. We perform a visual inspection using a Kernel density estimation to compare it to a normal distribution. Visually it is concluded, as with the Jarque-Bera test, that the residuals are in line with normality.

Assumption of Linear Relation of the Regression Model

In a regression model, assuming a linear relationship between the independent and dependent variables represents a major error. We perform a visual inspection to check for this by plotting the independent variable alongside the dependent variable with an added linear regression line. The same inspection is then performed on the residuals and the independent variable to see if any patterns can be identified. Visual examinations reveal no evidence of another linearly plausible relationship.

5. Conclusion and Final Remarks

5.1 Limitation to the Conducted Research

There are some limitations to the research conducted in this study. First, as described in the research demarcation, the research scope of our population and sample is limited. The study focuses on the listed banks that the ECB directly supervises. The listed entities that are subject to indirect supervision by the ECB were not included in this study. Future research could include indirectly supervised banks, with a more in-depth analysis of the implications on a national level, taking into account local regulators' actions and the related effects on stock prices.

Secondly, the study was solely based on the ECB's announcements, whereas UK banks, for example, saw similar communication from the Bank of England (BoE, 2020). Future research could expand on this and study geographies outside of the European Banking Union.

Thirdly, the study defines and investigates four announcement events that are solely related to dividend payments. Other events with news value may be worth investigating. For example, on the 12th of March, the European Central Bank issued a press release stating that the ECB will "consider operational flexibility in the implementation of bank-specific supervisory measures." In addition, the ECB stated that banks would be permitted to operate temporarily outside of the regulatory requirements. This announcement, as well as others that are not from the ECB, may be worth investigating further.

Finally, using CET1Δ as the main metric, with equity ratio and capital adequacy ratio as complements, to define capitalisation and, ultimately, balance sheet strength in the context of a potential economic downturn, limits the potential findings and conclusions. Further research could expand on the bank characteristics that can explain the observed negative abnormal returns.

5.2 Discussion

Now, did the market react rationally to the ECB's dividend omission announcements? To investigate, our analysis was split into the following: (1) How significant were the ECB announcements to the stock market? and, (2) did the market distinguish between strong and weak banks? The following sections connect and summarise the research findings from the two analyses, drawing combined conclusions about whether the market reacted efficiently and rationally.

According to the findings of the first step of the analysis, the market perceived the first announcement in March (Event 1) as significant at a 5 percent significance level for 21 of the 30 sample companies, of which 28 had negative abnormal returns. The second announcement in July (Event 2), and the final and third announcements in December (Event 3), did not indicate significant abnormal returns. The aggregated portfolio suggested abnormal returns of -0.1% and +0.6 percent, respectively in July and December, and did not reach statistical significance at a 10 percent significance level. The individual banks' confirming announcements (Event 4) following the ECB's announcement in March, show abnormal returns that, on an aggregated and cumulative basis, are not statistically significant at a 5 percent significance level. This resonates with the hypothesis, that a dividend omission, as well as the embedded negative signalling of the announcement will decrease valuations, as argued by Sprecher & Perl in 1983 and Pettit in 1972.

The findings of the second part of our research strongly suggest that the difference between the reported CET1 ratio and the minimum regulatory CET1 requirement explains the abnormal returns, as the CET1Δ correlates positively with abnormal returns. The regression model shows strong explanatory power and significance at a 1 percent significance level. A weaker bank experienced higher negative abnormal returns, as weaker banks are perceived to be worse positioned in a market downturn and should face a higher risk of bankruptcy. At the 5 percent significance level, we found significant inference when running regressions with the equity ratio as the independent variable. At the 5 percent significance level, the regression showed insignificant inference for the capital adequacy ratio as the independent variable. Both models had less explanatory power than CET1Δ as the independent variable. The relationship between abnormal returns and capital adequacy is in line with the expected outcome communicated by the interviewed experts. Given high explanatory power of the regression model with CET1Δ as the independent variable confirms the experts view that CET1Δ is the market standard in assessing capital adequacy in the context of estimating cash-buffers to absorb credit losses.

The result resonates with the hypothesis of efficient capital markets as described by Fama in 1970, since the publicly available information was incorporated in prices immediately, in line with the semi strong form of market efficiency. The statistically significant results of negative abnormal returns and market reactions explained by the CET1Δ and equity ratio support the hypothesis of a rational market reaction.

5.3 Concluding Remarks

The aim of this study was to provide comprehensive analysis of how the market perceived and reacted to the ECB announcements. We conclude that the dividend omission announcements caused valuation levels to decrease for the banks in the sample. Further, the capital adequacy levels CET1Δ and equity ratio correlate positively with abnormal returns. This implies that lower capital buffers result in steeper valuation decreases. The market punished 'weaker' banks, as they face a higher risk of bankruptcy in a potential market downturn. As this paper has shown, we conclude that the market reactions following the ECB dividend omission announcements align with the efficient market hypothesis and that the market reacted rationally.

Appendix

Table 8: *Conducted Interviews*

Interview #	Postition	Bank	Sector	Date
1	Equity Research Analyst	Goldman Sachs	FIG	April 17th, 2021
2	Investment Banking Associate	JP Morgan	FIG	April 24th, 2021
3	Investment Banking Analyst	Morgan Stanley	FIG	April 18th, 2021

Table 9: *Sample companies not fulfilling the general sample criteria*

Company name	Abbreviation	Company ID	Headquartered in Europe	Planned dividend payments post 27 March 2020
Banco Comercial Português, S.A.	BCP	31	v	x
Erste Group Bank AG	EBS	32	v	x
Bankinter, S.A.	BKT	33	v	x
CaixaBank, S.A.	CABK	34	v	x
Bank of Cyprus Holdings Public Limited Comp	BOCH	35	v	x
Hellenic Bank Public Company Limited	HB	36	v	x
Banca Carige S.p.A. - Cassa di Risparmio di C	CRG	37	v	x
Banca Monte dei Paschi di Siena S.p.A.	BMPS	38	v	x
Alpha Services and Holdings S.A.	ALPHA	39	v	x
Eurobank Ergasias Services and Holdings S.A.	EUROB	40	v	x
National Bank of Greece S.A.	ETE	41	v	x
Piraeus Financial Holdings S.A.	TPEIR	42	v	x
The Bank of New York Mellon Corporation	BK	43	x	n/m
Groupon, Inc.	GRPN	44	x	n/m
HSBC Bank Malta p.l.c.	HSB	45	x	n/m
JPMorgan Chase & Co.	JPM	46	x	n/m

Table 10: *Statistical result for portfolio in Event 1, 2 & 3 using the MSCI index*

Event (MSCI)	Date	Std. Dev.	R-square	AR	CAR	t-value	Significant
Event 1	30-Mar	1.1%	0.7%	(4.4%)	(8.0%)	(4.2)	**Yes**
Event 2	28-Jul	2.7%	0.2%	0.1%	(3.5%)	0.0	**No**
Event 3	15-Dec	2.1%	0.4%	0.9%	0.5%	0.4	**No**

Table 11: *Statistical result individual banks (25) for Event 4*

Name	Date	Std. Dev.	R-square	CAR	t-value	Significant
KBC Group NV	30-Mar	0.9%	59.3%	(10.7%)	(12.1)	**Yes**
Aareal Bank AG	05-Apr	1.5%	24.3%	0.1%	0.1	**No**
Commerzbank AG	30-Mar	2.0%	34.0%	(8.9%)	(4.4)	**Yes**
Deutsche Bank Aktiengesellschaft	09-Apr	2.1%	31.1%	(1.1%)	(0.5)	**No**
Deutsche Pfandbriefbank AG	03-Apr	1.0%	48.0%	(2.6%)	(2.6)	**Yes**
Swedbank AB (publ)	28-May	1.4%	35.2%	1.5%	1.1	**No**
AIB Group plc	30-Mar	2.5%	10.0%	(10.3%)	(4.1)	**Yes**
Bank of Ireland Group plc	30-Mar	2.1%	27.5%	(9.7%)	(4.5)	**Yes**
Banco de Sabadell, S.A.	08-Apr	2.0%	17.2%	(0.8%)	(0.4)	**No**
Liberbank, S.A.	30-Mar	1.7%	18.5%	(9.3%)	(5.3)	**Yes**
BNP Paribas SA	02-Apr	0.9%	62.1%	0.2%	0.2	**No**
Crédit Agricole S.A.	01-Apr	0.9%	63.9%	(1.5%)	(1.7)	**No**
Société Générale Société anonyme	31-Mar	1.0%	59.4%	(2.7%)	(2.7)	**Yes**
Banca Popolare di Sondrio S.C.p.A.	09-Apr	2.5%	24.3%	(5.6%)	(2.2)	**Yes**
Banco BPM S.p.A.	31-Mar	1.8%	34.6%	(3.3%)	(1.9)	**No**
BPER Banca SpA	01-Apr	1.7%	29.0%	0.5%	0.3	**No**
Intesa Sanpaolo S.p.A.	31-Mar	0.9%	61.7%	(0.8%)	(0.9)	**No**
UniCredit S.p.A.	29-Mar	1.6%	40.2%	(0.1%)	(0.1)	**No**
AB Siauliu Bankas	31-Mar	0.7%	43.9%	(0.1%)	(0.2)	**No**
Bank of Valletta p.l.c.	31-Mar	1.0%	0.2%	0.1%	0.1	**No**
ING Groep N.V.	30-Mar	1.0%	49.6%	(10.1%)	(9.8)	**Yes**
Addiko Bank AG	31-Mar	1.2%	15.7%	0.3%	0.3	**No**
BAWAG Group AG	29-Mar	1.3%	24.3%	(0.1%)	(0.1)	**No**
Raiffeisen Bank International AG	09-Apr	1.1%	43.9%	4.9%	4.6	**Yes**
Nova Ljubljanska Banka d.d.	02-Apr	0.9%	4.7%	1.1%	1.2	**No**
AVERAGE					**(1.7)**	**No**

Note: In column 7: the statistical significance level is tested at 5 percent

Table 12: *Jarque-Bera test for normal distribution*

Name	JB test	JB p-value	Norm Distr
KBC Group NV	4.0	13.8%	**Yes**
Aareal Bank AG	70.3	0.0%	**No**
Commerzbank AG	88.9	0.0%	**No**
Deutsche Bank Aktiengesellschaft	578.0	0.0%	**No**
Deutsche Pfandbriefbank AG	6.3	4.3%	**No**
Swedbank AB (publ)	353.5	0.0%	**No**
AIB Group plc	0.8	65.7%	**Yes**
Bank of Ireland Group plc	44.8	0.0%	**No**
Banco de Sabadell, S.A.	0.3	86.9%	**Yes**
Banco Santander, S.A.	8.2	1.6%	**No**
Liberbank, S.A.	0.6	75.9%	**Yes**
BNP Paribas SA	19.5	0.0%	**No**
Crédit Agricole S.A.	5.1	7.6%	**Yes**
Société Générale Société anonyme	11.3	0.3%	**No**
Banca Popolare di Sondrio S.C.p.A.	295.6	0.0%	**No**
Banco BPM S.p.A.	4.1	12.8%	**Yes**
BPER Banca SpA	792.3	0.0%	**No**
Intesa Sanpaolo S.p.A.	4.8	9.0%	**Yes**
Mediobanca Banca di Credito Finanziario S.p.	5.0	8.1%	**Yes**
UniCredit S.p.A.	199.3	0.0%	**No**
AB Siauliu Bankas	1.1	56.6%	**Yes**
Bank of Valletta p.l.c.	5.2	7.4%	**Yes**
ING Groep N.V.	68.1	0.0%	**No**
Addiko Bank AG	2.4	30.8%	**Yes**
BAWAG Group AG	0.6	75.5%	**Yes**
Raiffeisen Bank International AG	4.7	9.6%	**Yes**
Nova Ljubljanska Banka d.d.	0.6	73.5%	**Yes**
Nordea Bank Abp	769.3	0.0%	**No**
Unicaja Banco, S.A.	1.1	59.0%	**Yes**
Banco Bilbao Vizcaya Argentaria, S.A.	5.0	8.3%	**Yes**

Note: In column 4: the normal distribution is tested at 5 percent statistical significance

Table 13: *Breusch-Godfrey LM test for autocorrelation*

Name	Lag 1 p-value	Lag 2 p-value	Lag 3 p-value	Lag 5 p-value	Lag 10 p-value
KBC Group NV	82.4%	97.1%	100.0%	99.3%	99.1%
Aareal Bank AG	96.8%	100.0%	52.5%	69.4%	44.8%
Commerzbank AG	58.9%	95.6%	90.8%	59.6%	49.6%
Deutsche Bank Aktiengesellschaft	86.7%	58.1%	100.0%	17.9%	52.8%
Deutsche Pfandbriefbank AG	84.0%	54.3%	98.0%	98.7%	99.5%
Swedbank AB (publ)	99.2%	99.8%	1.6%	100.0%	90.3%
AIB Group plc	92.5%	83.5%	96.9%	95.0%	90.7%
Bank of Ireland Group plc	100.0%	97.7%	86.4%	99.0%	75.4%
Banco de Sabadell, S.A.	100.0%	54.5%	100.0%	99.2%	93.6%
Banco Santander, S.A.	45.3%	98.5%	69.2%	99.8%	49.2%
Liberbank, S.A.	90.3%	65.7%	100.0%	91.0%	100.0%
BNP Paribas SA	63.3%	93.5%	99.4%	99.9%	91.6%
Crédit Agricole S.A.	99.3%	100.0%	46.6%	83.4%	32.3%
Société Générale Société anonyme	54.2%	99.1%	62.5%	88.7%	77.4%
Banca Popolare di Sondrio S.C.p.A.	52.2%	37.7%	98.9%	15.6%	98.4%
Banco BPM S.p.A.	97.2%	97.0%	98.7%	99.9%	99.1%
BPER Banca SpA	97.7%	85.6%	99.7%	100.0%	99.4%
Intesa Sanpaolo S.p.A.	88.1%	99.7%	87.6%	99.6%	84.6%
Mediobanca Banca di Credito Finanziario S.p.	20.2%	99.4%	4.1%	99.9%	100.0%
UniCredit S.p.A.	97.6%	86.2%	100.0%	99.4%	100.0%
AB Siauliu Bankas	62.4%	99.9%	98.6%	98.5%	62.7%
Bank of Valletta p.l.c.	21.9%	96.7%	83.5%	94.3%	84.4%
ING Groep N.V.	99.0%	92.7%	60.9%	100.0%	77.6%
Addiko Bank AG	86.4%	99.9%	95.7%	77.5%	97.7%
BAWAG Group AG	97.2%	48.3%	37.0%	39.8%	99.2%
Raiffeisen Bank International AG	97.8%	99.4%	92.7%	100.0%	72.4%
Nova Ljubljanska Banka d.d.	90.3%	98.0%	76.6%	99.6%	100.0%
Nordea Bank Abp	39.2%	100.0%	70.7%	98.2%	86.4%
Unicaja Banco, S.A.	38.4%	94.3%	99.6%	99.9%	98.9%
Banco Bilbao Vizcaya Argentaria, S.A.	31.1%	52.9%	95.8%	39.9%	97.8%

Table 14: *Statistical results of the regression model with equity ratio as the independent variable*

Regression Statistics	
Multiple R	0.4137699
R Square	0.1712056
Adjusted R Square	0.1416058
Standard Error	0.0315862
Observations	30

	Coefficients	*St. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Jpper 95.0%*
Intercept	-0.094982	0.0182657	-5.200014	1.605E-05	-0.132397	-0.057566	-0.132397	-0.057566
X Variable 1	0.5631482	0.2341575	2.404997	0.0230285	0.0834982	1.0427982	0.0834982	1.0427982

Table 15: *Statistical results of the regression model with capital adequacy ratio as the independent variable*

Regression Statistics	
Multiple R	0.20670081
R Square	0.04272522
Adjusted R Square	0.00853684
Standard Error	0.03394632
Observations	30

	Coefficients	*St. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.0965361	0.03916992	-2.4645466	0.02011869	-0.1767721	-0.0163001	-0.1767721	-0.0163001
X Variable 1	0.00233085	0.00208502	1.11789981	0.27310994	-0.0019401	0.00660182	-0.0019401	0.00660182

Figure 3: R*egression output with abnormal returns as dependent variable and equity ratio as independent variable*

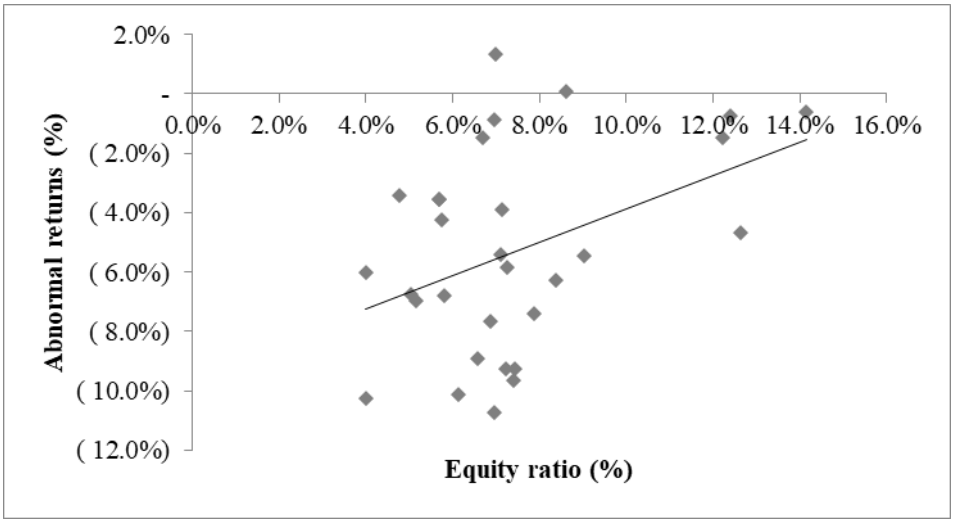
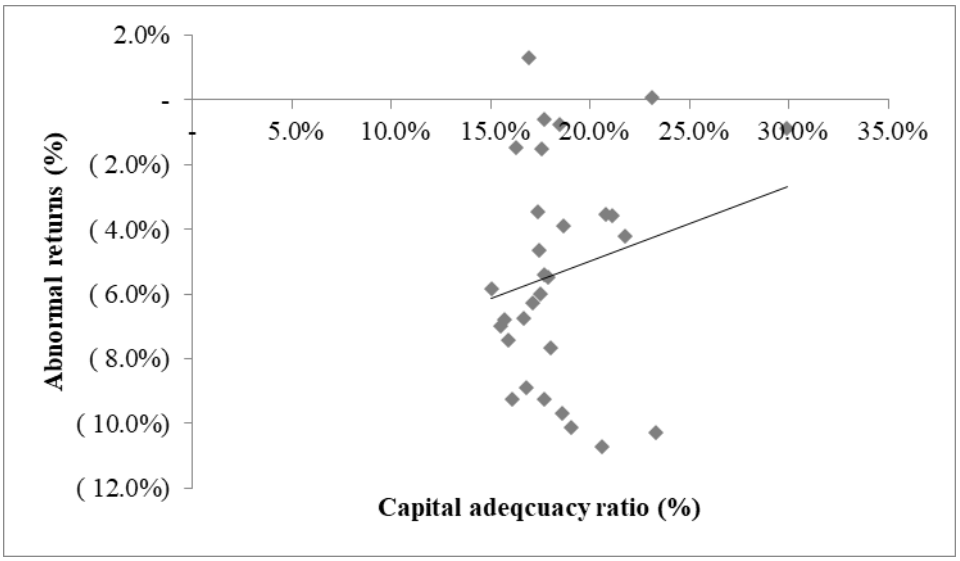


Figure 4: R*egression output with abnormal returns as dependent variable and capital adequacy ratio as independent variable*



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