ERASMUS UNIVERSITEIT ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS

Master Economics and Business (Financial Economics)

MASTER THESIS

"The role of unconventional monetary policy in Europe during the COVID-19 pandemic"

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APP – Asset Purchase Programme

CET1 – Common equity Tier 1

DiD – Difference-in-difference

EBA - European Banking Authority

ECB – European Central Bank

GDP – Gross Domestic Product

IMF – International Monetary Fund

LTRO – Long-term refinancing operation

OIS – Overnight index swap

OMT - Outright Monetary Transactions

PELTRO – Pandemic emergency long-term refinancing operation

PEPP – Pandemic Emergency Purchase Programme

RWA – Risk-weighted assets

SME - Small and medium-sized enterprise

TLTRO – Targeted long-term refinancing operation

WHO – World Health Organisation

Chapter 1. Introduction

1.1. Background

The Coronavirus (COVID-19), originating in China at the end of 2019, was found to be a highly transmittable and pathogenic viral infection (Padhan and Prabheesh, 2021). The fast transmission rate of the disease, the lack of pharmaceutical innovations, and the mortality rate of 1% were just a few of the reasons due to which COVID-19 was considered more dangerous and unpredictable than any other virus before (Padhan and Prabheesh, 2021). Thus, on 11 March 2020, the World Health Organization (WHO) announced COVID-19 as a global pandemic, and all countries worldwide started introducing various public health measures to combat the unprecedented health crisis. These range from lockdowns, travel restrictions, bans on mass gatherings and social distancing. Yet, despite the public instruments' successful results, there were also negative aspects. For instance, many businesses were forced to cease their activity for an indefinite period. In other words, from a health policy point of view, all these measures aided governments in containing the virus. Still, the economic and financial consequences resulting from the virus were enormous. For example, the global GDP declined by almost 5% in the second quarter of 2020 by reason of the economic shock of the pandemic (IMF, 2020). Additionally, the economic uncertainty during the period lead to the draw downing of credit lines and "panic borrowing" on behalf of the companies, despite most of the latter lacking any insolvency or illiquidity risk, following their revenue decline. In the initial months of the crisis, more than 87 billion credit lines were drawn down by European firms, which created immense pressure on the liquidity provision of banks in Europe (Cerrato et al., 2023). Furthermore, the levels of banks' equity in times of stress are pivotal for the liquidity buffer that the bank will have, which is directly related to the stock prices. Following the COVID-19 stock market crash, banking sector stock prices plummeted by a magnitude not observed since the Great Financial Crisis. However, due to the stricter regulations after the GFC and especially the introduction of Basel III capital requirements, the banking sector is more resilient and managed to avoid a financial crisis (Borri and di Giorgio, 2022). That was also due to the fast and adequate response by the governments and state's central banks by introducing financial and economic stimuli as well as monetary interventions.

One of these central bank interventions was the Pandemic Emergency Purchase Programme (PEPP), introduced on 18 March 2020 by the European Central Bank (ECB) in order to counteract the risks presented by the COVID-19 pandemic. This program is part of the ECBs Asset Purchase Programs (APPs), which are an unconventional monetary policy measure initiated by the ECB firstly in 2014 to ensure the transmission of monetary policy in order to ensure price stability (ECB, 2015).[1] By purchasing different types of assets, from sovereign to corporate bonds, the demand rises, and so do the prices of these securities, which results in gains for the banks holding the assets. By means of this instrument, the ECB also injects liquidity into the system and restores confidence in the financial markets. The PEPP had an initial envelope of 750 billion euros, later increased to more than 1800 billion. Furthermore, the assets eligible under the program were both private and public sector securities like the previous APPs, with an additional waiver for the Greek sovereign bonds. Along with the PEPP, in the outbreak of the crisis, ECB continued other operations and introduced new ones to support the banking and corporate sector. More specifically, the longer-term refinancing operations (LTROs) were in place, comprising the Targeted longer-term refinancing operations III (TLTRO III) and the Pandemic emergency longer-term refinancing operation (PELTRO). Both the APPs and LTROs were focused on a three-way goal – firstly, securing the monetary policy in a sustainable state; secondly, supporting the stabilisation of the financial markets in order to protect the monetary policy transmission; and thirdly, providing sufficient liquidity, particularly to maintain the bank lending rolling (Aguilar et al., 2020).

1.2. Research question and structure of the master thesis structure

Having all said in mind, the aim of the thesis is to investigate the third goal of the ECB on which the implementation of its instruments is based, namely the aim to provide sufficient liquidity for maintaining the bank lending rolling, with a specific focus on the PEPP. In order to do that, the thesis poses the following research question:

[1] Unconventional monetary policies are practices of the central bank mainly used in times of crisis to support the transmission of monetary policy to the real economy and their effects are highly dependent on the economic environment they are introduced into. Nonetheless, the unconventional monetary policy instruments of the ECB have been a topic of academic discussions for more than a decade now, not only from an economic, but also from a legal perspective. The issue examined is mainly with regards to the scope of ECB's accountability and democratic legitimacy, since it is a European Union's institution which has been given a specific mandate that should be overseen and not exceeded. For more information, see Amtenbrink, F. (2019). The European Central Bank's intricate independence versus accountability conundrum in the post-crisis governance framework. *Maastricht Journal of European and Comparative Law*, *26*(1), 165–179. https://doi.org/10.1177/1023263x18822789.

"How did the Pandemic Emergency Purchase Programme of the European Central Bank affect bank lending during COVID-19 in Europe?".

It will focus on the effects of various measures of the ECB to distinguish the influence of the PEPP specifically and also emphasise the differences in reactions of weakly and better-capitalised banks following the introduction of the program by conducting a Difference-in-Difference analysis.

As far as the structure of the thesis is concerned, Chapter 1 is the introduction which aims to provide the background (1.1) of the field studied and which influences the development of the research question (1.2). The Chapter in question also provides an overview, in the form of a literature review (1.3), of several main academic contributions to the research area in which the thesis is positioned. Next, Chapter 2 presents the two keystones of the thesis analysis, namely, the hypotheses development (2.1) and the data used (2.2), Chapter 3 is the main part of the analysis and will, firstly, present the methodology and, secondly, the results of the analysis conducted. Finally, Chapter 4 concludes the thesis.

1.3. Literature review

To study the impact of the Pandemic Emergency Purchase Programme, it is worth looking at the effects of other similar programmes developed and implemented by the ECB. This part of the thesis aims at presenting an overview of five key studies on the matter.

Research by Acharya et al. (2019) examines another unconventional monetary policy tool by the ECB, namely, the Outright Monetary Transactions (OMT) and its effect on bank lending. Even though the OMT program was never realised in practice, its sole announcement increased the sovereign bonds' prices, resulting in windfall gains for the banks. However, these scholars find that bank capitalisation ex-ante plays a crucial role in the lending responses from the credit institutions. Weakly capitalised banks did not get adequately capitalised by this programme, and thus, they engaged in the so-called "zombie lending". The latter involves banks extending loans to existing low-quality borrowers which are unable to repay their outstanding loans in order to not write off these loans as non-performing. The authors also point out that this credit misallocation leads to market distortions and affects non-zombie firms more negatively in industries with a high fraction of zombie firms. The research in question concludes that such unconventional programmes can be highly beneficial and indirectly recapitalise banks by inflating the price of

assets such as sovereign bonds. Still, the ECB has to be very vigilant about the amount of capitalisation that banks receive, because, on one hand, a good capitalisation of the banking sector will result in effective transmission of monetary policy to the economy. On the other hand, low capitalisation can lead to zombie lending and have a devastating effect on the financial sector.

Aguilar et al. (2020) research the monetary policy response by the ECB to the COVID crisis. Their paper investigates the collective response from the ECB, namely the APPs and the TLTROs, including the PEPP. It found out that, on the one hand, TLTROs were the main tool that stimulated the transmission of money to the banks during the pandemic. On the other hand, the APPs' goal was to lower interest rates suited for corporate and government bonds, leading to ECB incorporating a share of the duration risk on the financial market. Moreover, sovereign yields are essential for the transmission of monetary policy to the real economy as well as for evaluating funding costs of financial and non-financial institutions on the capital markets. Furthermore, the scholars pointed out that the ECB was insisting on banks focusing their lending on small and medium-sized enterprises (SMEs) and self-employed since those entities cannot obtain efficient market-based funding in times of crisis. Nonetheless, bank lending expense is dependent on their market-based funding, and the sovereign yields influence the interest rates on the bank loans, which are crucial for the SMEs.

Özlem Dursun-de Neef and Schandlbauer (2021) analyse the lending responses of European banks during the COVID-19. They concentrate on "worse-capitalised and better-capitalised" banks at the beginning of the pandemic. They also examine how the amount of exposure in different countries affects the lending of the banks, finding that banks with higher exposure to COVID-19 reduce their loans less than banks with less exposure. Similar to Acharya et al. (2019), the research in question finds that worse-capitalised banks tend to increase their loans more during periods of stress in order to avoid stacking up non-performing loans. However, the findings show that economic support during COVID-19 in forms of loosening capital requirements and adjusting the insolvency rules has had a positive impact on the different responses of weakly and better-capitalised banks. Moreover, these measures managed to phase out the excessive lending of weakly capitalised banks.

A paper by Afonso and Pereira (2022) looks at the impact of the APPs and PEPP on loans, employment, and investment by examining both banks and firms. The research finds that banks

with higher exposure to government debt securities or sovereign bonds had a larger increase in loan originations after the announcement of the APP suggesting the effect of the APPs by the ECB on bank lending. Nonetheless, they do not find the same results for the PEPP, which supposedly could be due to the flight-to-quality during the COVID-19 pandemic. In this regard, Aguilar et al. (2020) results also suggest that the PEPP have a significant effect on the employment, economic activity, and inflation in Europe.

In sum, these papers overviewed above find that ex-ante bank capitalisation plays a crucial role in the transmission of the ECB's unconventional monetary policy. Additionally, they find that the nature of the COVID-19 pandemic and the PEPP are quite different compared to previous crises, such as the Sovereign debt crisis. For instance, the increase in the risk-weighted capital ratio is from 8.8% in 2008 to 14.7% in 2016, with the lowest values of around 12% in Southern European countries and much higher values in Northern European countries (Couppey-Soubeyran et al., 2020). Another crucial difference is that the COVID-19 market crash in late February - early March severely affected banking sector stock prices in the Euro area, resulting in a decrease in banks' equity, subsequentially in banks' capitalisation.

Last but not least, a paper by Demirgüç-Kunt et al. (2021) investigates the stock performance of banks during the outbreak of COVID-19. The authors argue that banks' stocks are dropping in periods of economic deterioration. Moreover, the stocks are more susceptible to market risk due to their high equity betas. For example, during the initial stock market crash in March 2020, banks' stock was affected worse compared to other non-financial firms. This can be explained by the fact that the financial sector, particularly the banks therein, is the key to absorbing the setback by providing financing to the economy. Moreover, they point out that the negative effect of COVID-19 was worse and for longer in the banking sector compared to the corporate sector, suggesting that banks indeed absorbed some of the damage. The scholars also look at how different fiscal and monetary policy announcements introduced during the outbreak of the pandemic in other parts of the world affect the stock prices of the banks by doing an event study. They confirm that results vary across countries, yet they also suggest that liquidity provision and borrower assistance programs positively affect the bank's abnormal returns. Furthermore, banks' liquidity buffers are considered in the analysis for the abnormal returns, pointing out that banks with lower liquidity are encountering larger dips in their stock prices in comparison with banks with greater liquidity.

Chapter 2. Hypotheses development and data

The current chapter of the master thesis aims to present two preliminary elements on which the analysis will be based. Firstly, subsection 2.1 will elaborate on the development of the hypotheses which the research aims to test. Secondly, subsection 2.2 will outline the data that the analysis is going to use in order to answer the research question.

2.1. Hypotheses development

As already mentioned in Chapter 1, from late February, financial conditions in the euro area significantly and swiftly worsened across various asset classes.

The equity market witnessed a steep drop, with a loss of approximately 40% in value attributed to a more pessimistic economic outlook. Moreover, the spreads on corporate bonds, especially those with lower ratings, expanded as market participants incorporated heightened uncertainty and the expected economic consequences into their assessments (J. Boeckx et al., 2020). In their paper, J. Boeckx et al. also indicate that confidence indicators and economic activity experienced significant declines in March and reached unprecedented lows in April, reflecting the severe economic consequences of the pandemic and the accompanying containment measures. However, at the end of March, the circumstances in the stock market somewhat stabilised after the announcement of the PEPP by the ECB. From the graph from their paper (see below), it can be seen that Stoxx Europe 600 index, as well as the individual bank stocks, bounced back after the announcement of the programme. Also, the spreads on the sovereign and corporate bonds tightened after the disclosure of the ECB. By supporting the market conditions, the EU regulators managed to safeguard the transmission mechanism and avoid inconsistencies across European countries due to the different starting points of COVID-19 in each of the latter.

Note: Graph 1 - Euro area financial markets reacted abruptly to COVID-19. From: The ECB's monetary policy response to COVID-19 by Boeckx, J., Deroose, M., & Vincent, E., (2020) Economic Review, National Bank of Belgium, issue II, p. 39.

Moreover, apart from interest rates cuts and the APPs, the ECB also focused on establishing monetary stimulus for businesses and households through the TLTROs, which is extremely vital since private sector extraneous financing is strongly dependent on bank loans (J. Boeckx et al., 2020). Furthermore, the European competent authorities also authorised banks to use their capital and liquidity buffers, which led to banks having more flexibility and further improving their lending.

All of these policy responses by the European Central Bank have managed to ensure that the euro area avoids the unfavourable conditions of intense market stress combined with impaired access to cash, preventing a shrinkage in bank lending and disruption of the economic activity (Altavilla et al., 2023). Also, in their paper, Altavilla et al. found that when comparing the effect of the ECBs actions taken during the COVID-19 pandemic on the bank lending channel with analogous procedures in the past, there is no indication of weakening returns.

Finally, the collective approach to the crisis by the monetary and prudential authorities has created an ample boost in bank lending. Also, this increase in the lending did not result in the occurrence of zombie lending in Europe (Altavilla et al., 2023), which, as already mentioned, was one of the side effects of the unconventional monetary policy in the past, for example, during the sovereign debt crisis, where bank ex-ante capitalisation played a crucial role, as shown by Acharya et al. (2019). Thus, this master thesis will focus on the effects of the PEPP with respect to the capitalisation of the banks prior to the pandemic.

The hypotheses that will be tested are as follows:

1. Through the purchase of different sovereign and corporate assets on the secondary market under the Pandemic Emergency Purchase Programme (PEPP) European Central Bank manages to increase their demand and subsequentially their prices, thus stabilising the market conditions and restoring the confidence which indirectly leads to expansion in bank lending channel through the total equity of the bank.
2. The hike in the bank lending in the initial months of the pandemic was due to a compilation of measures from the ECB, such as the TLTRO III and the increase in the banks' lending capacity through loosening capital requirements as well as the PEPP.
3. Better-capitalised banks increase their bank lending by a larger amount after the introduction of the PEPP compared to weakly-capitalised.

2.2. Data

A sample of 64 banks is selected based on their capitalisation at the end of 2019, just before COVID-19, from the European Banking Authority (EBA) transparency spring exercise from 2020. After that, they are separated by their CET1 Ratio on weakly and better capitalised. With worse capitalised being within 2% of ECB's regulatory capital (Acharya et al. 2019) for 2019, which is 11.7% (ECB), 23 banks from the initial 64 are being weakly-capitalised. Following, Bloomberg and Refinitiv databases are used to collect bank-level data on the banks in the sample. Balance sheet items such as total assets, total liabilities, stock prices, liquidity, and Basel III regulatory ratios data on each will be gathered on a quarterly basis. Apart from that, Bloomberg database is used to collect data on the STOXX Europe 600 Banks Index to capture the stock price responses of the banks in combination with the individual stock prices.

For the analysis, the four measures of leverage from Gambacorta and Shin (2016) will also be taken into account, which are: the standard leverage ratio - total bank assets over total common equity; Basel III leverage measure - total exposure over Tier 1 capital; Risk weighted leverage - risk-weighted assets (RWA) over Tier 1 capital; and lastly, the market measure leverage - market value of assets (market capitalisation of equity and debt) over the market capitalisation (share price multiplied by the outstanding number of shares). In their research, Gambacorta and Shin also found out that a 1%-point increase in the equity to total assets ratio is leading to a 0.6% increase in the annual credit growth of the bank. This shows the importance of the leverage ratio of the banks for the rise in the credit they supply to the economy. Also, the hike in the credit supply is a crucial

component of the monetary policy transmission and displays the emphasis of bank capital on the responses of the central banks. Another essential point in their study is that increased bank capital is linked to higher lending, and this effect is driven by the reduced funding costs associated with better-capitalised banks. Furthermore, when bank equity is high, it promotes the macro-goal of stimulating bank lending and aligns with the supervisory objective of maintaining a sound banking system. On the contrary, a bank with low capitalisation may enhance its solvency measure by reducing its credit exposures.

In Table I are presented the summary statistics of the sample used. Panel A presents the bank-level data, Panel B the four leverage ratios mentioned earlier and Panel C some other descriptive characteristics of the banks. In Panel A are shown the market capitalisation of each bank, followed by its size, which is measured by dividing the total assets of the bank over the total aggregate assets of the whole sample, next two are the loans values as well as the Ln of loans value, followed by the total equity of each bank and the Tier 1 capital ratio. As it can be seen on the bottom of the table average market capitalisation of the sample is 19 747.96 billion euros and size of around 1.6%. Largest bank in terms of both market cap and size is J.P. Morgan Luxembourg S.A., however second in size is BNP Paribas with 8.7% even though it is not second in market capitalisation, which is HSBC Holdings. These differences might be occurring due to variation in the business model or even cultural discrepancies. Furthermore, average total loans of the sample are 207 480.15 billion euros, while total equity is 27 726.37 billion euros. The average Tier 1 capital is 16.35%, which is relatively high. Panel B are the 4 leverage ratios of Gambacorta and Shin (2016), which are incorporated in the regression models later, and lastly in Panel C it can be seen the country of origin of each bank and whether the bank was weakly capitalised at the end of 2019.

In Table II are the displayed the summary statistics for the average returns of each bank as well as the average returns of the Stoxxx Europe 600 index. It can be seen that mean average of both the market index and the average of all the banks in the sample is positive, showing that even with the market crash in the late February 2020 banks managed to recover relatively quickly. Another important observation is that the standard deviation of the banks in the sample is more than double the standard deviation of the Stoxxx Europe 600 index, implying that the volatility for the banks was much higher than that of the market index. Lastly, the average returns of the banks

in the sample are positively skewed and have relatively large kurtosis, also some banks observe minimum of around -19 average returns and maximum of 37.

Table I
Banks. Descriptive Statistics.

	Panel A: Balance sheet data					Panel B: Ratios						Panel C: Other characteristics	
Bank name	Market Capitalisation	Size	Total Assets	Loans	Ln(Loans)	Total Equity	Tier-1	Leverage ratio	Basel III leverage ratio	Risk-weighted leverage	Market measure leverage	Country	Weak. Cap. Q4 2019 (EBA)
Aareal Bank AG	1,292.93	0.14	42,527.67	32,184.67	10.38	2,873.33	22.10	15.87	16.59	4.52	5.73	AT	NO
Abanca Corporación Bancaria S.A.		0.21	61,767.03	38,766.99	10.57	4,533.65	13.73	14.85	14.76	7.29		ES	YES
ABN AMRO Bank N.V.	9,940.20	1.32	392,193.33	265,016.33	12.49	21,065.67	19.49	18.72	18.19	5.13	8.09	NL	NO
Banca Monte dei Paschi di Siena S.p.A.	1,237.77	0.46	138,141.67	86,592.00	11.37	8,094.67	13.75	27.86	17.50	7.30	20.81	ES	YES
Banco Bilbao Vizcaya Argentaria, S.A.	26,502.77	2.42	720,856.67	358,700.00	12.79	47,482.00	12.84	16.84	15.45	7.80	8.90	ES	YES
Banco BPM S.p.A.	2,543.47	0.59	175,454.33	107,466.00	11.58	12,024.67	15.52	16.30	17.22	6.44	17.24	ES	YES
Banco Comercial Português, SA	2,158.77	0.28	82,985.00	50,450.00	10.83	6,132.00	13.27	14.08	13.70	7.54	10.32	PT	YES
Banco de Crédito Social Cooperativo, S.A.		0.17	49,735.57	31,488.57	10.36	3,333.67	12.12	15.80	17.75	8.27		ES	YES
Banco de Sabadell, S.A.	3,483.27	0.76	227,396.33	146,380.33	11.89	12,783.33	13.38	22.20	21.08	7.49	10.75	ES	YES
Banco Santander, S.A.	47,573.37	5.10	1,522,164.67	881,538.33	13.69	91,933.67	13.05	22.14	19.81	7.66	7.13	ES	YES
Bank of Cyprus Holdings Public Limited Company	384.63	0.07	21,020.33	10,538.33	9.26	2,255.67	16.47	10.15	10.06	6.08	7.11	CY	YES
Bank Polska Kasa Opieki SA	4,312.13	0.16	48,915.67	31,938.33	10.37	5,437.67	15.39	9.70	10.23	6.52	3.28	PL	NO
Bankinter, S.A.	4,284.60	0.30	89,225.33	60,096.67	11.00	4,765.00	12.26	19.87	21.56	8.16	3.56	ES	YES
Barclays Plc	27,872.92	5.20	1,549,344.00	396,668.67	12.89	75,454.67	17.42	23.35	25.13	5.75	36.52	GB	YES
BAWAG Group AG	3,064.03	0.16	47,903.67	31,130.67	10.35	4,043.33	14.13	13.76	16.61	7.13	2.78	AT	YES
BNP Paribas	51,374.10	8.70	2,592,992.67	816,621.67	13.61	109,326.67	13.61	26.51	27.76	7.35	20.84	FR	YES
BPER Banca S.p.A.	1,962.13	0.28	84,067.67	62,048.00	11.03	5,472.33	15.41	17.58	16.32	6.58	4.11	ES	YES
Caixa Económica Montepio Geral, Caixa Económica Bancária, S.A.		0.06	17,736.38	12,354.40	9.42	1,396.38	12.48	13.07	13.92	8.01		PT	YES
Caixa Geral de Depósitos, SA		0.29	87,813.33	47,961.33	10.78	8,579.33	18.50	10.41	10.92	5.41		PT	NO
CaixaBank, S.A.	13,149.10	1.43	426,288.67	229,288.00	12.34	24,848.67	13.57	20.33	21.28	7.37	10.12	ES	YES
COMMERZBANK Aktiengesellschaft	5,862.50	1.66	495,878.67	237,587.33	12.38	28,647.00	13.19	18.95	20.66	7.58	28.76	DE	YES
Credito Emiliano Holding S.p.A.	1,494.97	0.17	50,847.35	32,074.73	10.37	2,932.82	18.17	20.35	23.48	5.45	15.64	IT	YES
Danske Bank A/S	10,885.50	1.78	530,995.67	280,725.33	12.54	22,628.33	20.33	24.80	25.13	4.92	19.29	DK	NO
Deutsche Bank AG	14,926.87	4.60	1,371,378.67	437,118.00	12.99	60,952.00	15.18	25.37	27.28	6.59	44.40	DE	YES
DNB BANK ASA	23,107.20	0.94	280,409.67	161,047.67	11.99	23,025.67	20.05	12.52	15.07	5.00	1.91	NO	NO
Erste Group Bank AG	10,228.33	0.88	261,995.00	161,099.67	11.99	16,378.00	15.41	17.43	14.21	6.51	5.35	AT	NO
Eurobank Ergasias Services and Holdings S.A.	2,339.80	0.22	66,110.67	37,534.33	10.53	6,171.33	15.37	11.48	10.46	6.55	5.92	GR	NO
First Investment Bank	146.87	0.02	5,560.70	3,158.90	8.06	540.27	21.15	10.51	6.93	4.73	8.36	BG	YES
Groupe BPCE		4.69	1,398,498.67	708,815.33	13.47	70,064.00	15.63	21.64	21.26	6.40		FR	NO
Groupe Crédit Agricole	28,884.07	6.30	1,879,466.67	403,900.00	12.91	63,166.67	12.86	42.07	43.19	7.78	30.17	FR	NO
Hellenic Bank Public Company Ltd	302.73	0.05	15,969.33	5,967.00	8.69	1,087.33	22.20	15.39	13.69	4.50	17.00	GR	NO
HSBC Holdings Plc	110,906.93	8.58	2,557,224.67	921,952.33	13.73	169,911.67	14.81	15.06	22.50	6.75	10.52	GB	NO
ING Groep N.V.	30,027.70	3.16	941,185.67	613,590.67	13.33	54,016.67	16.60	18.01	17.58	6.03	7.52	NL	NO
Intesa Sanpaolo S.p.A.	34,707.37	2.98	888,872.33	451,857.33	13.02	59,451.67	15.33	17.58	18.41	6.56	8.84	IT	YES
Íslandsbanki hf.		0.03	8,498.40	6,095.53	8.71	1,215.40	19.75	7.19	7.05	5.07		IS	NO
J.P. Morgan Bank Luxembourg S.A.	316,623.33	8.97	2,674,500.00	862,134.62	13.67	233,125.64	14.14	16.22	13.89	7.07	4.78	LU	NO
Jyske Bank A/S	2,118.87	0.30	89,248.33	65,376.00	11.09	4,770.67	19.31	18.72	19.03	5.18	9.06	DK	NO
KBC Groep	23,094.53	1.02	304,261.67	157,752.33	11.97	20,490.67	18.21	16.06	16.32	5.50	5.31	BE	NO
Lloyds Banking Group Plc	30,701.60	3.27	975,173.33	565,867.67	13.25	55,022.00	17.65	23.45	23.85	5.68	9.85	GB	YES
Mediobanca – Banca di Credito Finanziario S.p.A.	7,431.17	0.27	81,014.33	46,412.67	10.75	9,982.00	14.76	8.12	11.75	6.81	3.80	IT	YES
National Bank of Greece, S.A.	1,987.33	0.24	70,300.33	28,314.00	10.25	5,152.67	15.67	14.32	12.17	6.39	7.12	GR	YES
Natwest Group plc	24,139.97	2.99	890,296.33	395,310.33	12.89	50,111.67	19.50	20.95	22.42	5.14	16.64	GB	NO
Norddeutsche Landesbank -Girozentrale-		0.45	135,121.33	78,675.33	11.27	5,794.33	14.97	23.92	22.66	6.68	0.00	DE	NO
Nordea Bank Abp	25,618.10	1.91	569,134.00	305,466.33	12.63	32,220.33	18.24	19.97	20.50	5.49	7.49	DE	NO
Nova Ljubljanska Banka d.d., Ljubljana	970.00	0.05	16,009.33	8,314.67	9.02	1,772.67	15.05	9.22	10.29	6.61	4.63	SL	NO
Nykredit Realkredit A/S		0.73	217,594.67	190,359.67	12.16	11,506.67	20.99	19.43	19.99	4.77		DK	NO
OP Osuuskunta		0.51	151,369.00	92,698.67	11.44	12,653.00	18.77	13.60	13.77	5.33		FI	NO
OTP Bank Nyrt.	9,893.63	0.21	61,934.33	35,170.33	10.47	6,768.67	14.39	10.19	10.20	6.96	1.59	HU	NO
Piraeus Bank, S.A.	820.80	0.22	64,395.00	38,874.33	10.57	7,366.67	13.40	9.12	10.87	7.48	9.90	GR	YES
Powszechna Kasa Oszczędności Bank Polski SA	8,060.03	0.27	81,548.00	51,697.33	10.85	9,292.67	17.25	9.54	9.50	5.82	2.90	PL	NO
Raiffeisen Bank International AG	5,744.77	0.53	157,918.33	91,353.67	11.42	12,937.67	15.19	12.95	13.29	6.60	4.21	AT	NO
SBAB Bank AB - group		0.13	38,087.71	12,565.61	9.44	2,156.55	16.30	18.07	19.54	6.14		SE	YES
Skandinaviska Enskilda Banken - group	16,534.83	0.98	292,286.00	161,014.67	11.99	15,467.00	20.75	19.60	19.77	4.85	3.06	SE	NO
Société générale	17,950.13	4.91	1,463,725.33	453,572.00	13.02	62,296.33	15.08	25.34	27.46	6.63	42.69	FR	YES
SPAREBANK 1 SMN	1,092.73	0.06	17,005.67	12,145.00	9.40	1,864.67	19.12	9.59	9.96	5.24	3.26	NO	NO
SPAREBANK 1 SR-BANK ASA	2,042.03	0.09	25,898.67	19,978.33	9.90	2,407.67	19.22	10.90	11.58	5.20	1.87	NO	NO
Standard Chartered Plc	19,719.00	2.25	670,541.00	244,511.33	12.41	44,823.67	15.54	16.07	17.95	6.44	11.53	GB	YES
Svenska Handelsbanken - group	16,783.93	1.05	311,707.00	218,888.67	12.30	15,713.00	20.88	21.41	21.62	4.80	1.36	SE	NO
Swedbank - group	14,087.63	0.82	244,555.67	155,450.00	11.95	13,888.00	18.58	20.23	20.40	5.39	4.00	SE	NO
Sydbank A/S	980.40	0.07	20,731.67	10,326.33	9.24	1,605.67	20.15	13.24	14.19	4.97	5.53	DK	NO
Unicaja Banco, S.A.	1,187.90	0.19	57,861.00	46,684.33	10.75	4,039.33	14.39	14.57	17.48	6.95	2.69	ES	NO
UniCredit S.p.A.	20,703.20	2.95	879,718.00	479,248.67	13.08	60,501.00	15.61	15.25	15.58	6.42	12.11	IT	YES
Unione di Banche Italiane S.p.A.	3,398.93	0.43	128,143.00	83,333.33	11.32	11,005.33	12.46	13.09	20.76	8.38	4.58	IT	YES
Average	19,747.96	1.59	473,357.16	207,480.15	11.43	27,726.37	16.35	17.00	17.45	6.30	10.39		

Notes: The table reports descriptive statistics of the banks in the sample. Panel A displays the balance sheet data of the banks in terms of mean values: market cap; the size, measured as total assets/aggregate assets of the sample; total assets; total loans value; ln value of loans; total equity and tier-1 capital ratio. Panel B reports the four measures of leverage from Gambacorta and Shin (2016): standard leverage ratio; Basel III leverage ratio; risk-weighted leverage ratio and market measure leverage ratio. Lastly, Panel C has some other characteristics of the banks: country of the bank and whether bank was weakly capitalised at the end of 2019 based on the 2020 EBA Spring exercise. Data are from Bloomberg/Refinitiv databases and resemble averages over the period 2019:Q4-2020:Q4.

Table II

Bank returns. Descriptive Statistics.

Bank name	Mean	Std	Min	Max	Skewness	Kurtosis	Obs
Aareal Bank AG	0.42	3.76	-11.79	19.15	0.64	5.04	184
Abanca Corporación Bancaria S.A.							
ABN AMRO Bank N.V.	0.56	4.40	-13.08	26.98	1.33	7.48	184
Banca Monte dei Paschi di Siena S.p.A.	0.22	4.16	-13.06	22.78	0.80	5.61	184
Banco Bilbao Vizcaya Argentaria, S.A.	0.42	3.90	-9.92	17.75	0.84	3.37	184
Banco BPM S.p.A.	0.24	3.87	-13.08	20.05	0.94	4.91	184
Banco Comercial Português, SA	0.55	3.07	-9.45	17.91	1.06	6.00	184
Banco de Crédito Social Cooperativo, S.A.							
Banco de Sabadell, S.A.	0.76	4.83	-12.11	21.46	0.78	3.13	184
Banco Santander, S.A.	0.51	3.73	-10.72	20.27	0.86	4.82	184
Bank of Cyprus Holdings Public Limited Company	0.70	4.96	-18.63	37.30	2.27	16.92	184
Bank Polska Kasa Opieki SA	0.51	3.60	-7.71	26.05	2.38	14.78	184
Bankinter, S.A.	0.34	3.50	-11.07	18.69	1.03	5.63	184
Barclays Plc	0.46	4.23	-12.99	22.05	0.86	5.04	184
BAWAG Group AG	0.24	4.08	-11.78	21.91	0.98	5.06	184
BNP Paribas	0.35	3.72	-8.48	15.63	0.85	3.00	184
BPER Banca S.p.A.	0.55	4.08	-18.30	21.58	0.24	6.72	184
Caixa Económica Montepio Geral, Caixa Económica Bancária, S.A.							
Caixa Geral de Depósitos, SA							
CaixaBank, S.A.	0.29	3.52	-11.00	18.37	0.60	4.00	184
COMMERZBANK Aktiengesellschaft	0.25	4.49	-10.26	26.92	1.41	7.03	184
Credito Emiliano Holding S.p.A.	0.16	2.01	-7.60	9.21	0.69	3.72	184
Danske Bank A/S	0.16	2.75	-7.02	12.74	0.69	3.32	184
Deutsche Bank AG	0.12	4.08	-11.42	22.61	0.90	5.99	184
DNB BANK ASA	0.26	3.57	-10.02	19.37	1.20	6.17	184
Erste Group Bank AG	0.42	3.63	-11.19	14.12	0.51	2.55	184
Eurobank Ergasias Services and Holdings S.A.	0.60	5.25	-18.19	21.01	0.46	2.68	184
First Investment Bank	0.47	4.25	-18.80	23.61	0.89	9.83	184
Groupe BPCE							
Groupe Crédit Agricole	0.38	3.80	-8.90	20.28	1.48	7.09	184
Hellenic Bank Public Company Ltd	0.23	2.38	-7.28	11.01	0.63	2.99	184
HSBC Holdings Plc	0.43	2.73	-8.94	10.21	0.25	1.92	184
ING Groep N.V.	0.40	4.26	-17.01	24.03	0.98	6.75	184
Intesa Sanpaolo S.p.A.	0.26	3.15	-8.84	21.63	2.08	12.77	184
Íslandsbanki hf.							
J.P. Morgan Bank Luxembourg S.A.							
Jyske Bank A/S	0.20	2.35	-5.94	10.01	0.63	2.44	184
KBC Groep	0.33	4.00	-11.26	23.67	1.61	8.26	184
Lloyds Banking Group Plc	0.55	3.59	-10.38	14.90	0.49	2.46	184
Mediobanca – Banca di Credito Finanziario S.p.A.	0.28	3.67	-12.21	22.98	1.64	10.09	184
National Bank of Greece, S.A.	0.71	5.87	-15.91	26.49	1.27	4.90	184
Natwest Group plc	0.53	3.68	-11.86	13.69	0.20	1.70	184
Norddeutsche Landesbank -Girozentrale-							
Nordea Bank Abp	0.09	2.95	-8.04	16.07	1.27	5.98	184
Nova Ljubljanska Banka d.d., Ljubljana	0.31	2.24	-7.62	11.76	1.25	6.46	184
Nykredit Realkredit A/S							
OP Osuuskunta							
OTP Bank Nyrt.	0.36	3.43	-10.42	21.36	1.57	8.23	184
Piraeus Bank, S.A.	0.69	5.21	-14.93	23.24	0.96	4.15	184
Powszechna Kasa Oszczędności Bank Polski SA	0.36	3.07	-7.74	16.44	1.04	5.15	184
Raiffeisen Bank International AG	0.34	2.99	-10.52	14.64	0.53	4.46	184
SBAB Bank AB - group							
Skandinaviska Enskilda Banken - group	0.11	3.06	-8.46	17.41	1.31	6.39	184
Société générale	0.67	4.67	-11.23	21.44	1.03	4.02	184
SPAREBANK 1 SMN	0.19	3.61	-11.19	18.12	1.49	7.40	184
SPAREBANK 1 SR-BANK ASA	0.29	4.11	-12.99	26.84	1.98	11.85	184
Standard Chartered Plc	0.47	3.43	-10.29	14.43	0.45	2.69	184
Svenska Handelsbanken - group	0.19	3.01	-8.57	14.94	0.65	3.35	184
Swedbank - group	0.02	3.02	-9.41	17.54	1.39	6.76	184
Sydbank A/S	0.21	2.75	-13.44	13.47	0.53	7.54	184
Unicaja Banco, S.A.	0.28	3.70	-11.69	23.67	1.27	9.21	184
UniCredit S.p.A.	0.41	3.75	-9.09	20.86	1.26	6.17	184
Unione di Banche Italiane S.p.A.	-0.04	3.96	-19.06	24.14	0.89	10.86	184
Stoxxx Europe 600	0.10	1.72	-7.75	10.09	0.92	8.28	184
Average (banks)	0.36	3.69	-11.36	19.48	1.03	6.05	

Notes: The table reports supplementary descriptive statistic for the daily return of the banks in the sample: Mean, Standard deviation, Min, Max, Skewness, Kurtosis, and number of observations. All instants are multiplied by 100 except skewness and kurtosis. There is also data on the Stoxx Europe 600 index and Average(banks) representing the simple average of the financial institutions. Data are from Bloomberg/Refinitiv databases and resemble averages over the period 2019:Q4-2020:Q4.

Furthermore, Tables III, IV and V are displaying the correlations between all the variables used in the regression analysis later in the master thesis. First two variables in each table are the dependent variables, namely change in Ln(Loans) and change in Loans, followed by the independent variables. Moreover, it can be seen that, the different dependent variables show very similar correlations with some of the independent variables such as change in total equity, change in total leverage, but also variation with other variables such as change in long-term debt or change in market measure leverage. Also, in table V, the DiD variables correlations are shown, it can be seen that correlation between the change in Ln(loans) and the DiD estimator Post*Treat is positive, while the correlation between change in Loans and the Post*Treat variable is negative.

Table III

Correlations between variables prior the PEPP introduction

Variables	ΔLn(Loans)t-1	ΔLoanst-1	ΔTotalEquityt-1	Δleveraget-1	ΔBaselIIIt-1	ΔRWLeveraget-1	ΔMMt-1	ΔLTDebtt-1	ΔTier1Ct-1
ΔLn(Loans)t-1	1								
ΔLoanst-1	0.9895	1							
ΔTotalEquityt-1	0.7069	0.7077	1						
Δleveraget-1	-0.3558	-0.3428	-0.5903	1					
ΔBaselIIIt-1	-0.186	-0.1733	-0.3148	0.5841	1				
ΔRWLeveraget-1	0.0498	0.0441	-0.09	0.0569	0.1353	1			
ΔMMt-1	-0.0809	-0.0566	-0.0821	0.3454	0.3828	-0.0783	1		
ΔLTDebtt-1	0.0081	0.0012	0.0909	-0.0908	-0.1421	-0.0595	0.0809	1	
ΔTier1Ct-1	0.5299	0.5337	0.6633	-0.3064	-0.6986	-0.1698	-0.1266	0.1492	1

Note: The table reports the correlations of the variables used in the regression analysis for the period of t-1, denoting the period prior the introduction of the PEPP, where change in Ln(loans) and change in Loans are the dependent variables used.

Table IV

Correlations between variables following the PEPP introduction

Variables	ΔLn(Loans)t	ΔLoanst	ΔTotalEquityt	ΔLeveraget	ΔBaselIIIt	ΔRWLeveraget	ΔMMt	ΔLTDebtt	ΔTier1Ct
ΔLn(Loans)t	1								
ΔLoanst	0.9935	1							
ΔTotalEquityt	0.6528	0.6547	1						
ΔLeveraget	-0.0531	-0.0533	-0.606	1					
ΔBaselIIIt	-0.2912	-0.263	-0.4995	0.6571	1				
ΔRWLeveraget	-0.2458	-0.2199	-0.4712	0.4753	0.8493	1			
ΔMMt	0.1067	0.0998	-0.1133	0.3835	0.0591	-0.0583	1		
ΔLTDebtt	0.0391	0.0294	0.1686	-0.0786	-0.1385	-0.1081	0.0876	1	
ΔTier1Ct	0.6396	0.6285	0.7826	-0.4372	-0.7604	-0.7534	0.1015	0.1748	1

Note: The table reports the correlations of the variables used in the regression analysis for the period of t, denoting the period after the introduction of the PEPP, where change in Ln(loans) and change in Loans are the dependent variables used.

Table V

Correlations between variables for the DiD analysis

Variables	ΔLn(Loans)	ΔLoans	Post	Treat	Post*Treat
ΔLn(Loans)	1				
ΔLoans	-0.9923	1			
Post	-0.1032	0.0929	1		
Treat	0.029	-0.022	0	1	
Post*Treat	0.0393	-0.0376	0.559	0.5863	1

Note: The table reports the correlations of the variables used in the DiD analysis, where Post*Treat is the DiD estimator and change in Ln(loans) and change in Loans are the dependent variables used.

Chapter 3. Methodology and results

3.1. Methodology

The methodology and results will be divided into 3 parts to check each of the three hypotheses mentioned earlier, namely:

1. Through the purchase of different sovereign and corporate assets on the secondary market under the Pandemic Emergency Purchase Programme (PEPP) European Central Bank manages to increase their demand and subsequentially, their prices, thus stabilising the market conditions and restoring the confidence, which indirectly leads to expansion in bank lending channel through the total equity of the bank.
2. The hike in the bank lending in the initial months of the pandemic was due to a compilation of measures from the ECB, such as the TLTRO III and the increase in the banks' lending capacity through loosening capital requirements as well as the PEPP.
3. Better-capitalised banks increase their bank lending by a larger amount after the introduction of the PEPP compared to weakly-capitalised.

For the first hypothesis, the analysis involves using two almost identical OLS regressions to capture the growth in the bank lending following the PEPP introduction. The models used are in equations 1) and 1.1):

1) $\Delta Ln(Loans)_t = \alpha + \beta1*\Delta TotalEquity_t + \beta2*\Delta Leverage_t + \beta3*\Delta BaselIII_t + \beta4*\Delta RWLeverage_t + \beta5*\Delta MM_t + \varepsilon_t$

1.1) $\Delta Loans_t = \alpha + \beta1*\Delta TotalEquity_t + \beta2*\Delta Leverage_t + \beta3*\Delta BaselIII_t + \beta4*\Delta RWLeverage_t + \beta5*\Delta MM_t + \varepsilon_t$

The dependent variable in the first equation is the change in Ln(loans), while the second equation is the change in total loans, where period t denotes the change from Q1:2020 to Q4:2020. The independent variables for both models are the same, as follows: coefficient β1 – represents the change in total equity for period t, while coefficients β2, β3, β4 and β5 represent the four leverage ratios of Gambacorta and Shin (2016), namely standard leverage ratio, Basel III leverage ratio, risk-weighted leverage ratio and the market measure leverage ratio and ε_t is the error term.

For the second hypothesis, again an OLS regression is used to examine the hike in the bank lending after factoring the collection of the measures introduced by the ECB in the early months of the pandemic. Models are shown in equations 2) and 2.1):

2) $\Delta Ln(Loans)_t = \alpha + \beta1*\Delta LTDebt_t + \beta2*\Delta TotalEquity_t + \beta3*\Delta Tier1C_t + \beta4* \Delta Leverage_t + \beta5* \Delta BaselIII_t + \varepsilon_t$

2.1) $\Delta Loans_t = \alpha + \beta1*\Delta LTDebt_t + \beta2*\Delta TotalEquity_t + \beta3*\Delta Tier1C_t + \beta4* \Delta Leverage_t + \beta5* \Delta BaselIII_t + \varepsilon_t$

The dependent variable in the first equation is the change in Ln(loans), while in the second equation is the change in total loans, where period t denotes the change from Q1:2020 to Q4:2020. The independent variables for both models are the same, as follows: coefficient β1 – represents the change in total long-term debt for period t, coefficient β2 is the change in total equity, coefficient β3 is the change in the Tier1 capital and coefficients β4 and β5 represent two leverage ratios of Gambacorta and Shin (2016), namely standard leverage ratio, Basel III leverage ratio and ε_t is the error term.

For the third hypothesis, the methodology involves using the Difference-in-Differences (DID) model to outline the different effect of the PEPP on the bank lending of European banks during the COVID-19 based on their ex-ante capitalisation. Firstly, the treatment and control groups based on the bank's ex-ante capitalization will be defined as those that are more affected and less affected by PEPP, respectively. After defining the groups, a scenario will be created where the treatment group will encounter the ECB intervention in the form of PEPP, while the control group will not, since there is no data on how banks were truly affected by the PEPP, we will again consider the change in total equity as the measure for this.

The models used are in equations 3) and 3.1):

3) $\Delta Ln(Loans)_t = \alpha + \beta 1 * \Delta TotalEquity_{t+} \beta 2_{it} * Post + \beta 3 * Treat + \beta 4 * Post * Treat + \varepsilon_{it}$

3.1) $\Delta Loans_t = \alpha + \beta 1 * \Delta TotalEquity_{t+} \beta 2_{it} * Post + \beta 3 * Treat + \beta 4 * Post * Treat + \varepsilon_{it}$

The dependent variable in the first equation is the change in Ln(loans), while in the second equation is the change in total loans, where period t denotes the change from Q1:2020 to Q4:2020. The independent variables for both models are the same, as follows: coefficient β1 – represents the change in total equity for period t, coefficient β2 is a dummy variable, where 0 denotes the period pre-introduction of the PEPP and 1 the period after, coefficient β3 is another dummy variable taking the value of 1 for the treatment group, which is the weakly-capitalised banks and value of 0 for the control group, the better-capitalised banks, coefficient β4 is the coefficient for the DiD estimator and ε_{it} is the error term.

Lastly, the statistical significance of the DID outcome will be tested using a Wald test, and also the robustness of all the models will be checked, as well as ensuring the parallel trend assumption hold for the Difference-in-differences analysis.

3.2. Results

3.2.1. First hypothesis

As mentioned above, the results part is also separated into three parts to analyse each hypothesis. To begin with, the first hypothesis states that through the purchase of different sovereign and corporate assets on the secondary market under the PEPP, ECB manages to increase their demand and, subsequentially, their prices, thus stabilising the market conditions and restoring the confidence, which indirectly leads to expansion in bank lending channel through the total equity of the bank.

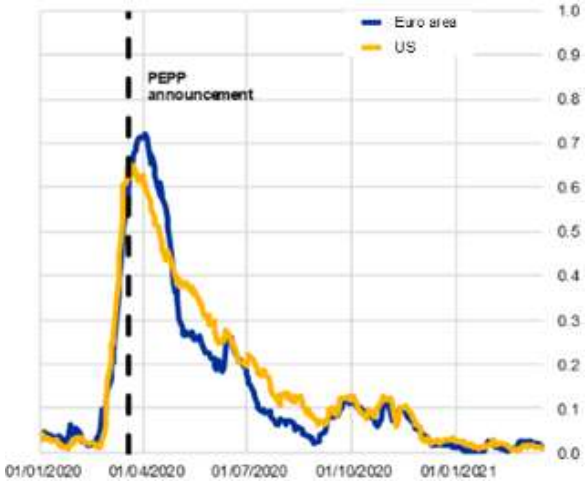

Figure 1. Systemic stress across money, bond, equity, and foreign exchange markets in the Euro area and US.
Source: Working Paper Series, No 1426, ECB.

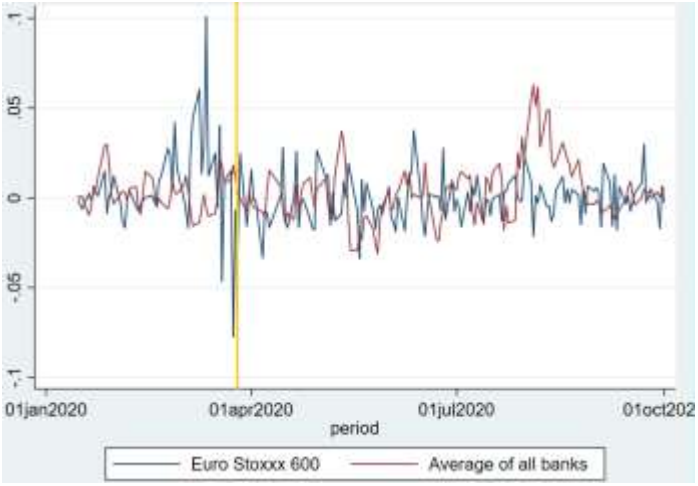

Figure 2. Average stock returns of Stoxxx 600 index and all banks in the sample
Note: Yellow line denotes the date 18.03.2020 when the PEPP was announced.

Before looking at the effects of PEPP on bank lending, figures 1 and 2 above illustrate how PEPP affects market conditions. In the first figure, it can be seen how the announcement of the programme affects the systemic stress in the financial markets. Around the moment of the announcement, the level of systemic stress was around 0.7 in the Euro area due to the pandemic and, specifically, the market crash of early March 2020. However, almost immediately after the announcement, the level plummets. The level returns to normal relatively fast in the next few months, displaying the stabilising effect of the PEPP in the market. Next, the second figure plots the average returns of the Stoxxx Europe 600 index and the average returns of the 63 banks in the sample used in this master thesis. There it can be seen that the volatility in the returns is enormous prior to the introduction of the PEPP, again mainly due to the market crash of early March 2020, which is why there is an increase in the volatility. Nevertheless, following the introduction of the programme, shown by the yellow line on the graph, the volatility stabilised, which was one of the reasons for the launch of the programme to restore confidence in the financial markets.

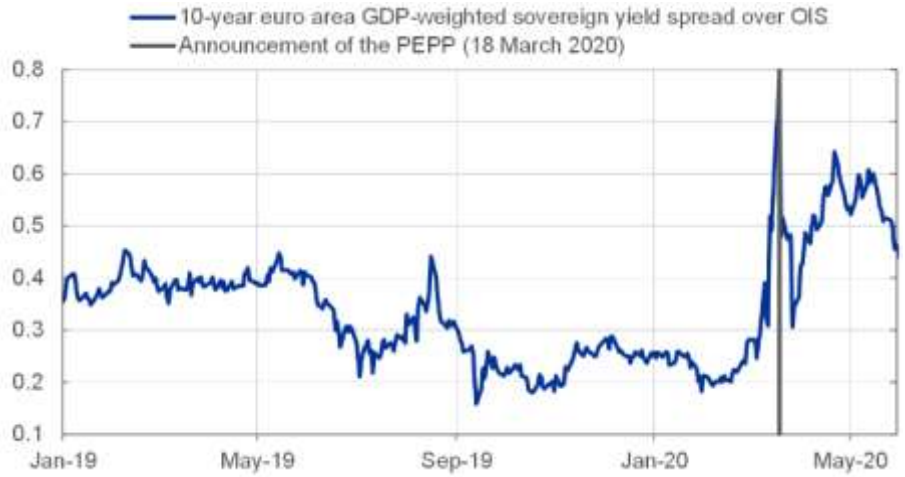

Figure 3. Euro area ten-year GDP-weighted government bond yield spread over the OIS rate for the period 01/2019 to 06/2020. Source: "Expanding the pandemic emergency purchase programme" by the ECB (05.06.2020)

Furthermore, figure 3 plots the spread of GDP-weighted government bond yield over the ten-year OIS rate, again focusing on the introduction of the programme in mid-March. From the figure, it can be seen that the spread increased substantially prior to the announcement of the PEPP, after which it had an immediate downward path. This further confirms the stabilisation effect of the programme. To sum up, all of the figures present similar trends in different aspects of the financial markets, resulting from the introduction of the PEPP, all of which, to some extent, directly or indirectly affect banks' lending. For instance, as shown in the first two figures, by reducing the stress in the markets and the volatility of the returns, PEPP positively affects banks' equity and leads to expansion in the bank lending channel. On figure 3, the spread of government bond yield over the OIS rate affects the cost of funding for the banks, which also influences the bank lending channel.

Now the analysis moves on to looking at Table 1, displaying the results of equations 1) and 1.1) from the methodology for period t-1, which is the period before the introduction of the programme from the ECB. Panel A represents the results for the growth in Ln (Loans) in t-1, while Panel B for the growth of Loans. Starting off, by looking at columns (1) and (6), it can immediately be seen that change in loan growth can be explained by the change in total equity of the bank, and it is statistically significant on the 1% level, which further confirms the mentioned earlier relationship between banks' lending originations and equity. Additionally, even after adding each of the four leverage ratios of Gambacorta and Shin (2016) in columns (2) – (5) and (7) – (10) to function as controls, the coefficient of total equity still remains statistically significant on the 1% level. The main difference between the usage of change in Ln(loans) and just the change in loans is that the coefficients in columns (6) through (10) are larger than these (1) through (5), but they follow the same trends. The relationship between loan growth and change in equity is strictly positive and statistically significant on the 1% level, and also it can be seen that this model has an R-squared of around 0.5, so total equity explains half of the variation in the loan growth of the banks in period t-1 (Q4:2019-Q1:2020).

Table 1

How does bank lending react to changes in equity prior the PEPP introduction

Explanatory variables	Panel A: Dependent Variable: growth rate of Ln (Loans) in t					Panel B: Dependent Variable: growth rate of Loans in t-1				
	(1) ΔLn(Loans)t-1	(2) ΔLn(Loans)t-1	(3) ΔLn(Loans)t-1	(4) ΔLn(Loans)t-1	(5) ΔLn(Loans)t-1	(6) ΔLoanst-1	(7) ΔLoanst-1	(8) ΔLoanst-1	(9) ΔLoanst-1	(10) ΔLoanst-1
ΔTotalEquity t-1	0.0564***	0.0609***	0.0609***	0.0618***	0.0624***	0.588***	0.645***	0.645***	0.653***	0.657***
	(0.00723)	(0.00898)	(0.00906)	(0.00905)	(0.00921)	(0.0752)	(0.0931)	(0.0940)	(0.0940)	(0.0958)
ΔLeverage t-1		0.00563	0.00569	0.00632	0.00710		0.0714	0.0693	0.0755	0.0801
		(0.00671)	(0.00792)	(0.00790)	(0.00814)		(0.0696)	(0.0821)	(0.0820)	(0.0846)
ΔBaselII t-1			-0.000091	-0.00115	-0.000387			0.00340	-0.00704	-0.00252
			(0.00650)	(0.00652)	(0.00678)			(0.0674)	(0.0677)	(0.0705)
ΔRWLeverage t-1				0.00142	0.00135				0.0139	0.0135
				(0.00113)	(0.00115)				(0.0117)	(0.0119)
ΔMMt-1					-0.000387					-0.00228
					(0.000852)					(0.00886)
Constant	0.00112***	0.000922*	0.000924*	0.000874*	0.00108	0.0136***	0.0112**	0.0111**	0.0106**	0.0118*
	(0.000397)	(0.000461)	(0.000481)	(0.000480)	(0.000668)	(0.00413)	(0.00478)	(0.00499)	(0.00499)	(0.00695)
Observations	63	63	63	63	63	63	63	63	63	63
R-squared	0.500	0.506	0.506	0.519	0.520	0.501	0.509	0.509	0.521	0.522

Note: This table shows the results from equation 1) and 1.1) for period t-1, denoting the change prior the PEPP introduction from Q4:2019 to Q1:2020. Columns (1) - (5) are for equation 1) with dependent variable growth in Ln(loans), while columns (6) - (10) are for equation 1.1) with dependent variable growth in Loans. Both dependent and independent variables are expressed by the change in period t-1. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level

After analysing the relationship between loan growth and the equity of the banks before the introduction of the PEPP, now it is time to look does bank lending actually increases following the announcement of the programme. By running the same regressions as in Table 1, but this time for period t (Q1:2020-Q4:2020). The results are displayed in Table 2. Similarly, columns (1) – (5) are for change in Ln(loans) and change in loans are in columns (6) – (10). Immediately it can be

seen that, again, the coefficient for change in total equity is positive and statistically significant on the 1% level across the whole table. However, there are some substantial differences between Table 1 and Table 2, and that is all leverage ratios, with the exception of the market measure one (MMt), are also statistically significant on the 1% level, which was not the case in Table 1. Also, in Table 2, after their addition in columns (2) – (5) and (6) – (10), the coefficient for total equity becomes larger compared to Table 1. Moreover, in Table 2 the R-squared is drastically larger after the inclusion of the leverage ratios – around 0.7.

Thus, by taking all the figures and graphs into account, it can be concluded that the launch of the programme resulted in reduction in the stress and the volatility in the financial markets as well as reducing the yield spread. All of these measures are stabilising the market conditions and affect banks' equity positively, which shown by Tables 1 and 2 proven to indirectly have an effect on the bank lending hence first hypothesis of this master thesis can be approved to be true.

Table 2

How does bank lending react to changes in equity following the PEPP introduction

Explanatory variables	Panel A: Dependent Variable: growth rate of Ln (Loans) in t					Panel B: Dependent Variable: growth rate of Loans in t				
	(1) ΔLn(Loans)t	(2) ΔLn(Loans)t	(3) ΔLn(Loans)t	(4) ΔLn(Loans)t	(5) ΔLn(Loans)t	(6) ΔLoanst	(7) ΔLoanst	(8) ΔLoanst	(9) ΔLoanst	(10) ΔLoanst
ΔTotalEquityt	0.0503***	0.0755***	0.0720***	0.0765***	0.0767***	0.544***	0.818***	0.787***	0.835***	0.837***
	(0.00747)	(0.00779)	(0.0075)	(0.00726)	(0.00735)	(0.0805)	(0.0837)	(0.0823)	(0.0797)	(0.0808)
ΔLeverageт		0.0388***	0.0503***	0.0565***	0.0577***		0.420***	0.521***	0.589***	0.601***
		(0.00726)	(0.00803)	(0.0079)	(0.00881)		(0.0780)	(0.0881)	(0.0868)	(0.0969)
ΔBaselIIIt			-0.0151***	-0.0349***	-0.0351***			-0.133**	-0.348***	-0.350***
			(0.00545)	(0.00868)	(0.00876)			(0.0598)	(0.0954)	(0.0964)
ΔRWLeverageт				0.0367***	0.0362***				0.397***	0.393***
				(0.0129)	(0.0130)				(0.142)	(0.144)
ΔMMt					0.00076					-0.00748
					(0.0023)					(0.0262)
Constant	-0.000444	-0.00206***	-0.00201***	-0.000436	-0.000578	-0.00468	-0.0221***	-0.0217***	-0.00469	-0.00608
	(0.000758)	(0.000697)	(0.000661)	(0.000835)	(0.000951)	-0.00816	-0.00749	-0.00726	-0.00918	-0.0105
Observations	63	63	63	63	63	63	63	63	63	63
R-squared	0.426	0.611	0.656	0.698	0.699	0.429	0.615	0.645	0.687	0.688

Note: This table shows the results from equation 1) and 1.1) for period t, denoting the change after the PEPP introduction from Q1:2020 to Q4:2020. Columns (1)-(5) are for equation 1) with dependent variable growth in Ln(loans), while columns (6)-(10) are for equation 1.1) with dependent variable growth in Loans. Both dependent and independent variables are expressed by the change in period t-1. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level

3.2.2. Second hypothesis

After the acceptance of the first hypothesis, the master thesis continues to test the second hypothesis, which is that the hike in the bank lending in the initial months of the pandemic was due to a compilation of measures from the ECB, such as the TLTRO III and the increase in the banks' lending capacity through loosening capital requirements as well as the PEPP.

In order to do that, the models in equations 2) and 2.1) are used where, again, for the effects of PEPP, the change in total equity is used, while the impact of the TLTRO III and PELTRO is captured by the change in the long-term debt, since both these LTROs are providing finance to the bank inform of long-term debt. For the consequences of the loosening in the capital requirements by the ECB, the change in Tier-1 capital is going to be considered, and in the end, two of the leverage ratios will be incorporated to serve as controls, namely the simple leverage ratio and Basel III leverage ratio.

The results are again separated based on two periods, t-1 and t, where one is prior the establishment of all these measure by the ECB and the other is after that to better capture their impact. Table 3 displays the results of the regression for the period of t-1 with columns (1) – (5) having dependent variable growth rate of Ln(loans), while in columns (6) – (10) is growth rate of loans. Firstly, looking at the columns (1) and (6) to see the impact long-term debt growth on the bank lending it can be observed that when it is the only dependent variable the relation is positive, but very small, 0.0000488 and 0.0000742, also it is not statistically significant at all and R-squared is 0. However, when other dependent variables are added the coefficient becomes negative and again not statistically significant, meaning the change in the long-term debt is not an explanatory for the changes in bank lending. Furthermore, the change in tier 1 capital is also not statistically significant in columns (3) and (4) only after adding the change in the Basel III leverage as dependent variable in column (5) and (10), the coefficients 0.0359 and 0.414 for the tier 1 capital become significant on the 10% and 5% level respectively. Overall Table 3 results show that prior to the introduction of the compilation of measures by the ECB, change in long-term debt and tier 1 capital are not affecting the bank lending channel, while the change in total equity of the bank is still influential.

Table 3

How does bank lending react to the same variables prior the introduction of the set of measures by the ECB?

Explanatory variables	Dependent Variable: growth rate of Ln (Loans)					Dependent Variable: growth rate of Loans				
	(1) ΔLn(Loans)t-1	(2) ΔLn(Loans)t-1	(3) ΔLn(Loans)t-1	(4) ΔLn(Loans)t-1	(5) ΔLn(Loans)t-1	(6) ΔLoanst-1	(7) ΔLoanst-1	(8) ΔLoanst-1	(9) ΔLoanst-1	(10) ΔLoanst-1
ΔLTDebt t-1	0.0000488	-0.000343	-0.000408	-0.000384	-0.000389	0.0000742	-0.00402	-0.00474	-0.00442	-0.00447
	(0.000776)	(0.000554)	(0.000558)	(0.000562)	(0.000554)	(0.00808)	(0.00576)	(0.00580)	(0.00582)	(0.00570)
ΔTotalEquity t-1		0.0569***	0.0506***	0.0548***	0.0288		0.593***	0.524***	0.580***	0.275
		(0.00730)	(0.00972)	(0.0116)	(0.0197)		(0.0758)	(0.101)	(0.121)	(0.203)
ΔTier1C t-1			0.00824	0.00740	0.0359*			0.0910	0.0799	0.414**
			(0.00845)	(0.00858)	(0.0195)			(0.0877)	(0.0889)	(0.201)
Δleverage t-1				0.00458	-0.0139				0.0599	-0.157
				(0.00684)	(0.0132)				(0.0709)	(0.136)
ΔBaselIII t-1					0.0241					0.282*
					(0.0148)					(0.153)
Constant	-0.000179	0.00116***	0.00121***	0.00105**	0.000848*	0.000164	0.0142***	0.0147***	0.0126**	0.0102**
	(0.000517)	(0.000406)	(0.000410)	(0.000481)	(0.000490)	(0.00539)	(0.00422)	(0.00425)	(0.00498)	(0.00504)
Observations	63	63	63	63	63	63	63	63	63	63
R-squared	0.000	0.503	0.511	0.515	0.536	0.000	0.505	0.514	0.520	0.547

Note: This table shows the results from equation 2) and 2.1) for period t-1, denoting the change prior the introduction of the measure from Q4:2019 to Q1:2020. Columns (1)-(5) are for equation 1) with dependent variable growth in Ln(loans), while columns (6)-(10) are for equation 1.1) with dependent variable growth in Loans. Both dependent and independent variables are expressed by the change in period t-1. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level

Moving the emphasis to Table 4, where again the results of equation 2) and 2.1) are shown, but this time the focus is on period t, where the measures by the ECB are already established. Similarly, as in Table 3 the coefficient for the change in long-term debt is positive only in columns (1) and (6) 0.00171 and 0.0139 respectively, but still, it is not statistically significant and R-squared is 0. However, after adding the other coefficients to the regression the coefficient of long-term debt becomes negative and stays insignificant showing that TLTROs introduced did not have significant impact on the bank lending. Furthermore, it can be seen that in columns (3), (4), (8) and (9) change in tier 1 capital is statistically significant on the 5% level, which was not the case in Table 3. Also, change in total equity similarly to Tables 1 and 2 is strictly positive and statistically significant on the 1% in all columns showing the impact of the PEPP. Another important difference between table 3 and 4, which emphasises the influence of all the measures introduced by the ECB on the bank lending channel is the fact that R-squared goes up from maximum of around 0.55 in Table 3 column (10) to maximum of 0.667 in Table 4 column (5). Additionally, the coefficient presenting the effect of change in the leverage ratio in Table 4 is statistically significant on the 1% level in all columns, where in Table 3 it was never statistically significant.

Consequently, after looking at the results from both tables, it can be seen that LTRO III and PELTRO does not explain the changes in the loans, at least in the early months of their introduction since all the coefficient for changes in the long-term debt are insignificant. Nonetheless, the

loosening capital requirements instead can explain the variation in the loans, since the coefficients were statistically significant following their implementation shown in Table 4 with positive coefficients of around 0.02 to 0.025. Again, changes in total equity have positive coefficient and are significant on the 1% after the introduction of the PEPP, following the trend from Tables 1 and 2.

To sum up, the second hypothesis can be accepted, even though it was found that LTROs do not affect the growth in the loans, since the other two measures, namely loosening capital requirements by the ECB assessed by the change in tier 1 capital is explanatory for the growth in the lending in almost all scenarios presented in Table 4 and also the effect of PEPP on the bank lending channel is confirmed once more.

Table 4

How does bank lending react to the set of measures introduced by ECB?

Explanatory variables	Dependent Variable: growth rate of Ln (Loans)					Dependent Variable: growth rate of Loans				
	(1) ΔLn(Loans)t	(2) ΔLn(Loans)t	(3) ΔLn(Loans)t	(4) ΔLn(Loans)t	(5) ΔLn(Loans)t	(6) ΔLoanst	(7) ΔLoanst	(8) ΔLoanst	(9) ΔLoanst	(10) ΔLoanst
ΔLTDebtt	0.00171	-0.00320	-0.00386	-0.00433	-0.00469	0.0139	-0.0394	-0.0459	-0.0510	-0.0537
	(0.00561)	(0.00433)	(0.00420)	(0.00345)	(0.00341)	(0.0605)	(0.0465)	(0.0455)	(0.0374)	(0.0374)
ΔTotalEquityt		0.0512***	0.0308**	0.0585***	0.0749***		0.556***	0.356***	0.657***	0.778***
		(0.00761)	(0.0117)	(0.0109)	(0.0147)		(0.0818)	(0.126)	(0.118)	(0.161)
ΔTier1Ct			0.0249**	0.0213**	-0.00197			0.244**	0.205**	0.0330
			(0.0110)	(0.00911)	(0.0168)			(0.120)	(0.0985)	(0.184)
ΔLeveraget				0.0379***	0.0520***				0.412***	0.516***
				(0.00701)	(0.0110)				(0.0758)	(0.121)
ΔBaselIIIt					-0.0168					-0.124
					(0.0103)					(0.112)
Constant	0.00114	-0.000529	-0.00116	-0.00265***	-0.00210***	0.0123	-0.00573	-0.0119	-0.0282***	-0.0240***
	(0.000957)	(0.000769)	(0.000795)	(0.000710)	(0.000778)	(0.0103)	(0.00827)	(0.00861)	(0.00768)	(0.00852)
Observations	63	63	63	63	63	63	63	63	63	63
R-squared	0.002	0.431	0.476	0.652	0.667	0.001	0.435	0.473	0.650	0.658

Note: This table shows the results from equation 2) and 2.1) for period t, denoting the change after the introduction of the measures from Q1:2020 to Q4:2020. Columns (1)-(5) are for equation 1) with dependent variable growth in Ln(loans), while columns (6)-(10) are for equation 1.1) with dependent variable growth in Loans. Both dependent and independent variables are expressed by the change in period t-1. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level

3.2.3. Third hypothesis

After confirmation of the first two hypotheses, the analysis continues further testing the last hypothesis left, which is that better-capitalised banks increase their bank lending by a larger amount after the introduction of the PEPP compared to weakly-capitalised. This hypothesis, comparable to the other two, also tests the effect of the initiation of the purchase programme by the ECB. However, this time it goes further by checking whether the ex-ante capitalisation of the banks is playing a crucial role in the growth of the lending. By using the difference-in-difference examination and separating the weakly-capitalised banks being the treatment group, while the control group being the better-capitalised as mentioned earlier in the methodology. For this

analysis, equations 3) and 3.1) are used, where again, the main distinction is the dependent variable being change in Ln(loans) and change in total loans, respectively.

The results of the DiD analysis are presented in Table 5, column (1) displays the outcome of equation 3), while column (2) of equation 3.1). Initially, it can be seen that the coefficients for the change in total equity are quite different. In the first column, it is negative, but in the second column, it is positive. Also, the DiD estimator, which is represented by the Post*Treat variable in the table, is again negative in column (1) and positive in column (2), giving puzzling results. Nonetheless, when a closer look is taken in column (1), the coefficient is very small at -0.0000985, while in column (2) is much bigger at 0.0026847. Thus, pointing out that for the evaluation made by the Difference-in-difference model, the dependent variable of change is regular number of loans compared to the Ln value might be a better estimator. Taking this into account, the coefficient of 0.0026847 for the DiD estimator, displays that after the introduction of the PEPP actually, weakly-capitalised banks increase their lending more compared to the better-capitalised banks. Moreover, at the bottom of the table is the result of the Wald test, which was conducted to assess the statistical significance of the model, showing significance on the 1% level with p-values very close to 0.

Lastly, after conducting the DiD analysis in order to check what role ex-ante capitalisation plays in the bank lending growth of the banks following the introduction of the PEPP by the ECB. The results found out that the third hypothesis of this master thesis is going to be rejected and that actually weakly capitalised banks tend to increase the bank lending more following the introduction of the program, similarly to the papers by Acharya et al. (2019) and Özlem Dursun-de Neef and Schandlbauer (2021). Both papers point out that weakly capitalised banks tend to increase their lending in order to avoid stacking of non-performing loans, which can lead to the insolvency of the banks. Acharya et al. (2019) discovered that following an unconventional monetary policy announcement and the increase of capital received by banks weakly capitalised banks tend to lend more, while Özlem Dursun-de Neef and Schandlbauer (2021) observed that during COVID-19 or especially in times of stress, weakly capitalised banks are lending more compared to their better-capitalised peers.

Table 5

How does bank lending of weakly capitalised banks react to the introduction of PEPP compared to better capitalised?

Explanatory variables	(1) ΔLn(Loans)t	(2) ΔLoanst
$\Delta TotalEquity_t$	-0.05212***	0.55961***
	(0.0054141)	(0.057885)
Post	0.0016063	-0.0194084
	(0.0012087)	(0.0129228)
Treat	-0.0004427	-0.0048468
	(0.0011495)	(0.0011495)
Post*Treat	**-0.0000985**	**0.0026847**
	(0.0016585)	(0.0122904)
Constant	-0.000792	-0.000792
	(0.0008081)	(0.0086401)
R-squared:	0.4508	0.4506
Observations	126	126
Number of banks	63	63
Wald chi2(4)	99.3	99.23
Prob > chi2	**0.0000*** **	**0.0000*** **

Note: This table shows the results from equation 3) and 3.1) for period t, denoting the change after the PEPP introduction from Q1:2020 to Q4:2020. Column (1) is for equation 3) with dependent variable growth in Ln(loans), while column (2) is for equation 3.1) with dependent variable growth in Loans. Post and Treat represent dummy variable taking values of 0 and 1 and Post*Treat is the DiD estimator. At the bottom of the table, we can see the Wald test results for statistical significance. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level

3.2.4. Robustness check and Parallel trends assumption

To check the results for robustness, the usage of robust standard errors is implemented in the same regression models used earlier to test the three hypotheses. The results of equations 1), 1.1), 2) and 2.1) for the period of t-1 are presented in Table 6. The only striking difference from the robustness check is that in the column (2) and (4), where the coefficient for the change in the long-term debt prior to the implementation of the TLTROs is statistically significant on the 10% level, which was not the case when using the regular standard error model, even though it was very close. The other coefficients are the same or follow a similar pattern with the addition of the robust standard errors. Moving on to Table 7, which checks the robustness of the models after the introduction of the measures by the ECB in period t. Once more, the addition of the robust standard errors in the model does not change the outcome of the different regression models. Additionally, Table 8 checks the robustness of the difference-in-differences analysis, which also provides the same valuations as presented in Chapter 3.2.3, which further confirms that the initial decisions for each of the hypotheses still remains the same.

Table 6

Robustness check prior the addition of the measures by ECB

Explanatory variables	Dependent Variable: growth rate of Ln (Loans)		Dependent Variable: growth rate of Loans	
	(1)	(2)	(3)	(4)
	ΔLn(Loans)t-1	ΔLn(Loans)t-1	ΔLoanst-1	ΔLoanst-1
ΔTotalEquity t-1	0.0624***	0.0288	0.657***	0.275
	(0.0151)	(0.0241)	(0.146)	(0.238)
Δleverage t-1	0.00710	-0.0139	0.0801	-0.157
	(0.00770)	(0.0113)	(0.0827)	(0.115)
ΔBaselII t-1	-0.000387	0.0241*	-0.00252	0.282**
	(0.00704)	(0.0121)	(0.0729)	(0.126)
ΔRWLeverage t-1	0.00135***		0.0135***	
	(0.000304)		(0.00311)	
ΔMM t-1	-0.000387		-0.00228	
	(0.000896)		(0.00933)	
ΔLTDebt t-1		-0.000389*		-0.00447*
		(0.000228)		(0.00250)
ΔTier1C t-1		0.0359*		0.414**
		(0.0198)		(0.205)
Constant	0.00108	0.000848*	0.0118	0.0102**
	(0.000821)	(0.000471)	(0.00835)	(0.00478)
Observations	63	63	63	63
R-squared	0.520	0.536	0.522	0.547

Table 7

Robustness check after addition of the measures by the ECB

Explanatory variables	Dependent Variable: growth rate of Ln (Loans)		Dependent Variable: growth rate of Loans	
	(1)	(2)	(3)	(4)
	ΔLn(Loans)t	ΔLn(Loans)t	ΔLoanst	ΔLoanst
ΔTotalEquity t	0.0767***	0.0749***	0.837***	0.778***
	(0.00868)	(0.0190)	(0.0961)	(0.212)
Δleverage t	0.0578***	0.0520***	0.601***	0.516***
	(0.00709)	(0.0113)	(0.0752)	(0.127)
ΔBaselII t	-0.0352***	-0.0168*	-0.350***	-0.124
	(0.00669)	(0.00894)	(0.0710)	(0.102)
ΔRWLeverage t	0.0362***		0.393***	
	(0.0106)		(0.117)	
ΔMMt	-0.000764		-0.00748	
	(0.00214)		(0.0234)	
ΔLTDebtt		-0.00469		-0.0537
		(0.00501)		(0.0525)
ΔTier1Ct		-0.00197		0.0330
		(0.0183)		(0.208)
Constant	-0.000578	-0.00210***	-0.00608	-0.0240***
	(0.000957)	(0.000716)	(0.0105)	(0.00796)
Observations	63	63	63	63
R-squared	0.699	0.667	0.688	0.658

Note: This tables show the results of the robustness check for the equations 1), 1.1), 2) and 2.1) for the period t-1 in Table 6 and period t in Table 7, denoting the change in the variable from Q4:2019 – Q1:2020 and Q1:2020 – Q4:2020, respectively, by considering the robust standard errors of the variables. Columns (1) and (2) are for equations 1) and 2) respectively, while columns (3) and (4) are for the equations 1.1) and 2.1). * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level.

Table 8

Robustness check for the Difference-in-difference analysis

Explanatory variables	(1)	(2)
	ΔLn(Loans)t	ΔLoanst
$\Delta TotalEquity_t$	0.052118***	0.559606***
	(0.0098329)	(0.0992601)
Post	0.0016063	-0.0194084
	(0.0013391)	(0.0145007)
Treat	-0.0004427	-0.0048468
	(0.0007287)	(0.0075913)
Post*Treat	**-0.0000985**	**0.0026847**
	(0.001728)	(0.0191672)
Constant	-0.000792	-0.0106642
	(0.0005642)	(0.0057265)
R-squared:	0.4508	0.4506
Observations	126	126
Number of banks	63	63
Wald chi2(4)	32.51	37.15
Prob > chi2	**0.0000*** **	**0.0000*** **

Note: This table shows the results of the robustness check for the difference-in-differences equations 3), 3.1) for period t, , denoting the change after the PEPP introduction from Q1:2020 to Q4:2020 by considering the robust standard errors of the variables. Column (1) is for equation 3, while column (2) is for equation 3.1). Post and Treat represent dummy variable taking values of 0 and 1 and Post*Treat is the DiD estimator. At the bottom of the table, we can see the Wald test results for statistical significance. * - Statistically significant at the 0.10 level, ** - Statistically significant at the 0.05 level, *** - Statistically significant at the 0.01 level.

Furthermore, Figure 4 displays the plots for the parallel trend assumption of the Difference-in-Differences analysis. The left panel demonstrates that the control and treatment groups are following the same trend following the treatment effect of the PEPP, implying that the parallel trend assumption holds. Correspondingly, the right panel exhibits the same outcome following the addition of the robust standard errors in the model. Parallel trends are holding as well.

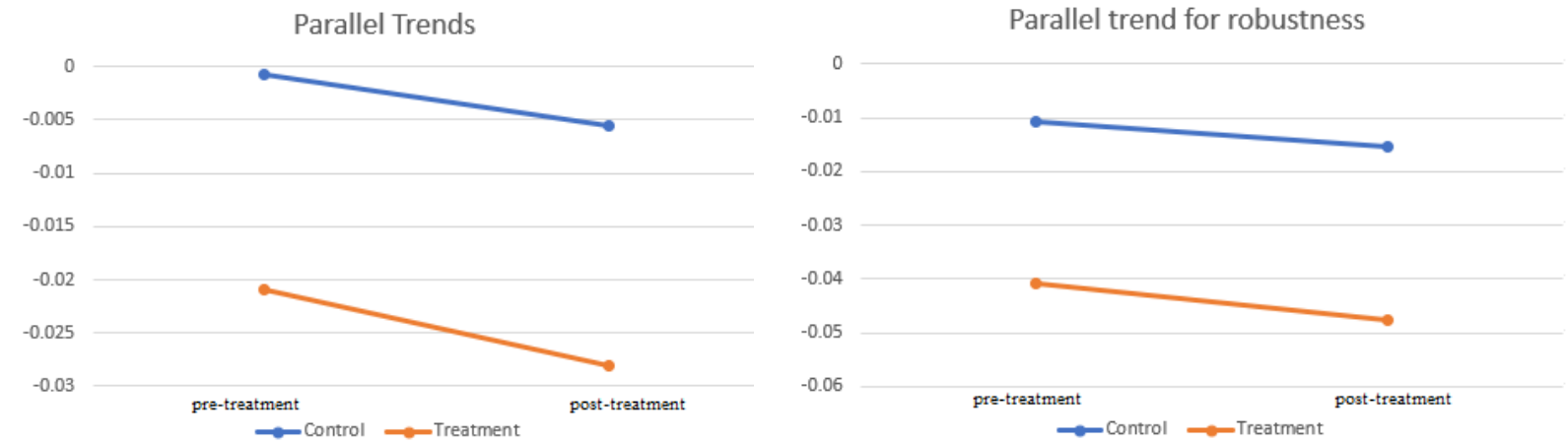

Figure 4. Left panel shows Parallel trend assumption for the Difference-in-Differences analysis of Table 5, while right panel shows Parallel trend assumption for robustness of the Difference-in-Differences analysis (Table 8).

Chapter 4. Conclusion

The Covid-19 pandemic, even though a global health crisis, quickly managed to develop into a global economic and financial crisis, which resulted in the necessity for intervention from governments and central banks all over the world. Apart from the public health measures introduced in forms of lockdowns, travel restrictions, social distancing and business closures, there were many fiscal and economic stimuli provided by the governments as well as monetary interferences made by the central banks.

Amid the pandemic, the European Central Bank initiated its Pandemic Emergency Purchase Program (PEPP) to counter the shock of the pandemic on the market conditions. PEPP is an unconventional monetary policy instrument which is part of the Asset Purchase Programs of ECB. The main aim of these programs is to purchase large amounts of financial assets on the secondary market to increase their demand and, subsequently, their prices resulting in profits for the banks which are holding them. Besides the PEPP, the ECB also used other mechanisms to stabilise the economic conditions and support the banking and corporate sectors, such as their long-term refinancing operations (LTROs), containing the TLTRO III and PELTRO, as well as relaxing the banks' capital requirements. By considering all the different measures launched by the ECB, this master thesis' goal was to assess the impact of the PEPP on the bank lending channel during the pandemic.

Numerous papers have examined the effects of different unconventional monetary policies on the bank lending channel for example: Acharya et al. (2019) look at the OMT announcement, while Aguilar et al. (2020), Özlem Dursun-de Neef and Schandlbauer (2021) and Afonso and Pereira (2022) focus on the Covid-19 pandemic. Generally, all these papers find out that ex-ante capitalisation is playing an important role in the transmission of the unconventional monetary policies. Also, the pandemic economic shock is quite different from the previous economic crisis due to the increase in bank regulation and supervision as well as that it was accompanied by a market crash occurring in late February 2020.

In order to evaluate the effect of the PEPP on bank lending, this master thesis uses three hypotheses, where for the first two, an OLS-regression model is used, while for the third - the difference-in-differences analysis is performed.

The first hypothesis was that PEPP indirectly affected the bank lending channel by stabilising the market conditions in Europe, which were the overall stress in the markets, the average returns of the financial institutions as well as the Stoxxx Europe 600 index, and the yield spread over the OIS rate. Furthermore, the results of the regression analysis show that after the initiation of the PEPP, the change in total equity coefficient increases compared to the coefficient prior to the announcement of the program, thus, the first hypothesis was accepted.

In the second hypothesis, the other two ECB measures, the LTROs and the loosening capital requirements, were included in the regression analysis to check whether the increase in the bank lending was solely due to the PEPP or a combination of all the measures. In this regard, the second hypothesis suggested that the increase was a result of two of the instruments. The analysis' results indicated that apart from the purchase programme, the loosening of capital requirements was also contributing to the hike in the bank lending, while the result for the LTRO was not significant and negative. Only when adding the robust standard errors, it becomes significant on the 10% level, but the coefficient is very low and negative. Hence, the second hypothesis was also accepted.

Last but not least, the third hypothesis examined the role of ex-ante capitalisation on the responses of the banks, by checking whether better-capitalised banks increase their lending more compared to their weakly-capitalised peers by using the DiD analysis. However, this hypothesis was rejected, since the results pointed out that weakly-capitalised banks actually increase their lending more following the PEPP introduction.

Finally, these results strongly suggest that even though the Pandemic Emergency Purchase Programme did not have an exclusive and direct effect on bank lending, it generally managed to affect bank lending in Europe during the Covid-19 pandemic positively.

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