

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

**“Has Banking Union managed to make euro banks
safer?”**

verfasst von / submitted by

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angestrebter akademischer Grad / in partial fulfillment of the requirements for the degree of

Master of Science (MSc)

Wien, 2018 / Vienna 2018

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	A 066 914
Studienrichtung lt. Studienblatt /degree programme as it appears on the student record sheet:	Masterstudium Internationale Betriebswirtschaft
Betreut von / Supervisor:	Univ.-Prof. Dipl.-Vw. Thomas Gehrig, PhD

ABSTRACT

This thesis investigates changes in the performance of euro banks supervised by the Banking Union, compared to “OTHER-EU” and “NON-EU” banks between January 2008 and December 2017. The methodology is divided into two parts, each following one priority outlined by the Single Supervisory Mechanism (SSM), namely profitability and risk management. Since its establishment on November 2014 Banking Union has worked towards achieving safer and more resilient euro banking system. However, the results of this thesis showed supervised banks experiencing the slowest recovery of its still declining profitability. In contrary to this, banks outside the EU recorded the best performance, and in 2016 first positive growth rates in retail and corporate loans, total assets, total deposits as well as in net income. In addition to this, the second part of the thesis determined Banking Union as the main driver behind rising conditional systemic riskiness in Europe. Thereby, the Eurozone also hosts the most systemically risky countries and banks. To conclude, despite the work of Banking Union, the performance of supervised banks still cannot be considered as safer or as stronger compared to other European banks.

ABSTRACT (GERMAN)

Diese Masterarbeit analysiert Änderungen in der Performance von Euro-Banken im Vergleich zu den anderen EU Banken und Banken ausserhalb der EU im Zeitraum von Januar 2008 bis Dezember 2017. Innerhalb von zwei methodologischen Bereichen wird jeweils eine SSM-Aufsichtspriorität untersucht, und zwar die Bestimmungsfaktoren der Ertragskraft und das Risikomanagement. Seit ihrer Gründung im November 2014 strebt die Bankenunion nach einem sicheren und stärkeren Euro Bankensystem. Jedoch zeigen die ersten Ergebnisse eine schwache Entwicklung des Euroraums und dessen noch immer sinkender Ertragskraft. Im Gegensatz dazu konnten sich die Banken ausserhalb der EU am schnellsten erholen und zeigten 2016 ein positives Wachstum in Privat- und Unternehmenskrediten, im Aktivvermögen, in Gesamteinlagen wie auch in der Profitabilität. Darüberhinaus wurde im zweiten Teil dieser Arbeit die Bankenunion als Haupttreiber des bedingten steigenden systematischen Risikos Europas ermittelt. Zudem befinden sich gerade in der Eurozone jene Staaten und Banken mit dem höchsten systematischen Risiko. Somit kann festgestellt werden, dass die Performance der beaufsichtigten Banken weder als sicherer, noch als besser im Vergleich zu den anderen Banken Europas dargestellt werden kann.

ACKNOWLEDGMENTS:

Herby I would like to thank my supervisor, Univ.-Prof. Thomas Gehrig, Ph.D., for his support and patience throughout all stages of my work on this thesis. Many meetings and long discussions made me interested in the empirical work and motivated me to start one of my own. I also thank him for the opportunity to work at the Faculty of Finance. In this regard, I further thank Dr. Maria-Chiara Iannino, Ph.D., for her kindness and support in my endless econometric questions as well as to Univ.-Prof. Mag. Dr. Andrea Gaunersdorfer and Univ.-Prof. Mag. Dr. Christian Keber for their support and interesting discussions. Such a positive surrounding encouraged me to learn more and to dive into new fields, which in the end led to this thesis.

Furthermore, I wish to thank my friends, Alen Horvat Vrabl for his endless support and many discussions on risk measures, Ivan Popovic for his admirable technical assistance in R, Rebecca Summereder and Nermina Mujabasic for their excellent formatting and proofreading skills, Tanja Simeonovic, Anja Vidakovic and Emina Delalic for their finest feedback.

I also thank Mag. Daniel Obszelka for signing me in his course, Statistical Programming and Thomas Hillebrand for his technical assistance in R. I appreciate the time of Univ.-Prof. Dipl. Ing. Dr. Erhard Reschenhofer for answering my questions on volatility models. Special thanks to Soni Himanshu (SNL Financial) for his fast support with the data.

Last but not the least, I am grateful to my friends in Vienna and in Tuzla for their support.

Finally, I would like to thank my dear parents for their support throughout my studies.

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LIST OF ABBREVIATIONS

APP	Asset Purchase Programme
CET	Common Equity Tier
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EDIS	European Deposit Insurance Scheme
ES	Expected Shortfall
ESRB	European Systemic Risk Board
FSR	Financial Stability Review
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GSIB	Global Systemically Important Bank
IMF	International Monetary Fund
JST	Joint Supervisory Team
LRMES	Long Run Marginal Expected Shortfall
LSI	Less Significant Institution
MES	Marginal Expected Shortfall
NCA	National Competent Authority
NPL	Non-Performing Loan
SI	Significant Institution
SREP	Supervisory Review and Evolution Process
SRM	Single Resolution Mechanism
SRISK	Systemic Risk
SSM	Single Supervisory Mechanism

1. INTRODUCTION

The establishment of Banking Union, an idea initiated by the European Commission (EC), represents the most important milestone after the completion of Economic and Monetary Union. The main goal of Banking Union is to make Eurozone banks more resilient and to prevent further financial and contagion troubles in Europe, while “*making sure banks finance economic activity and growth*”¹. As such, the union has two main tasks. One, to take over the supervision from national banks over systemically important banks and to keep them under unified control, and second, to take over the responsibility over troubled banks from taxpayers and sovereigns. Thereby, Banking Union is aimed to provide more transparent, unified and safer banking system. Since its establishment on 4th November 2014, those goals have remained the same and the EC strongly believes that financial institutions will be stronger and more immune to shocks within Banking Union.²

The recovery process began already at the end of 2013 during the preparation for the establishment of Banking Union. At that time the European Central Bank (ECB) together with national competent authorities (NCAs) implemented its first comprehensive assessment of 130 financial institutions. As a result, already in the following year, 12 out of 25 troubled banks reduced their capital shortfall from EUR 25 billion to EUR 10 billion.³ Since then, regular financial reviews issued by the ECB have mainly reported a continuous progress in strengthening Eurozone banks’ balance sheets despite many adverse shocks.⁴

Thereby, a lot of attention has been placed on increasing capital buffers towards more resilient banking system, which is especially related to the work of Single Supervisory Mechanism (SSM) of Banking Union.⁵ In 2016, the outcome of their second SREP tests presented yet another pace of Banking Supervision for which Supervisory Board even stated that, “...*this cycle of supervisory reviews shows that European banking supervision is making our banks safer*”⁶. In the same year, the European Banking Authority (EBA) tested 51 globally significant EU financial institutions and confirmed continued improvement.⁷

Financial markets on the other hand rather disagreed with that picture, and as a result in 2016 some of the largest banks experienced serious market penalizations⁸, whereas their stock prices continued performing below US and world banks throughout 2017. Despite positive perspective of the EU institutions, looking more into details of financial stability reviews (FSRs) published by the ECB (2016, 2017), it can be noticed that the condition of euro area banks is nothing but only modestly improving, while facing strong headwinds. In fact, 2016

1 EC, *Press Release*, (2011), p.1-3

2 EC, *Fact Sheet*, (2015), p. 1-7

3 ECB, *Banking Supervision, ECB Annual Report on Supervisory Activities*, (2014), p.9

4 ECB, *Financial Stability Review*, (2015), p. 59; (2017), p.66; (2017a), p.63

5 ECB, *Banking Supervision, ECB Annual Report*, (2016), p.6-7

6 ECB, *Press Release*, (2016), <https://www.bankingsupervision.europa.eu/press/pr/date/2016/html/sr161215.en.html>

7 ECB, *Press Release*, (2016), <https://www.bankingsupervision.europa.eu/press/pr/date/2016/html/sr160729.en.html>

8 See Chapter 3.1, Figure 2.

was in particular tough. Supervised banks recorded decreasing revenues followed by further deteriorated profitability. Price to book (P/B) ratios reached low levels below one (in summer 2016: 0.5) and return on equity (ROE) fell below cost of income. Later in the first half of 2017, profitability somewhat improved, mainly driven by non-interest income. Median P/B ratio recovered to 0.9 and ROE grew by nearly 1.5% compared to 2016. Yet, banks' core interest and fee revenue grew by only 2%. Apart from low interest rate environment, banks are still facing high loan impairment costs due to large size of NPLs and poor progress in cost-efficiency, which in overall only supports the poor profitability.⁹ It seems that improved capital buffers represent the sole argument in the favor of more resilient financial system. However, the outcome of most recent SREP stress test was for the first time recognized with a more concerning view.¹⁰

In addition to the prospects of continuing low profitability, three other priority areas, including credit risk, risk management and multiple risk dimensions guide the work of Banking Union.¹¹ Thereby, the systemic risk has received minor attention, even though it can be triggered by each of the key risks¹² to the financial stability, while in their poorest conditions. Currently 48% of 103 significant euro institutions are keeping banking sector weaker in terms of business, governance, capital or liquidity coverage risk, and 0% of banks raise no concern in any of the mentioned aspects, compared to 2% in 2016.¹³ Furthermore, based on the data from the first quarter of 2017 and 5 market risk measures, including beta, volatility, distance to default, Marginal Expected Shortfall and SRISK, euro banks are determined as riskier compared to Nordic, UK or US banks. At the same time, all indicators showed a clear improvement on their individual levels during the past year. Finally, the study also estimated a positive impact of a changed monetary policy on lowering Eurozone capital shortfalls in a scenario with 40% market decline, however, only for the period of 2013 and 2014.¹⁴

Aside from that general information on key risks and capital buffers, there still seems to be insufficient information¹⁵ provided on euro significant banks, including the conflict of opinions between financial markets and EU financial officials. In particular, how are supervised banks operating on country-based levels, or how the overall condition has changed with the arrival of Banking Union, compared to significant banks outside the supervised scope, remains open. Therefore, this thesis aims to offer a more detailed analysis on European banking sector for the period between 2008 and 2017, while investigating the effects of Banking Union. In fact, the methodology will be divided into two parts, each focused on one

9 ECB, Financial Stability Review, (2016a), p.67; (2017a), p.65-66

10 Banking Supervision, *Press Release 1*, (2016)

11 Banking Supervision, *Supervisory Priorities*, (2018), p. 1.

12 ECB, Banking Supervision, *ECB Annual Report*, (2017) p.9

13 Resti A., *Review of 2017 SREP Results*, (2018), p.9

14 ECB, *FSR*, (2017a), p.11; p.64

15 EBA, compared to Single Supervisory Mechanism (SSM), does publish more results in terms of rankings, but which are based on complex hypothetical scenarios, further based on macroeconomic downturns. All changes in financial-macroeconomic variables need to be assumed based on four defined hypothetical systemic shocks and the implementation of calculations requires many banks' non-publicly available data.

top priority outlined by Single Supervisory Mechanism (SSM) of Banking Union, namely profitability and risk management.

In particular, in the first part, movements among different variables from income statements and balance sheets are observed. In the second part, a stress testing based on the methodology of Brownlees and Engle (2017) is recreated to estimate the level of systemic risk. Euro area banks are currently estimated as adequately¹⁶ capitalized, despite EUR 1.092 trillion¹⁷ in non-performing EU loans or EU 800 billion¹⁸ in the Eurozone. Apart from profitability and capital shortfalls, the results of this thesis will offer more information on the banks' market equity losses relative to market expected shortfalls.

Most importantly, the same approach will be implemented not only on euro area banks, but also on a sample of listed European banks, not supervised by the Banking Union. In fact, the main contribution of this thesis lies in a comparison of outcomes from Methodology I and Methodology II, between three samples of banks, each representing one area: Banking Union, OTHER-EU and NON-EU area.

2. ABOUT BANKING UNION

Banking Union is mandatory for all euro area states and consists of 19 members or so called EA-19: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. If other EU Member States choose to join the Banking Union, they need to join all three pillars: the Single Supervisory Mechanism (SSM), the Single Resolution Mechanism (SRM), and European Deposit Insurance Scheme (EDIS), with their foundations established within Single Rulebook. Such framework was initially set up by the European Banking Authority (EBA), which was established in 2011 when it took over all existing responsibilities and tasks of the Committee of European Banking Supervisors.¹⁹

Banking Union identifies different risk factors to the euro area financial stability such as the ultra-low/negative interest rate environment, high levels of non-performing loans (NPLs) and lackluster economic growth across euro area countries, EU geopolitical uncertainties, the reactions of banks and markets to new regulation, a potential reversal of risk premia in financial markets, the situation in emerging market economies, EU fiscal imbalances, cases of misconduct by banks, developments in real estate lending markets, cybercrime and IT disruptions and non-bank competition.²⁰

Based on those subgroups, the SSM furthermore defines its priorities for a future guidance and after 3 years of supervision, three priorities remained the same: 1) credit risk, 2) risk management and 3) the business model and profitability drivers. As of this year, SSM added

¹⁶ ECB, *Financial Stability Review*, (2017a), p.68

¹⁷ EU Parliament, *NON-Performing loans in the Banking Union*, (2017), p.1

¹⁸ ECB, *FSR*, (2017b), p. 69

¹⁹ ECB, Single Supervisory Mechanism, <https://www.bankingsupervision.europa.eu/about/thessm/html/index.en.html>

²⁰ ECB, Banking Supervision, *ECB Annual Report*, (2016) p.10-11; (2017) p.10-11; (2018) p.9-10

the fourth priority comprising multiple risk dimensions, including Brexit preparations and Stress Testing for 2018. Within its focus on credit risk, SSM continues to provide banks and the Joint Supervisory Team with the necessary support and guidance on dealing with non-performing loans. In terms of risk management, banking supervision is mostly focused on the review of banks' compliance with the Basel Committee on Banking Supervision's principles for effective risk data aggregation and risk reporting (BCBS 239). It also reviews Pillar 1 internal models as well as ICAAP and ILAAP processes as part of the capital and liquidity management. When it comes to the matter of profitability among supervised banks, general information can be found in Financial Stability Reviews (FSRs), published by ECB and Annual Reports on Supervising Activities, published by ECB and Banking Supervision.²¹ Later in the thesis, the section "Within Banking Union" covers most important developments related to the work on those priorities.

2.1 SINGLE SUPERVISORY MECHANISM (SSM)

Council Regulation (EU) No 1024/2013 issued by European Parliament, established the SSM by conferring policies regarding the cooperation and division in staff responsibilities between the ECB and NCAs. In particular, the ECB became automatically responsible for direct supervision of 124 significant credit institutions (known as SIs) across euro members, together with other banks of volunteer countries. In this way, it added a new macro prudential function in addition to its usual monetary responsibilities. Moreover, under the conditions of SSM Regulation, the NCAs are ought to supervise 3500 less significant financial institutions (LSIs), which fall under the scope of the SSM but also to further assist ECB. The supervision of each significant bank is carried out by Joint Supervisory Teams (JSTs), comprising staff of the ECB and the national supervisors. The significance is in general determined by (a) size, (b) importance for the economy of the Union or any participating Member State, or (c) significance of cross border activities, or because it is part of a supervised group that fulfills at least one of these criteria.

Since its establishment, Single Supervisory Mechanism has worked towards achieving: 1) safe and sound European banking system, 2) increased financial integration and stability and 3) consistent supervision. In overall, its purpose is to prevent another financial crisis by increasing the resilience of banks.²²

The main tool of the SSM is called the Supervisory Review and Evaluation Process (SREP). It is a common methodology applied to all significant banks of the euro area showing how those stand with respect to capital requirements and risk factors. In 2014, the Basel Committee initially introduced the SREP. The SSM has so far performed 4 SREP stress tests, which consisted of: 1) Business Model assessment, 2) Governance and risk management assessment, 3) Assessment of risks to capital and 4) Assessment of risks to liquidity and funding. Based on the results of stress testing, the SSM further defines capital requirements for the following year regarding, 1) Quantitative capital measures, 2) Quantitative liquidity

²¹ Banking Supervision, *Supervisory Priorities*, (2018), p. 1-5.

²² ECB, *Guide to Banking Supervision*, (2014a), p.5.

measures and 3) Other supervisory measures for each bank individually. As the risk profile of a bank increases, so does the likelihood of the SSM adding more quantitative requirements.²³

Next to SSM, the EBA also conducts a microprudential bottom-up stress test of globally significant European financial institutions and the results are available to the public. The approach of the exercise is a constrained bottom-up, meaning banks themselves are required to project the impact of the defined scenarios before submitting results to national authorities who then report to the EBA. Top-down models cannot be manipulated by banks, but they are also prone to model risk. The common methodology assesses solvency and covers all main risk types including: credit risk and securitization, market risk, sovereign risk, funding risk and operational and conduct risks.²⁴

Some of the top euro-area banks under the ECB's direct supervision are: BNP Paribas, Deutsche Bank, Societe Generale, BBVA, UniCredit, Santander and Credit Agricole. Top EU banks not supervised can be found in the United Kingdom (HSBC, Barclays, Lloyds, RBS and Standard Chartered), Switzerland (Credit Suisse), Sweden (Nordea) and Denmark (Danske Bank). However this does not count for their branches operating in the euro area.

2.2 EXCURSION ON SREP REQUIREMENTS

When it comes to standard capital measures, euro financial institutions are required to meet the same level of minimum Common Equity Tier 1 (CET1) or Pillar 1 of 4.5%. This level has also remained the same after the 2017 SREP results. However, the sum of that minimum and Pillar 2 Requirements (P2R), called Tier 1 Capital, must be at least 6% of risk-weighted assets of all time. Moreover, minimum Total Equity Capital is ought to be at least 8% of risk-weighted assets of all time, a requirement that in fact has existed since 1988. The difference between the total capital requirement and the Tier 1 requirement can be met with Tier 2 and higher forms of capital.²⁵

Additional requirements above the 4.5% are defined by the SSM for each bank independently depending on the SREP outcomes, and as such requirements usually vary among banks. In particular, depending on the qualitative outcome of the stress test, minimum P2R (additional Tier 1) for 2018 amount to 2%, as in 2017 (2016: 3.1%). Pillar 2 Guidance level drops to 1.6%, but on the other hand, banks need to meet 0.5% for Systemic Buffers, more than in 2017 (0.3%). A bank that fails to meet its Pillar 1, Pillar 2 and CBR, whose minimum as of 2018 amounts to 9% (2017: 8.3%), is prohibited from distributing more than the MDA amount.²⁶

Non-obligatory P2G level is partially based on the quantitative impact of the adverse scenario. The maximum Distributable Amount (MDA) is the bank's distributable profit (e.g. dividends, AT1 payments) multiplied by a factor ranging between 0.6 and 0 depending on how much

²³ ECB, Banking Supervision, *SSM SREP Methodology Booklet*, (2017a), p.15

²⁴ EBA, *EU-Wide Stress Test: Methodological Note*, (2016), p.13

²⁵ Basel III: *Finalizing post-crisis reforms*, (2017), p. 141

²⁶ ECB, Banking Supervision, *SSM SREP Methodology Booklet*, (2017a), p.5.

CET1 capital is missing to meet the Combined Buffer Requirements (CBR). Capital buffers consist of the Capital Conservation Buffer (level depends on the CET1 scale), Cyclical Buffers (0-3%), buffers for O-SII and G-SII institutions and the systemic risk buffer (up to 0.5%).²⁷

Besides capital measures, liquidity coverage also plays an important role in safeguarding the banking sector. According to Basel Committee it should “... *help ensure that global banks have sufficient unencumbered, high-quality liquid assets to offset the net cash outflows it could encounter under an acute short-term stress scenario.*”²⁸ Moreover, this coverage aims at ensuring sufficient stock of cash or convertible assets to meet liquidity needs for the period of 30 calendar days. It is determined as the percentage of the value of the stock of high quality liquid assets (HQLA) in the total net cash outflow over the next 30 days. Minimum LCR requirement for 2016 was 70% and in 2017 is 80%.²⁹

Finally, all of these SREP measures actually build on “BASEL III” international standards developed by Basel Committee in Banking Supervision, which also aims to strengthen the regulation, supervision and a risk management of the banking sector. Basel III is the expanded version of International Convergence of Capital Measurement and Capital Standards document (Basel II). In addition to focusing on strengthening capital measures, it has introduced global liquidity standards. Unlike Basel II, Basel III tends to account not only for institutional risk but also for systemic risk of the banking sector as a response to 2008 financial crisis. Capital measures came as first within Basel I in 1988. In 2004, Basel II was introduced and it offered new guideline on risk managing including market, credit and operational risk.³⁰

2.3 SINGLE RESOLUTION MECHANISM (SRM)

Integrated crisis management framework was published under the regulation No 806 in 2014 by the European Parliament and the European Council, though became fully operational on 1st January 2016. Its Single Resolution Board (SRB) coordinates the insolvency proceedings, or so called resolution of troubled banks within the rules of Bank Recovery and Resolution Directive (BRRD). The primary aim of SRM is to ensure the resolvability of banks without exposing taxpayers to any losses. If the financial status of the bank is crumbling, the ECB is granted approval to act quickly and make recapitalization plans.

However, if the bank of public interest is declared as “failing or likely to fail” by the ECB, the resolution begins. At this point, the tools such as, sale of the business to another bank, creation of a temporary bridge bank for critical assets, write-down of debt or its conversion into shares can be used. In the cases where shareholders and creditors of the bank have faced losses equal to 8% of their liabilities, the use of public funds is considered based on the

²⁷ ECB, Banking Supervision, *SSM SREP Methodology Booklet*, (2017a), p. 28; 30; 39.

²⁸ Basel III, *A global regulatory framework for more resilient banks and banking systems*, (2011), p. 17.

²⁹ Basel III, *The Liquidity Coverage Ratio and liquidity risk monitoring tools*, (2013), p.1.

³⁰ BIS Chronology, <https://www.bis.org/about/chronology.htm?m=1%7C4%7C550>

principle of “burden sharing”, under the supervision of the EC.³¹ The Single Resolution Fund covers up to 5% of banks’ liabilities. The Single Resolution Board collects EUR 6.6 billion annually and as of July 2017 the Fund reached EUR 17 billion in total.³²

2.4 EUROPEAN DEPOSIT INSURANCE SCHEME (EDIS)

Finally, the establishment of the third and so far the last pillar was proposed and adopted in 2015, however, the first phase of further implementation has not started yet. The goal of EDIS would be to protect retail deposit accounts of up to EUR 100.000 per depositor per institution, across Banking Union in case of insolvency or resolution. Such transition from national deposit-guarantee schemes to a central scheme provides governments with additional support in case of serious local shocks.³³

3. WITHIN BANKING UNION

3.1 PROFITABILITY

The prospect of continuing low profitability has been highlighted³⁴ as a key risk to financial stability. In 2017, growth in revenues, mainly supported by non-interest income, remained weak. Cost efficiency has not improved since 2010, while cost to income as well as cost to assets stand at the unfavorable level compared to many international peers. On aggregate level, euro area underperformance is still highly determined by high loss provisions. Especially endangered are significant institutions operating in fixed-rate countries. Modest loan growth has not accelerated yet, while debt issuance dropped in 2017 compared to 2016. Banks have increased loan exposure to the borrowers outside Europe, but declined in the area of emerging Europe. Sovereign debt was reduced and one third of that decline was accounted for by the exposures towards euro area sovereigns. Cross-regional differences in the profitability have partially varied due to different pace in economic recovery and in the level of non-performing assets. For instance, Germany and France have suffered from subdued operating profits while Italy and Portugal have faced high impairment costs. In overall, when comparing past Financial Stability Reviews, it can be noticed how major issues have remained the same and their progress slow.³⁵

Additional information on banks can be found in their publicly (websites) available financial statements. Table 1 summarizes such data, in particular yearly changes in revenues and earnings for some of Eurozone biggest banks in terms of assets. Highly fluctuating numbers put into doubt the consistency of the ongoing recovery among globally significant banks, but also the recovery of other smaller euro-area institutions.

31 Speech by Ignazio Angeloni, (2017), <https://www.bankingsupervision.europa.eu/press/speeches/date/2017/html/ssm.sp170629.en.html>

32 Single Resolution Board, *Press Release*, (2017), <https://srb.europa.eu/en/node/362>

33 European Commission, https://ec.europa.eu/info/business-economy-euro/banking-and-finance/banking-union/european-deposit-insurance-scheme_en

34 Speech by Julie Dickson, (2016), <https://www.bankingsupervision.europa.eu/press/speeches/date/2016/html/se161128.en.html>.

35 ECB, *Financial Stability Review*, (2017), p.68-84; (2017a), p.62-80

Eurozone banks are challenged with new monetary measures, initially aimed to boost the economy. Since mid-2014, several central banks around the world have introduced unconventional policies to provide additional economic stimulus, including Danmarks Nationalbank, the European Central Bank, Sveriges Riksbank, the Swiss National Bank and most recently the Bank of Japan. Current marginal lending rate³⁶ in the Eurozone amounts at low 0.25%, the deposit rate at negative 0.4% and banks' profitability is still defined as troubled. Borio, Gambacorta and Hofmann (2015) argue that in this sense profitability is still insufficiently researched area. Their study showed positive correlation between the high interest rates and the return on equity (ROA).³⁷ Lower rates also turned out to be positively correlated with the movements in the euro area equity valuations³⁸, what partially explains 2016, when banking sector experienced surged stock prices and some banks their lowest price-to-book ratios. Moreover, banks faced clear gap between ROA (5%) and cost of equity (10%), which endangered their access to funds as well as to supply abilities.³⁹ Throughout 2017, stocks of biggest European financial institutions continued performing below US and world banks (see Figure 1). Nevertheless, according to the ECB: *"Recent monetary policy measures have so far had a neutral impact on bank profitability, as the effects on different components of bank profitability have largely offset each other."*⁴⁰

To some level market sentiment towards European banks seems to have slightly recovered due to more opportunistic expectations about the banks' earnings outlook and the future level of short-term rates, as well as steeping yield curve (difference between the German ten-year government bond and the three-month EURIBOR). However, given that analysts' forecasts can be prone to herding behavior, such market expectations may as well simply be a result of intrinsic interest in a positive stock market outlook.⁴¹

Table 1: Yearly changes in revenues and profits of biggest euro financial institutions

	BNP Paribas (FR)	Credit Agricole (FR)	Deutsche Bank (DE)	Santander (ES)	Societe Generale (FR)	BPCE (FR)	UniCredit (IT)	ING (NL)	BBVA (ES)
REVENUES									
Q2 2017	3%	4%	10%	0%	26%	5%	0,4%	3%	6%
Q1 2017	4%	7%	9%	12%	5%	4,9%	12%	8%	4%
Q4 2016	1%	3%	6%	3%	1%	1%	0,3%	10%	1%
Q3 2016	2%	12%	3%	2%	0,06%	0,4%	2%	9%	4%
Q2 2016	2%	1%	20%	6%	2%	2%	6%	9%	9%
Q1 2016	2%	4%	22%	7%	3%	4%		6%	13%
PROFITS									
Q2 2017	6%	8%	n.m.	5%	28%	-6%	4,2%	6%	1%
Q1 2017	4%	33%	143%	14%	12%	9,7%	41%	9%	69%
Q4 2016	6%	10%	0,1	1%	41%	3%	n.m.	8%	28%

36 ECB, https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

37 Borio, C., L. Gambacorta and B. Hoffman, *The influence of monetary policy on bank profitability*, (2015), p.16-17

38 ECB, *Financial Stability Review*, (2017), p.70

39 ECB, FSR, (2016a), p.67

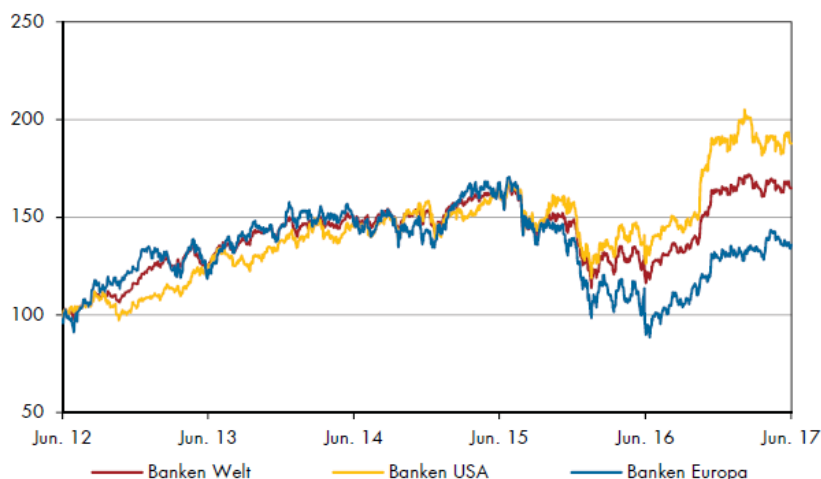
40 ECB, FSR, (2016a), p.72

41 ECB, FSR, (2017), p.71

Q3 2016	6%	25%	n.m.	1%	2%	2,7%	17%	27%	n.m.
Q2 2016	5%	7%	n.m.	4%	42%	21%	6%	262%	8%
Q1 2016	4%	9%	58%	5%	7%	11%	21%	29%	54%

Source: Companies' quarterly financial statements. Note: All figures available on companies' websites. Numbers in red color are declines. n.m. stands for non-measurable. n.m. in red color means non-measurable decline and in blue color means an increase above 300%.

Figure 1: Movements among indices



Source: Raiffeisen Equity Research, Vienna, 2017

3.2 CREDIT RISK

According to the ECB, banks are in overall adequately capitalized. In order to provide euro area banks with necessary financial support, the ECB expanded its asset purchase programmes (APP) at the same time when Banking Union was established. This expansion included asset-backed securities programme and a third covered bond purchase programme. Afterwards, in 2015, the ECB set another fund for buying mainly government bonds, called public sector. With EUR 1.7 trillion, this is the largest fund considering that as of July 2017 holdings in all programmes amounted at EUR 2.01 trillion. Thereof Germany (EUR 9.8 trillion) and France (EUR 9.3 trillion) received the biggest amounts, yet proportionally still less than Italy (EUR 7.7 trillion) and Spain (EUR 5.1 trillion) given that French banks account for EUR 7.4 trillion in assets, followed by Germany (EUR 4.4 trillion), Spain (EUR 3.4 trillion) and Italy (EUR 2.4 trillion)⁴². The latest APP was established in 2016 and has been focused on buying corporate sector bonds. Obviously, all four funds flow directly or indirectly into euro banks' accounts. APPs will be maintained until the inflation reaches maintainable level of close to 2%. Furthermore, the ECB has made securities purchased under public sector and covered bond programmes available for lending against cash or other securities. Apart from that, euro financial institutions have been supported with other non-standard monetary policy measures such as LTROs (long term refinancing operations) and TLTROs (targeted longer-term refinancing operations) financing of up to three and five years.⁴³

⁴² Gehrig, T. et al., *European Banking Supervision: The first eighteen Months*, (2016), p. 15

⁴³ ECB, <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>

As a result, already in 2016 some of the biggest euro area banks showed improved average ratio in non-performing loans (see Figure 3 in the Appendix), followed by improvements in loan loss provisions. For instance, Deutsche Bank, managed to keep its NPL ratio below its peers and its provisions for credit losses in 2017 declined by more than 50% after an increase of 45% in 2016.⁴⁴ The same was the case with Commerzbank. While group's loan loss provisions increased by 29% in 2016, in 2017 they fell by 13%.⁴⁵ In contrast to this, Banco Santander with 3.93% has higher NPL ratio, yet its group loan loss provision was kept almost the same given the minor reduction of 5.8% in 2016 and 4% during 2017.⁴⁶ At the end of 2017, NPL ratio of Erste Group fell from 4.9% to 4.0% while its provisions were reduced by 73% already in 2016.⁴⁷

European institutions were indeed more successful with placing their non-performing assets on the adequate market. However, the overall amount is still high. In particular, the stock of NPLs of significant institutions covered by the SSM decreased from EUR 920 billion in 2016 to EUR 800 billion in June 2017. With above 5%, the NPL ratio stands better than last year (Q3 2016: 6.49%; Q1 2016: 6.85%) or in 2015 when it stood at 7.31%, yet it is still significantly higher compared to 1.5% in the US and Japan.⁴⁸

In fact, based on the data from 2016, within the EU there is still some EUR 1,092 trillion in NPLs. The NPL ratio of 5.1% improved from 5.7% in 12/2015 and 6.5% in 12/2014.⁴⁹ Due to uneven distribution of NPL among the EU members, the European Commission has recently identified three groups of Member States based on their individual states: 1) BE, DE, DK, FI, FR, NL, SE, UK, with low level of the NPL and no significant rise during the crisis; 2) AT, CZ, EE, ES, HU, LT, LV, PL, SK are the states with low level of the NPL but have reported high rise during the crisis and 3) BG, CY, EL, HR, IE, IT, MT, PT with currently high levels. Thereby, Cyprus (44.8%) and Greece (45.9%) face the highest the NPL ratios, followed by Portugal (19.5%), Italy (15.3%) and Slovenia (14.4%). However, if considering absolute numbers, with EUR 276 billion (2015: EUR 330 billion), Italy actually accounts for one fifth of EU bad loans. Second placed is Spain with EUR 141 billion and third-placed is Greece with EUR 148 billion.⁵⁰

As a result, as the EBA pointed out during the 2017 CIRSf Conference: “...*there are calls for acknowledging the exceptional nature of the crisis and for a public intervention conducted under a temporary exemption from current rules*”⁵¹. This described the current sentiment on the work of Banking Union initiated by the latest happenings in the southern Europe. First it was the oldest financial institution, Monte dei Paschi di Siena, which was supported by the

44 https://www.db.com/ir/en/download/Release_4Q2016_results.pdf, p. 4.

45 https://www.commerzbank.de/media/aktionaere/service/archive/konzern/2018_2/q4_2017/2017_Q4_Analysts_Presentation.pdf, p.12.

46 https://www.santander.com/csgs/Satellite/CFWCSancomQP01/en_GB/pdf/Memoria_Consolidada_Grupo_Santander_31122017_ENG.pdf

47 https://www.erstegroup.com/content/dam/at/eh/www_erstegroup_com/en/Investor%20Relations/2017/News_en/IR_News_170228en_FY16.pdf, p.2.

48 ECB, Banking Supervision, *ECB Annual Report*, (2017), p.17.

49 European Parliament, *Non-Performing Loans in the Banking Union*, (2017), p.1

50 European Commission, *A Macroeconomic Perspective on Non-Performing Loans*, (2017), p. 1-15.

51 Speech by Andrea Enria, (2017),

<https://www.eba.europa.eu/documents/10180/1863663/Andrea+Enria's+speech+at+the+CIRSf+Annual+International+Conference+2017.pdf>

government for the third time in December 2016. In June of the following year, Intesa Sanpaolo acquired good assets of two “failed, likely to fail” banks, namely the Veneto Banco and Popolare Vicenza. Not only did Intesa receive additional support from the Italian government to keep her capital ratios stable (EUR 5.2 billion) due to this investment expenditure, but also the state has guaranteed to cover bad loans of both troubled banks (EUR 12 billion). In these cases, Banking Union did not meet its objectives of providing supranational support and most notably, the burden was not shared among Member States. In fact, the latest report of ECB on financial integration confirmed low contribution of euro area members to smoothing of country-specific stocks.⁵² In contrast to this, in the US not more than a third of any asymmetric shock is covered by the government.⁵³

3.3 SREP STRESS TESTING IN 2016 AND 2017

Results of 2017SREP showed that out of some 103 significant institutions from 19 countries, there are no riskless banks without concern in terms of their business, governance, capital or liquidity coverage risk (2016: 2%). Those banks usually receive the highest SREP score of 1. At the same time, 52% (2016: 47%, 2015: 44%) were identified with a low level of such exposure; 36% (2016: 40%, 2015: 43%) with a medium concern, while 12% (2016: 11%, 2015: 11%) of banks received the lowest score of 4 and as such pose the highest level of risk to the viability of the institution. These differences between two periods suggest rather minor movements towards less troubled banking sector. There are still 48% of significant financial institutions that keep banking sector weaker.⁵⁴

Given the results of SREP 2017, the overall CET1 demand (without systemic buffers), which in 2017 amounted at 10.1%, remained the same also for the current 2018 year. This suggests no negative change in the risk profile of the banking sector. Banks with the highest risk concern are required to keep the same CET1 as in 2017, 11.6% (2016: 11.3%). However, financial institutions of low and medium risk contribution have to keep CET1 at 9.6% (2016: 9.3%, 2015: 9.4%) and 10.4% (2016: 10.3%, 2015: 10.2%), respectively. In both cases, this is more than last year, which means that more banks have received additional rather than fewer requirements (excluding systemic buffers).⁵⁵

The importance of sufficient capital was proved in the EBA adverse scenario from 2016, where it was shown that in case CET1 average ratio falls down to 9.4% from 13.2% (weighted average in 2015), and this would result in a net cumulative loss over the three years.⁵⁶ It is however also well-known that the US bank Lehman Brothers had a high Tier 1 ratio of 11% before the financial crisis in 2008 despite the fact that the bank failed and initiated systematic shock.⁵⁷ Similarly to the SSM, the latest FSR from May 2017 stressed the

⁵² ECB, *Financial Integration in Europe*, (2017), p.4.

⁵³ Asdrubali, P. and Kim, S., *Dynamic risk sharing in the United States and Europe*, (2004), p. 809.

⁵⁴ ECB, Banking Supervision, *SREP Methodology Booklet*, (2016a), p. 4; (2017), p. 4.

⁵⁵ ECB, Banking Supervision, *SREP Methodology Booklet*, (2016a), p. 6; (2017), p. 6.

⁵⁶ EBA, *EU-WIDE Stress Test: Results*, (2016), p. 7

⁵⁷ <https://www.economist.com/node/15328883>

critical importance of completing the implementation of Basel III requirements in strengthening the resilience of the financial system.⁵⁸

3.4 2016 EU-WIDE STRESS TEST ⁵⁹

Unlike the Single Supervisory Mechanism, in 2016, the EBA carried out its microprudential stress test on a sample of 51 banks from 15 EU and EEA countries. Thereby, 37 countries were supervised by SSM and 14 came from other EU regions including, Denmark, Hungary, Norway, Poland, Sweden and the UK. The resilience of EU-banks was assessed under a common macroeconomic baseline and adverse scenario for the period of 2016 to 2018, based on the year-end 2015 figures. Materialized financial-macroeconomic shocks in adverse scenario were supposed to demonstrate reactions in capital ratios and in losses (profitability). In addition to results for CET1 capital, the EBA also reported results of the Tier 1 capital ratio and total capital ratio, as well as a leverage ratio for every year of the exercise.

With regard to key results, under a baseline scenario CET1 ratio would rise from 13.2% in 2015 to 13.9% in 2018. However, in the adverse scenario it would fall to 9.4% at the end of 2018. The fully loaded ratio would decrease from 12.6% to 9.2%. On the aggregate basis, for only 37 SSM banks fully loaded CET1 would fall from 12.2% to 8.9% by the end of 2018. Thereof, 14 banks in total would experience fall of more than 5%, including 4 banks (RBS, NRW Bank, Monte dei Paschi di Siena and Allied Irish Banks plc.) declining by more than 7%. Another four banks experienced worse outcome than in the adverse scenario of 2014 Stress Test, including Raiffeisen Landesbanken-Holding GmbH, HSBC Holding, Powszechna Kasa Oszczędności Bank Polski SA and OTP Bank Nyrt. Italian banks scored better than expected and Monte dei Paschi di Siena was the only bank in the total sample with negative capital in the results. Under the adverse scenario among UK banks, Royal Bank of Scotland had a biggest CET1 impact of -745 bps.

The biggest driver of such decline in capital ratio was recognized in a credit loss due to exposures in Italy, the UK, Spain and France. The cumulative credit losses in the adverse scenario amounted to EURO 349 billion, an impact of -370bps on the CET1 capital ratio. With regard to market risk, total aggregate losses in the adverse scenario would amount to EURO 8 billion due to substantial loss in 2016 of EURO 53 billion, (in 2015: positive income of 47 billion). 90% of those losses came from dropped values in assets available for sale, including sovereigns. Adverse scenario also showed that banks would generate positive profits by the end of 2018 but on aggregate level of three years a loss of EURO 90 bn. This is due to a strong decrease in net interest income, which would fall by EURO 68 billion by the same year.

Since December 2013, CET1 capital has increased by some EURO 180 billion for the banks in the EU sample. Regulators could confirm improved resiliency since the starting value for CET1 from 2015 stood above both starting points from previous stress tests (2011, 2014) and given the also the final average CET1 ratio in the adverse scenario increased.

⁵⁸ ECB, FSR, (2017), p.68

⁵⁹ Summary of EBA, (2016), *EU-WIDE Stress Test: Results*

3.5 SYSTEMIC RISK IN THE EURO AREA

One of the purposes of SREP and EU-wide stress testing is to avoid another systemic crisis. Thus, financial stability is nothing else but the absence of a systemic risk. It can be driven by any of the most important business segments, while being in their unsustainable poor conditions, such as low profitability, slow debt sustainability or poor liquidity. Therefore, those unwanted business circumstances are also defined as main threats to the wide financial stability.⁶⁰

Usually, in the next phase troubled banks transmit shocks until one bank fails, due to large capital shortfall, which leads them all into a financial crisis.⁶¹ In particular, such financial contagion is defined as a *"spread through risk and illiquidity in the financial sector, as liquidity-constrained banks transmit financial shocks to the real economy, thereby creating systemic risk (e.g., through bank transmission of fluctuations in investor sentiment)." ⁶²* Systemic risk is not only known for its "domino effect" but even more for its negative adverse effects on the system-wide economy⁶³, which was in particular evident in the example of 2008 financial crisis. International Monetary Fund and BIS define systemic risk as, *"a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and that has the potential to cause serious negative consequences for the real economy."*⁶⁴

Each of potential sources of systemic crisis can be further selected either as pronounced, medium-level or potential systemic risk. This depends on *"...the amount of the cumulated level of the risk, which is a combination of the probability of materialization and an estimate of the likely systemic impact of the identified risk over the next 24 months, based on the judgment of the ECB's staff."* As of May 2017, debt sustainability was revised upwards to "medium-level systemic risk" from a "potential systemic risk" status, leaving the liquidity risk as the only "potential systemic risk".⁶⁵

The risk of macroeconomic contagion makes regulators and governments concerned about the systemic risk. The European Systemic Risk Board (ESRB) in particular focuses on this matter and identifies four systemic risks to the stability of the EU financial sector: 1) An abrupt reversal of compressed global risk premia, amplified by low secondary market liquidity; 2) Weak profitability prospects for banks and insurers in a low nominal growth environment, amid incomplete balance sheet adjustments; 3) Rising of debt sustainability concerns in the public and non-financial private sectors, amid low nominal growth; 4) Prospective stress in a rapidly growing shadow banking sector, amplified by spillover and liquidity risk. In fact, within EU-wide stress scenarios, capital and profitability figures become a subject to shocks

60 Schinasi, G., *Defining Financial Stability* (2004), p.6-8; ECB, *Financial Stability Review*, (2017), p. 6; (2016a), p. 7.

61 Speech by Sabine Lautenschlaeger, (2018), <https://www.bankingsupervision.europa.eu/press/speeches/date/2018/html/ssm.sp180215.en.html>

62 Berger, A.N., P. Molyneux, and Wilson J., *The Oxford Handbook of Banking*, (2015), p. 181.

63 Bandt, O. and P. Hartmann, *Systemic Risk: A Survey*, (2001), p. 12; Engle R. and Brownlees C., *SRISK*, (2012), p. 14.

64 IMF and BIS, *Report to the G-20*, (2009), p.4.

65 ECB, *FSR*, (2017), p. 6.

on financial-macroeconomic variables (such as GDP, inflation, unemployment, asset prices and interest rates), initially caused by those systemic risks defined by the ESRB.⁶⁶

The SSM does not analyze systemic risk as an individual risk category, given the available reports. However, it indirectly defines the level of systemic riskiness based on the resiliency of the banking sector, which is estimated with the results of SREP testing. As it was mentioned in the introduction, last year the ECB published expanded view on 5 systemic risk indicators, but still without mentioning performance at country or bank individual levels.

So far, it seems that the academic research on financial stability has attributed the most attention to the importance of systemic risk. It can be divided into structural approaches based on contingent claim analysis (Lehar, 2005; Gray, Merton and Bodie, 2007; Gray and Jobst, 2013) and reduced form approach based on econometric models (Acharya, Pedersen, Philippon and Richardson, 2010; Huang, Zhou and Zhu 2011; Adrian and Brunnenmeier, 2016). This research can be further split on the basis of different systemic risk measures aimed either to measure overall systemic risk (Acharya and Steffen, 2012; Engle, Jondeau, and Rockinger, 2012), to estimate contribution and exposure of a single bank (Brownlees and Engle, 2016), to predict economic downturns (Allen, Bali and Tang, 2012) or to regulate the risk (Acharya et al., 2010).

The credibility of those measures can be recognized on multiple occasions. Acharya and Steffen (2012) measured systemic risk among EU banks between 2007 and 2012. The data from July 2007 showed many indications for a financial crisis. Not surprisingly given the size of the banking sector, the UK turned out to be the biggest contributor, followed by France and Spain, all together accounting for 50% of the overall riskiness. Many of banks, which authors estimated as systemically important, after 2012 were indeed either bailed out by the government or by private bank syndicates, or taken over by other banks. These included Banca Italease SpA, Deutsche Bank AG, Natixis, Commerzbank AG, Hypo Real Estate Holding, IKB Deutsche Industriebank, Raiffeisen Bank International, DnB NOR Bank ASA, Bank of Ireland and Credit Agricole SA.

Also in 2012, Engle, Jondeau, and Rockinger discovered that between 2010 and 2012 EU banks faced 80% of the systemic risk in Europe. Countries with the highest systemic risk were again the UK and France, with 527 and 465 billion euros in capital shortfall respectively, together contributing approximately 50% of the total exposure of European financial firms. Further estimates showed that the capital shortfall of the four riskiest banks (Deutsche Bank, Barclays, Cr'edit Agricole, and BNP Paribas) equaled to 5.6% of the European GDP.

More recently, Gehrig and Iannino (2017) estimated systemic risk from 1988 to 2016 over 320 European listed banks, and confirmed highest levels being between 2008 and 2012. During the following 2 years, aggregate level declines while the data for 2015 and 2016 suggests a reversal and a clear upward tendency. In addition, their findings showed directly supervised banks by the ECB as the most systemically risky banks.

66 <https://www.eba.europa.eu/documents/10180/1383302/2016+EU-wide+stress+test+Adverse+macro-financial+scenario.pdf>

Regular update on a systemic riskiness of some of the biggest financial regions worldwide is provided by the V-Lab. Compared to earlier findings, current country contribution to the overall systemic riskiness declines. In particular, conditional on a systemic event France would need an injection of almost USD 250 billion in capital, followed by Germany with slightly above USD 100 billion, and Italy and Spain each with below USD 100 billion in capital. Outside Banking Union, the UK would require the biggest support; slightly between USD 150 billion and USD 200 billion. When it comes to individual banks, the biggest contributors to the overall euro area systemic risk according to this database are BNP Paribas, Deutsche Bank and Credit Agricole, with average USD 80 billion in capital shortfall. On the other hand, Banco Santander stands with some USD 35 billion and UniCredit near USD 25 billion.⁶⁷

Given the importance of spillover effects, there is an open question on how much has systemic riskiness of the euro-area banking sector changed over the years compared to the rest of Europe, which in particular will be studied in this thesis.

4. SAMPLE AND METHODOLOGY I

There are 3 main samples which comprise of: 1) the ECB directly supervised banks as representative of Banking Union; 2) EU banks which do not fall under the scope of the SSM (OTHER-EU) and 3) banks outside the EU, often referred as NON-EU banks. All data were collected from the SNL Financial. All three samples contain the listed European banks and depending on different balance sheet indicators, samples can range from 240 to 350 listed banks. Considering that quarterly results were too volatile for reliable interpretation, following outcomes on profitability are established on yearly figures.

The observation period starts with either 2008 or 2009, depending on the available information, and ends with 2016, since the data for 2017 are still not available for all banks. Thereby, the data are not consistent for years before 2013. Therefore, two samples for each accounting variable were created to avoid permanently losing important observations. In particular, the first sample focuses on the observation period after 2009 and the second one after 2012. Given that 2008 has the most missing observations, in the case of important variables such as different loan types, companies' available reports were used to fill missing observations from that year.

Investigating profitability among European banks is based on accounting data, the same approach also used in all ECB reports including stress testing. Accounting data and especially the IFRS accounting standards have been often tested in the empirical literature and proved as value important (Collins, Maydew and Weiss, 1977; Ohlson 1995; Eli and Lev, 1996; Jermakowicz 2004; Lenormand and Touchais 2009; Camodeca, Almici and Brivio, 2014 or Marianne and Akkeren, 2017).

⁶⁷ <https://vlab.stern.nyu.edu/welcome/risk/>

This part of the research focuses on Net Interest Income and its driving variables including interest revenues and interest expenses, before discussing net earnings. The first category includes; Loans to other Banks; Retail and Corporate Loans; Total Loans and Leases; Derivatives; Equity and Debt Instruments as well Cash with Central Banks. Those are the most common sectors on which each banking business is built. In particular, interest on loans account for the highest proportion of total interest income. Thereby, movements in Total Assets should correspond to the movement of different investment categories. Given that most of data on Interest Expenses are not available, Total Debt and Total Deposits were used as a proxy for interest expenses.

Information on loans and deposits also gives additional insight into current demand and supply on the European market and explains effects of low interest rates. According to the ECB, there should be a “neutralizing” effect of changed policies on net income. Yet, there is still confusion on how this effect is being created, given weak profitability, which resulted from weak loan demand and constrained investing abilities, which on the other hand resulted from tighter regulations and/or higher capital requirements. Meaning, if anything has neutralized the negative effect it would be the asset purchases programmes. If balance sheets have indeed improved, Total Debt is expected to have declined.

Moreover, three approaches were used in calculating average values per area and bank, or per region and bank, which are explained here on the example of Total Debt. The same is applied to every other variable.

The first approach is a simple average of total debt from one area divided with the number of observations (banks) from that sample. Those results are then being further analyzed with the second approach, which calculates average value per sample and year as a sum of all country individual average values from that sample. Each country average value is a total debt of one country divided with the number of banks of that country. This way was used to account for differences in total values and in number of observations among countries. These movements of average values over the observation period can be seen on graphs.

The results presented in Tables show annual changes of yearly average values, determined by the mentioned methods. In addition, those results were also compared with the third average value, which is an average of all country annual changes (from one sample). This belongs to a third method. In addition to three main samples, there are results for different regions, including Germany & France, Italy & Spain, Norway & Sweden and the UK.

5. SAMPLE AND METHODOLOGY II

5.1 SRISK

Methodology II is implemented on the same group of listed banks, used in the first part of thesis, and it covers two observation periods separately. First sample estimates period from January 2008 to December 2017 based on 182 banks from 31 countries, including 70 banks from Banking Union, 53 OTHER-EU and 59 NON-EU banks. In order to increase the number of observations and in this way to check previous results, another observation period that starts with January 2014 was introduced. It contains 213 banks covering 34 countries and is more coherent in the number of banks across three areas. In particular, 75 banks represent Banking Union, 59 OTHER- EU and 79 NON-EU region.

Acharya, Pedersen, Philippon and Richardson (2010) go beyond the IMF definition of systemic risk and point out the difference between having a troubled bank in a capitalized and undercapitalized system. When the aggregate capital in the financial system falls below a certain fraction of the aggregate assets, systemic crisis occurs. In that moment, losses of one failed bank that created external costs imposed on the whole society, as well as losses of guaranteed creditors, are difficult to absorb. On the other hand, in a well-capitalized system few other healthier firms would easily absorb liabilities of a one falling institution. Financial regulations such as Basel accords were mostly focused on limiting individual risk of each institution in isolation, and not so much on the impact of that risk when the whole system is in crisis. In this sense, they defined systemic event as a sufficiently extreme scenario under which market declines below a certain threshold C during the time horizon h .

Brownlees and Engle (2017) methodology builds on that idea but focus on measuring the systemic risk contribution of a financial firm within dynamic econometric methods. Systemic risk contribution is defined as the amount of capital shortfall one firm would need in times of crisis. Authors also showed that SRISK has a high predictive power. In particular, results of SRISK for the period before the 2008 crisis significantly matched the capital injections US Federal Reserve Bank implemented between 2007 and 2009. What is more, in their predictive regression analogously to Allen, Bali and Tang (2012) a growth rate in aggregate SRISK predicted future worsening of macroeconomic conditions such as increased unemployment rate and declines in industrial production. Therefore, results of SRISK are expected to show how much is current financial system undercapitalized and which banks are its biggest contributors. At the same time, with the sum of SRISK values across all firms, it can be seen how substantial the difference between banks of Banking Union, OTHER-EU banks and NON-EU banks is.

SRISK is a measure of a firm size, leverage and a risk. It successfully merges accounting and market data and conceptually is similar to stress test. In particular, systemic risk is measured as an expected capital shortfall a firm i would need in a case multi-period arithmetic market return R_m between 2 periods declines below threshold C . This systemic event is referred as a market distress.

$$SRISK_{it} = E_t(Capital\ Shortfall_{it+h} \mid R_{mt+1:t+h} < C) \quad (1)$$

Capital shortfall CS is a difference between A, the capital a firm is required to hold and W, a market value of firm's equity. D is the book value of firm's debt that remains unchanged in case systemic crisis occurs.

$$CS_{it} = kA_{it} - W_{it} = k(D_{it} + W_{it}) - W_{it} \quad (2)$$

When that difference is positive, it means that bank's market value of equity is below its minimal capital and a capital shortfall exists.

Thereby, a number of parameters need to be set to compute the index. The value of k is set at 8% and represents prudential capital ratio. The horizon h is based on the period of 22 months. Finally, threshold C stands at 10%.

(1) and (2) put together define SRISK as:

$$SRISK_{it} = kD_{it} - (1 - k)W_{it}(1 - LRMES_{it})$$

$$SRISK_{it} = W_{it}[kLVG_{it} + (1 - k)LRMES_{it} - 1] \quad (3)$$

LVG denotes the quasi leverage ratio, $(D_{it} + W_{it})/W_{it}$ as seen in the Acharya et al. (2010) model. What is new in the current model is the LRMES or Long Run Marginal Expected Shortfall, the expectation of the firm equity multi period arithmetic return $R_{it+1:t+h}$ conditional on the systemic event:

$$LRMES_{it} = -E_t(R_{it+1:t+h} \mid R_{mt+1:t+h} < C) \quad (4)$$

5.2 LONG-RUN MARGINAL EXPECTED SHORTFALL (LRMES)

This risk measure actually builds on the earlier version of SRISK from 2012 where the capital shortfall was estimated on a short and long Marginal Expected Shortfall (Brownlees and Engle, 2012). Marginal Expected Shortfall was firstly used under the name conditional tail expectations in Tasche (2002). In that earlier version of SRISK, Capital Shortfall was estimated as a negative expectation of the working capital:

$$CS_{it+hcont} = -kD_{it} + (1 - k)W_{it}E_t(R_{it+h:t} \mid R_{mt+h:t} < C)$$

$$CS_{it+hcont} = -kD_{it} + (1 - k)W_{it}MES_{it+h \mid t}(C)$$

Here, $MES_{it+hcont}(C) = E_t(R_{it+h:t} \mid R_{mt+h:t} < C)$ is the tail expectation of the firm equity returns conditional on the systemic event.

Brownlees and Engle (2016) estimated LRMES predictions as Monte Carlo average of the simulated multi-period arithmetic returns, $R_{it+1:t+h}$, $R_{mt+1:t+h}$, conditional on a systemic event. Next to the simulation based procedure the paper explains two more alternative approaches for LRMES predictions. The first is based on a static bivariate model and the second on a dynamic bivariate copula model.

In the static model, which will be used in this thesis, and was also used in Brownlees and Engle (2012) as well as in Gehrig and Iannino (2017), the firm and market logarithmic returns are assumed to be iid from a bivariate normal distribution with zero means:

$$\begin{aligned} r_{m\ t} &= \sigma_{m\ t} \epsilon_{m\ t} \\ r_{i\ t} &= \sigma_{i\ t} \rho_{i\ t} \epsilon_{m\ t} + \sigma_{i\ t} \text{sqr}(1 - \rho_{i\ t}^2) \xi_{i\ t} \\ (\epsilon_{m\ t}, \xi_{i\ t} &\sim F) \end{aligned}$$

where $\sigma_{i\ t}$ is the conditional standard deviation of the firm return, $\sigma_{m\ t}$ is the conditional standard deviation of the market return, $\rho_{i\ t}$ is the conditional market/firm correlation and $(\epsilon_{m\ t}, \xi_{i\ t})$ are the shocks that drive the system. The shocks are independent and identically distributed over time and have zero mean, unit variance and zero variance. However, they are not assumed to be independent of each other. In fact, daily return of a firm i can be written as:

$$r_{i\ t} = \beta_{i\ t} r_{m\ t} + \sigma_{i\ t} \text{sqr}(1 - \rho_{i\ t}^2) \xi_{i\ t}$$

Given iid bivariate normal distribution LRMES can be approximated as a product of 1) one period market ES, 2) market beta (systematic beta) and 3) the square root of the forecast horizon: $LRMES_{i\ t}^{stat} = -\sqrt{h} \beta_{i\ t} E(r_{m\ t+1} \mid r_{m\ t+1} < C)$. (5)

Actually, the product of a systematic risk and ES is the Marginal Expected Shortfall of the market as seen in the earlier version on SRISK (Brownlees and Engle, 2012). This formula should, however, be used for short predictions only due to negative approximation error. Market beta is determined as, $\beta_i = \rho_i * \frac{\sigma_i}{\sigma_m}$, with GJR-DCC models. This beta is also used for estimation of the cost of equity.

5.3 VOLATILITY AND CORRELATION MODELS

GJR-GARCH model estimates banks' and market daily volatilities, based on which DCC model obtains their mutual correlation. Both GARCH and DCC are performed on market and stock log returns, $r_{i\ t}$ and $r_{m\ t}$, which denote respectively the i^{th} firm's and market log returns on day t : $r_{i\ t} = \log(1 + R_{i\ t})$ and $r_{m\ t} = \log(1 + R_{m\ t})$.

The GJR-GARCH model equation for the volatility dynamics is defined as:

$$\begin{aligned} \sigma_{i\ t}^2 &= w_{Vi} + \alpha_{Vi} r_{i\ t-1}^2 + \gamma_{Vi} r_{i\ t-1}^2 I_{i\ t-1}^- + \beta_{Vi} \sigma_{i\ t-1}^2 \\ \sigma_{m\ t}^2 &= w_{Vm} + \alpha_{Vm} r_{m\ t-1}^2 + \gamma_{Vm} r_{m\ t-1}^2 I_{m\ t-1}^- + \beta_{Vm} \sigma_{m\ t-1}^2 \end{aligned}$$

Thereby, $I_{i\ t}^- = 1$ if $r_{i\ t} < 0$ and $I_{m\ t}^- = 1$ if $r_{m\ t} < 0$. This volatility model is actually built on the multivariate GARCH version of Lawrence R. Glosten, Ravi Jagannathan and David E. Runkle (1993) who tested the relation between conditional expected monthly return and its conditional monthly variance. Thereby, the authors modified standard GARCH-M by allowing: 1) seasonal patterns in volatility, 2) positive and negative innovations to returns due to their different impacts on conditional variance and 3) nominal interest rates in the conditional variance function. This additional information creates the so called

Econometrician's Information set G , which is a subset of agents' information set F . Meaning that V_i and V_m from Brownlees and Engle (2017) are a subset of G . Moreover, it is the second variation of the GARCH-M model for conditional variance: $v_{t-1} = b_0 + b_1 v_{t-2} + g_1 \epsilon_{t-1}^2 + g_2 \epsilon_{t-1}^2 I_{t-1}$, which corresponds to the model used in Brownlees and Engle (2017). This equation builds on the basic standard GARCH-M model for stock excess return x , which consists of: 1) conditional mean function as $x_t = \alpha_0 + \alpha_1 v_{t-1} + \epsilon_t$ and 2) conditional variance function as $v_{t-1} = b_0 + b_1 v_{t-2} + g_1 \epsilon_{t-1}^2$, where v_{t-1} is a variance and ϵ_{t-1} is the past innovation to the return x_t . Nevertheless, in the second variation, the authors assumed that the impact of the ϵ_{t-1}^2 (from the mean function) on the conditional variance v_{t-1} is different when ϵ_{t-1} is positive (the dummy variable I_{t-1} is 1) than when it is negative (the dummy variable I_{t-1} is 0). Volatility is further estimated by using QML, which guarantees consistent estimate of the model parameters as long as the conditional variance equation is correctly specified (Brownlees and Engle, 2012).

Engle (2002) introduced a new class of multivariate models called dynamic conditional correlation (DCC) for estimating time varying correlations, later surveyed in Engle (2009). The DCC model can be formulated with the following statistical specifications (Engle 2002):

$$r_t \text{ con } \mathfrak{I}_{t-1} \sim N(0, D_t, R_t, D_t)$$

$$D_t^2 = \text{diag}\{w_i\} + \text{diag}\{K_i\} \circ r_{t-1} r_{t-1} + \text{diag}\{\lambda_i\} \circ D_{t-1}^2$$

$$\varepsilon_t = D_t^{-1} r_t$$

$$Q_t = S \circ (u' - A - B) + A \circ \varepsilon_{t-1} \varepsilon_{t-1} + B \circ Q_{t-1}$$

$$R_t = \text{diag}\{\square_t\}^{-1} Q_t \text{diag}\{Q_t\}^{-1}$$

In the first equation we have the assumption of normality and in the second the diagonal of the dynamic conditional correlation model expressed as $H_t = D_t R_t D_t$. D_t carries volatilities derived with the GARCH process on returns. R_t is time varying, correlation matrix (of the standardized residuals ε_t) that contains conditional correlations as in:

$R_t = D_t^{-1} H_t D_t^{-1} = E_{t-1}(\varepsilon_t \varepsilon_t')$. Q_t is the covariance matrix, belonging to MARCH family of Ding and Engle (2001), with S as the unconditional correlation matrix of epsilons.

Standard deviations and correlations are then used in the calculation of daily market beta, before turning to the next step of finding market expected capital shortfall.

5.4 MARGINAL EXPECTED SHORTFALL (MES)

In order to estimate the expected shortfall, $E(r_{m,t+1} \mid r_{m,t+1} < C)$, the Acharya et al. (2010) will be followed. The expected shortfall is the expected loss conditional on the loss being greater than the VaR, or it is the average of returns on days when the portfolio's loss exceeds its VaR limit. For instance, with $\alpha = 5\%$, VaR is the most bank loses with 95% confidence.

$$ES_\alpha = -E[R \mid R \leq -VaR_\alpha]$$

$$ES_{i,t} = -E_{t-1}[r_{i,t} | r_{m,t} \leq c = q_{5\%}] \quad (6)$$

Finally, $LRMES_{i,t}^{stat} = -\sqrt{h}\beta_i ES_{i,t}$. Dynamic models for Value-at-Risk and Expected Shortfall have been developed in Engle and Manganelli (2004) and Taylor (2008).

Based on Acharya, Engle and Richardson (2012), LRMES can also be ~~also~~ approximated as $1 - \exp(-18xMES)$, where MES is the one-day loss expected if market returns are less than -2%. MES_{α}^i can be derived from $ES_{\alpha} = -\sum_i y_i E[r_i | R \leq -VaR_{\alpha}]$. Thereby, banks' return R is decomposed into returns from different groups or trading desks, $R = \sum_i y_i r_i$, where y represent weights of different groups.

$$\frac{\partial ES_{\alpha}}{\partial y_i} = -E[r_i | R \leq -VaR_{\alpha}] \equiv MES_{\alpha}^i$$

Nevertheless, once calculated, LRMES can be plugged in the final formula of SRISK.

$SRISK_{it} = kD_{it} - (1 - k)W_{it}(1 - LRMES_{it})$. Aggregate SRISK can be seen as total amount of capital or a bailout a system would need under a systemic event scenario.

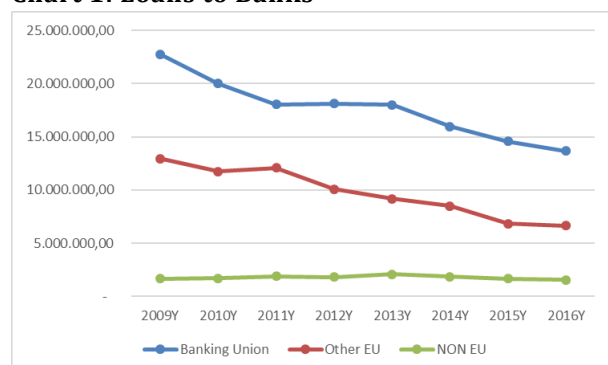
$$SRISK_t = \sum_{i=1}^N (SRISK_{it}) \quad (7)$$

6. RESULTS I

6.1 LOANS

First results show average movements per bank in two lending activities: 1) to other banks and 2) to retail and corporate customers, for each of three areas selected on a basis of supervision. Chart 1 shows uninterruptedly decreasing demand by banks, throughout the whole observation period and in all three areas. Similar tendency is evident in the Chart 2. While banks are obviously struggling to increase the loan demand, these results also imply that lending opportunities have been impacted by stricter lending requirements. On the other hand, such outcome can also be interpreted as a slow response to cheaper financing costs because of a saturated demand. Apart from that, an important turnaround is visible. In particular, the decaying pace in both categories for the first time slows down in 2016. What is more, the NON-EU area managed to increase its lending to retail and corporate customers, representing the only positive growth rate in the category of loans.

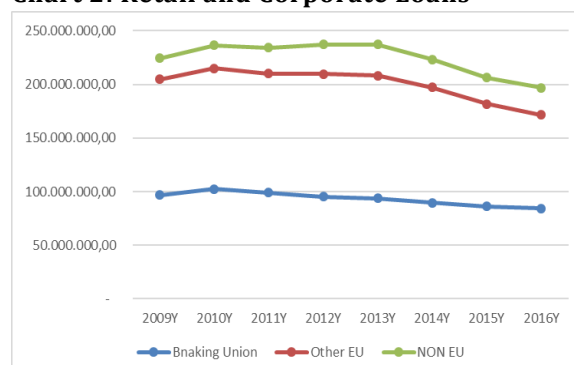
Chart 1: Loans to Banks



Data Source: SNL Financial

Notes: Simple Average; calculated as total lending for one area divided with the number of listed banks

Chart 2: Retail and Corporate Loans



Data Source: SNL Financial

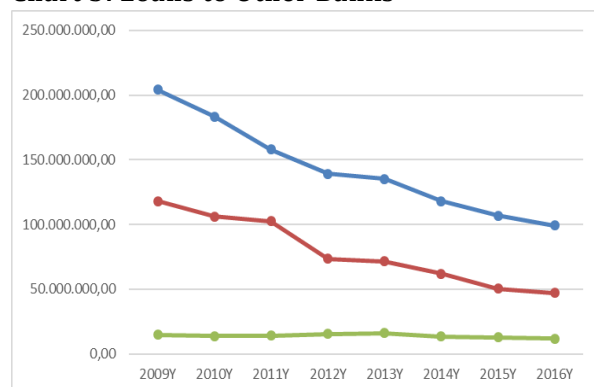
Notes: Second Approach Average; calculated as total lending for one area divided with the number of listed banks

In both graphs, the curve describing NON-EU banks is flatter due to lower total amounts in lending, but is more volatile when observed alone. NON-EU lending can be compared to 8% and 30% of total Eurozone lending to banks and to other customers, respectively. Furthermore, when it comes to total value in loans to retailers and corporates, despite smaller sample of EU not supervised banks (49), compared to ECB supervised (80), in 2016 the first group recorded by 31% more lending, mainly driven by lending in the UK, which furthermore equaled to 47% of the euro-area's lending.

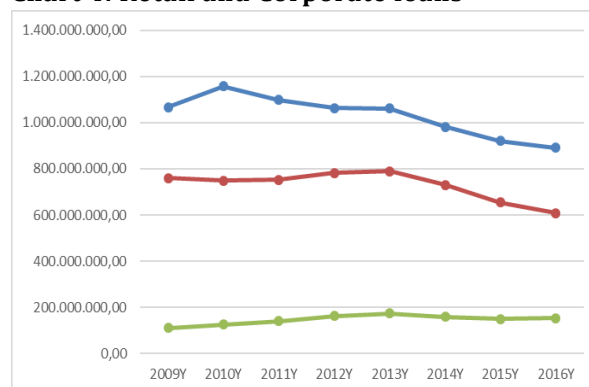
In addition to looking into simple averages, charts 3 and 4 show even steeper movements in lending activities based on sums of all countries' individual averages, which also correspond to the performances captured at the individual country level.

Table 1 confirms previous findings from which two major observations arose. Firstly, the overall lending within Banking Union has reduced the strength of its declining tendency but the tendency itself has not reversed yet. Secondly, there seems to be no substantial difference in lending activities among three samples, and the growth rates are mostly below zero. Only the NON-EU area recorded positive growth of 3% in lending to customers, and this is the case mainly owing to the improvements in Russia (+9%) and Norway (+7%). In this sense, supervised banks have not proven to be substantially more immune to shocks of the changed interest rate policy.

Looking into details, in 2016, Eurozone financial institutions experienced stronger declines in lending to other banks than to retail and corporate customers. In the first loan category, they performed worse than OTHER-EU members and with 1% difference better than NON-EU banks. However, based on the second approach, OTHER-EU area did not perform better than supervised area. Both declines were slightly stronger and stood at 7%.

Chart 3: Loans to Other Banks

Data Source: SNL Financial
Notes: Simple Average.

Chart 4: Retail and Corporate loans

Data Source: SNL Financial
Notes: Second Approach Average.

Furthermore, many Eurozone countries are faced with the issues of weaker lending to other banks, including France (-8%), Spain (-12%), Germany (-14%), Ireland (-31%) and Austria (-18%). Italy, on the other hand, surprisingly managed to push its demand by 8%. If these yearly growth rates are compared to those previous ones, and especially on a country individual level, then the performance can be considered as recovered. For example, in 2016, Greece recorded a yearly decline of 12% after a surge of 27% in the period before. Similar developments can be found among less troubled economies such as Austria, where lending dropped by 38% in 2015, and by 18% in 2016. Also, 19 banks of Denmark, which in 2016 almost doubled their growth rate from 2015, led lending within not-supervised EU members. In contrast to this, the worst performance was recorded in Sweden where lending to other banks fell by 23%, below the level in 2015. Demand in the UK decreased by 4%, while in the year before substantially more (20%). Finally, EU non-euro area still managed to improve lending to other banks in 2016. Similar to Sweden, 23 Norwegian banks recorded negative performance of 23%. As a result, Scandinavian region recorded the least successful performance relative to other regions (see Table 2).

In terms of lending to customers, the ECB supervised banks ended 2016 slightly better than those not supervised banks, but worse than banks outside the EU. The majority of euro banks, with the exception of France (+3%), Belgium (+1%), and Slovakia (+8%), dealt with an average decline of 3%. In the UK lending amount was notably decreasing and in 2016 it plunged by another 10%. The rest of the EU not supervised banks experienced less severe declines, including a 5% decline by Swedish banks. Outside the EU, lending was consistently stronger throughout the whole sample, including Norway (+7%), which also showed better results than majority of the supervised banks.

If we observe regional yearly changes (Table 2), it can be said that Banking Union regions stand better than other two not supervised regions, yet all are still within their clear downwards-oriented movements. Positive performances of France and Italy in lending to other banks smoothed negative growth rates of their neighboring countries.

Table 1: Changes in Lending for two consecutive years

Retail & Corporate Loans	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	69	-3%	-4%	-8%	-4%	-6%	-10%
Other EU	49	-9%	-11%	-6%	-1%	-10%	-8%
NON EU	74	3%	-7%	-12%	3%	-6%	-9%
Net Loans to Banks	Sample	(1)	(2)	(3)	(1)	(2)	(3)
Banking Union	84	-6%	-11%	-11%	-7%	-12%	-13%
Other EU	63	-2%	-20%	-8%	-7%	-18%	-14%
NON EU	88	-5%	-10%	-11%	-9%	-6%	-16%

Source: SNL Financial

Notes: The movements on Charts 1 and 2 can be observed in the first part of the Table 1, while its second part represents Charts 3 and 4, and the same structure is also implemented in the rest of the thesis. Columns 2, 3 and 4: Changes for 2 consecutive years in average lending per area and bank. Columns 5, 6 and 7: Changes for 2 consecutive years per area based on sums of countries' average lending values. Average value of one country is a ratio of total lending for all banks of that country, over the number of banks.

Table 2: Regional Yearly Changes in Lending Activities

Retail & Corporate Loans	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	26	-4%	-2%	6%
Italy & Spain	24	-4%	-1%	-7%
Norway & Sweden	26	-2%	-9%	-11%
UK	11	-10%	-12%	-4%
Net Loans to Banks	Sample			
France & Germany	30	-1%	-13%	-12%
Italy & Spain	24	-2%	1%	-8%
Norway & Sweden	27	-28%	-22%	10%
UK	12	-4%	-20%	-7%

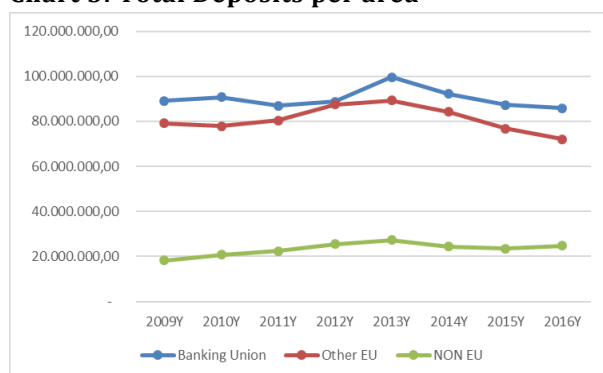
Source: SNL Financial Notes: Changes for 2 consecutive years per region based on sums of countries' average values. Average value of one country is a ratio of total value for all banks of that country over the number of banks.

6.3 TOTAL DEPOSITS

In order to observe interest expenses for which the data were mostly missing, deposits and banks' values in debt were observed as a proxy for interest expenses. The data on different deposit types were also not available, so the focus will be placed on total deposits. As Charts show, the performance in total deposits is downwards oriented, except for the NON-EU area where deposits increased by 5% in the past year, primarily owing to more savings in Russia (+14%). On the other hand, growth rates in the Eurozone and outside improved each by 3 % compared to declines in 2015, but still were by 2% and 6% below zero (see Table 3). Due to the size of the UK's banking sectors, its 7% decline in savings had more impact than all declines from the euro area together, which resulted into 6% decline of OTHER-EU area. On the other hand, such gradually improving performance in savings confirms rising employment rates and therefore more bank accounts across Europe. According to Eurostat data, the unemployment level in the euro area peaked at 19.3 million in the second quarter of 2013, before going down and reaching 15.7 million or 10% at the end of 2016. In the EU-28 in 2011, the unemployment rate stood at 11% before gradually decreasing to 8,2% at the end of 2016.

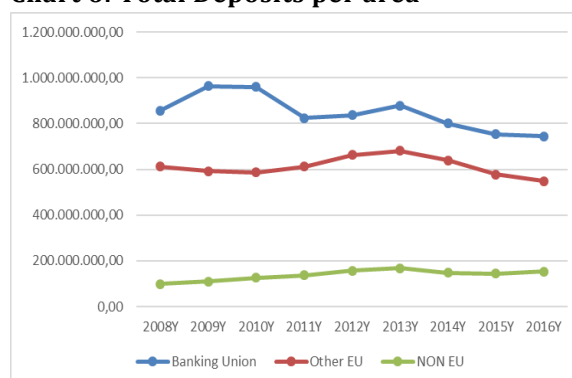
When observing country individual levels, the ECB supervised banks have not performed better than not supervised banks. In particular, among other EU members, only the UK and Sweden experienced negative growth rates of 7% and 4%, respectively, while in the Banking Union many more, including Germany (-6%), Spain (-2%), Belgium (-4%), Portugal (-13%), Cyprus (-3%) and Ireland (-7%). On regional level (see Table 4), South- and West-European neighbors managed to stagnate relative to 2015 thanks to mutually neutralizing growth rates. In particular, while savings in Germany declined by 6%, for the same amount in France they jumped. Moreover, while Italian savings rose by 3%, in Spain those fell by 2%.

Chart 5: Total Deposits per area



Source: SNL Financial.
Notes: Simple Average.

Chart 6: Total Deposits per area



Source: SNL Financial.
Notes: Second Approach Average.

Table 3: Changes in Total Deposits for two consecutive years

Total Deposits	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	85	-1,7%	-5,3%	-7,4%	-1%	-6%	-9%
Other EU	63	-6,1%	-8,8%	-5,5%	-5%	-10%	-6%
NON EU	90	5,4%	-3,8%	-10,1%	5%	-2%	-12%

Source: SNL Financial

Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values.

Unless deposits are efficiently transferred into investments, they become a burden to banks. Given results in Loans and Investments, it becomes challenging to think of a standard product in which banks are currently investing and earning returns. This must be an explanation why the ECB advises banks⁶⁸ to look for other sources of income than interest-bearing activities. The solution in this matter is however not straightforward, and big banks are restricted in their possibilities. This also means that current deposits are either being used for existing lending or money withdrawals, because for the overnight deposits banks receive negative rates. However, further results will actually show increased amounts of cash with central banks in 2016 compared to 2015.

Table 4: Regional average changes for two consecutive years

Total Deposits	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	30	0%	-2%	-7%
Italy & Spain	24	0%	-2%	-7%
Norway & Sweden	27	-2%	-15%	-10%
UK	12	-7%	-8%	-5%

Data Source: SNL Financial

Notes: Changes for 2 consecutive years per region based on sums of countries' average values. Average value of one country is a ratio of total value for all banks of that country over the number of banks.

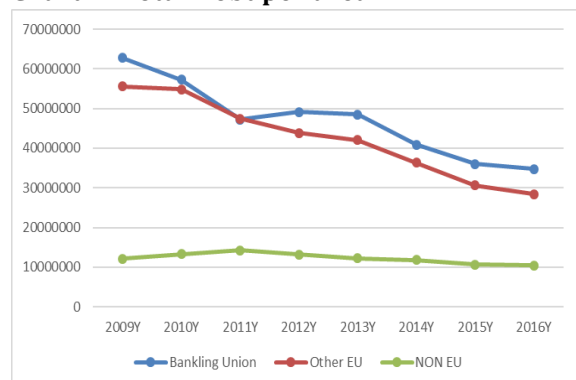
7.3 TOTAL DEBT

Considering stricter regulations and asset sales, the supervised banks are expected to have substantially reduced their debt levels compared to the level before 2014. The ECB implemented APPs instead of issuing more loans due to already high leverage rate among EA-19 banks. The results show reduced total debt as of 2010 with occasional volatility among different areas suggesting less junior debt (Charts 7 and 8). This implies that despite cheaper borrowing costs, big banks have been lending less, as previous results showed, and consequently also borrowing less. While debt has been reduced across Europe, the amount in

68 Speech by Danièle Nouy, <https://www.bankingsupervision.europa.eu/press/speeches/date/2016/html/se160223.en.html>, (2016)

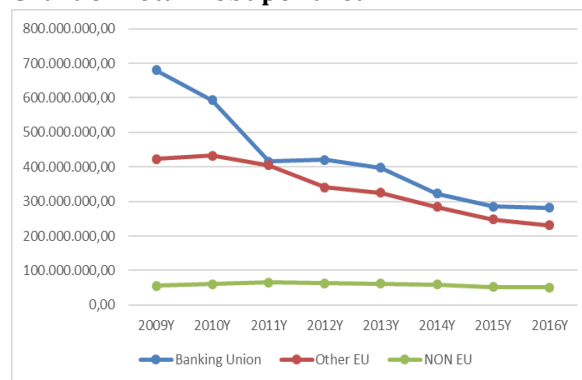
2016 did not decline above the level from 2015 (see Table 5). In particular, in the ECB-supervised area, the level dropped by 12% in 2015, and in the year ahead, the decline was weaker and amounted to 4%. The same happened in other two areas. Weaker tendency of falling debt rate was also mirrored in the performance of total deposits.

Chart 7: Total Debt per area



Data Source: SNL Financials
Notes: Simple Average.

Chart 8: Total Debt per area



Data Source: SNL
Financial Notes: Second Approach Average

Table 5: Changes in Total Debt

Total Debt	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	84	-4%	-12%	-16%	-1%	-12%	-19%
Other EU	58	-7%	-16%	-14%	-7%	-13%	-13%
NON EU	84	-2%	-10%	-3%	-3%	-11%	-4%

Data Source: SNL Financial

Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values. Average value of one country is a ratio of total value for all banks over the number of banks.

Southern countries among supervised ones experienced the biggest reductions in 2016, including Greece (-26%), Portugal (-26%), Cyprus (-25%) and Italy (-16%). Among those who have initiated the upwards-movement are France (0%) and Germany (+4%). Given previous reductions in lending to other banks, one would expect stronger decay in total debt for German banking sector. Spanish banks, on the other hand, managed to improve lending in both categories, which partially explains no decline in its debt level. Moreover, these performances also resulted in smaller reductions in total debt on regional level and that for both, France-Germany and Spain-Italy (see Table 6). Obviously, every decline in the amount of debt is a welcomed measure as long it represents a useful reduction and not such that would harm investment opportunities and eventually the whole business. Based on the performance in loans, a weaker investment tendency of companies in general can be assumed. In fact, the data⁶⁹ on completed mergers and acquisitions from all industries in Western Europe show

⁶⁹ RBI Equity Research, Bloomberg data, accessed on 22.08.2017

increased volumes by 7% to USD 0,7 trillion in 2016. In the US, the volume rose much more, by 20% to USD 1.55 trillion. Within banking industry, mergers and acquisitions amounted to USD 9 billion in 2016 compared to USD 11.5 billion in 2014. In the US on the other hand, the volume has nearly doubled to USD 21.3 billion since 2014.

Given declined lending in the UK, it is not surprising that also its total debt decreased for additional 10% in 2016. Russia on the other hand managed to maintain the level from 2015. Sweden (-4%) and Norway (+1%) together recorded weaker downfalls, in particular up to 4%.

The data on debt and deposits showed weaker decaying pace, which suggests decaying interest expenses; an assumption we will need later while describing net interest income.

Table 6: Regional average changes for two consecutive years

Total Debt	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	29	1%	-11%	-20%
Italy & Spain	24	-11%	-13%	-16%
Norway & Sweden	27	-4%	-9%	-10%
UK	12	-10%	-21%	-18%

Data Source: SNL Financials

Notes: Changes for 2 consecutive years per region based on sums of countries' average values. Average value of one country is a ratio of total value for all banks of that country over the number of banks.

7.4 OTHER DRIVERS OF NET INTEREST INCOME

In order to further analyze the profitability among banks and to understand the reasons behind surged stock returns, other products besides loans, such as total equity instruments, total debt instruments, derivatives and cash with central banks were analyzed.

Total equity instruments include common and non-redeemable preferred equity issued by public and private corporations, held as investments at value reported on the balance sheet at company risk. Total Debt Instruments are all fixed income securities (either available for sale, held to maturity, trading or at fair value through profit and loss), at value reported on the balance sheet at company risk. Apart from those, total loans and leases were added as one category, which has not been previously shown. Finally, there are total deposits as already familiar variable, and it is placed along others for a better comparison of the overall results.

In particular, figures from Table 7 suggest declining tendencies on a yearly basis for all investments, except for the overnight deposits with central banks where all financial institutions recorded a positive yearly growth rates. The biggest one was accounted by banks outside the EU. It has to be mentioned that in absolute values deposited amounts account for much less value of the total assets than some other variables, such as total loans and even debt equity instruments.

In fact, among the supervised banks, the cash with central banks equaled to not more than 8% of the value in total loans, while in the case of not supervised EU banks and NON-EU banks it

amounted to 13% and 21% respectively. Moreover, considering that total deposits to banks are declining, rising deposits with central banks could be a result of selling non-performing assets. However, the declines in total assets cannot be compared to increases in cash with central bank, which means that some part of cash was used to reduce the debt. In fact, the data on total liabilities were also checked, and here as well there is a clear declining tendency for all three areas.

Table 7: Different drivers on net interest income

Category	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Total Debt Instruments							
Banking Union	84	-6%	-10%	-8%	-8%	-11%	-10%
Other EU	62	-8%	-14%	-12%	-6%	-14%	-12%
NON EU	90	0%	-14%	-16%	1%	-10%	-16%
Total Equity Instruments							
Banking Union	84	-3%	-11%	-4%	-4%	-7%	-3%
Other EU	61	-5%	-19%	-8%	-7%	-28%	-8%
NON EU	90	-2%	-18%	5%	-2%	-17%	3%
Derivatives							
Banking Union	80	-8%	-25%	12%	-8%	-25%	9%
Other EU	55	-10%	-26%	19%	-11%	-27%	22%
NON EU	85	-9%	-33%	1%	-9%	-34%	8%
Cash							
Banking Union	85	24%	0%	-15%	17%	13%	-12%
Other EU	63	4%	-11%	-6%	-2%	-15%	2%
NON EU	91	26%	-1%	-3%	24%	-1%	-4%
Total Net Loans							
Banking Union	85	-4%	-7%	-9%	-12%	-9%	-5%
Other EU	63	-8%	-9%	-7%	-6%	-9%	-8%
NON EU	91	3%	-5%	-8%	6%	-6%	-10%
Total Deposits							
Banking Union	85	-2%	-5%	-7%	-1%	-6%	-9%
Other EU	63	-6%	-9%	-5%	-5%	-10%	-6%
NON EU	90	5%	-4%	-10%	5%	-2%	-12%

Data Source: SNL Financial

The second biggest overall positive change between 2015 and 2016 happened in derivatives. The value in derivatives compared to the value in total loans and leases of EU-19, OTHER-EU and NON-EU areas amounted at 15%, 24% and 8% respectively.

Based on lending to banks and customers it is hard to expect that performance in total loans and leases developed any differently. In fact, the results are almost identical to those related to lending to customers, with some exceptions on the country individual level. In particular, Norway recorded a strong decline in lending to other banks, and its value in total loans and leases rose by 5%. Once again, the NON-EU area was the only one to record positive growth rate in this category.

Apart from weaker demand, another reason for which the value in loans dropped during past two years is the APP, which has been used across the EU for eliminating bad loans from balance sheets. On the other hand, imposed stricter regulations also contributed to this effect by regulating unhealthy lending, which resulted in less new loans compared to the periods before the crisis. As a result, we are witnessing a slow recovery.

Table 8: Total Net Loans and Leases per region and country

Loans & Leases	Sample	Total Change 2016-2015	Total Change 2015-2014	Total Change 2014-2013
France & Germany	30	-3%	-5%	-10%
Italy & Spain	24	-3%	-5%	-10%
Norway & Sweden	27	-2%	-9%	-11%
UK	12	-10%	-10%	-6%
Germany	12	-7%	-8%	-9%
France	18	3%	-5%	-7%
Italy	16	-3%	-12%	-14%
Spain	8	-3%	0%	-8%

Data Source: SNL Financial

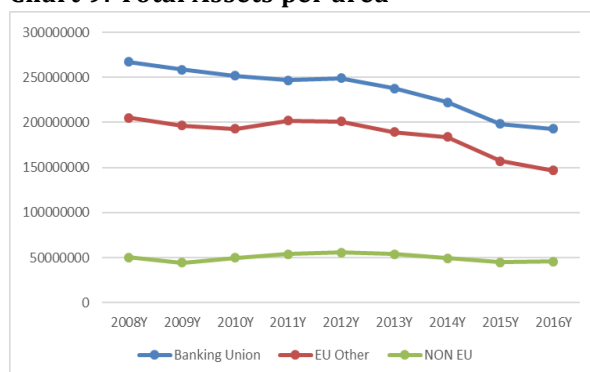
Given small amounts invested in equity instruments, these cannot be considered as important source of income. If compared to amounts in total loans and leases ratios amount at 4%, 6% and 4% for EU-19, other EU and non-EU banks respectively. In contrary to this banks invest more in debt equity instruments, 21%, 33% and 21% for the three areas. Apart from Greece, Germany also experienced the strongest decline of 23% in debt instruments. The highest out of two positive growths was in Cyprus of 7%. In fact, when looking into three averages of all yearly changes per country and bank, OTHER-EU banking firms managed to increase its investing in debt instruments by 4%. Thereby, the strongest increase was in Hungary, 23%, while the biggest cut was made in the UK, 8%.

Among all investment types within three analyzed areas, the situation seems to be the best in the NON-EU area where positive growth rates are evident in the most important source of income, which are loans, but also in the most important source of financing which are total deposits.

7.5 TOTAL ASSETS

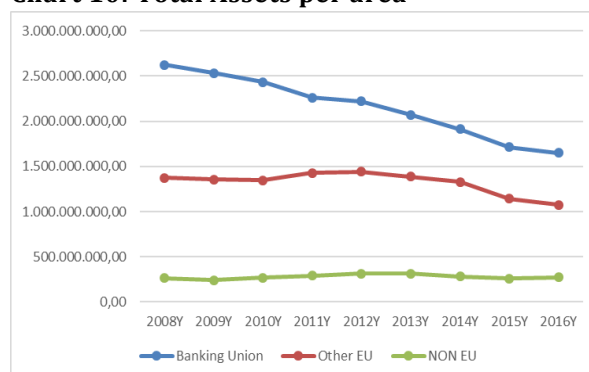
Before looking into final results of net income, the overview of total assets should additionally test whether previous results correspond to the actual movement in total assets. In a view of declining loans and the fact that banks have been dealing with non-performing assets in order to finance capital requirements, one can expect downward-oriented performance in total assets. Indeed, chart 9 shows a reduction in total assets except for NON-EU banks, whose value in assets rose by 3% in 2016. Based on the sum of all average changes, their assets rose by 5%. This result was driven by an increase in loans and leases, of 3%, which has not yet happened among EU banks yet. The biggest contributor was Russia where assets were increased by 22%, followed by Norway, 7%.

Chart 9: Total Assets per area



Data Source: SNL Financials
Notes: Simple Average

Chart 10: Total Assets per area



Data Source: SNL Financial
Notes: Second Approach Average

The previous results showed an increase in cash with central banks and occasional improvements among other investment types, which at the end prevented stronger declines in total assets for the supervised and not supervised EU banks. For instance, Italian assets were reduced by only 1% partially owing to higher balances with central banks of 14%, as well as increased equity investing by 10%. In Germany, the decline in total assets was up to 7%, driven by declines in all instruments, except for the deposits with central banks (+59%). Not surprisingly, the biggest reductions in total assets still happened in Greece (17%), Ireland (11%) and Cyprus (8%), which also recorded no positive growth in individual investment categories. None of the supervised banking centers have managed to increase assets so far, with France being the closest given its zero percentage in change. Overall performance in total assets also supports further results in net interest income.

With 7% EU not supervised area experienced strongest decline. However, based on the average of all annual country changes (third method), there was a stagnation, which can be explained with loans and leases. In particular, value in loans and leases declined by not more than 1% given the results of the third approach, compared to simple average value of 8% (see Table 7). In the UK, value in assets declined by 8%, and in Sweden by 13%. When it comes to other two areas, either observing averages of annual changes per each country of one area or annual changes in the sums of all average values per country and bank, the results are the same.

Table 9: Yearly changes in Total Assets

Total Assets	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	83	-3%	-11%	-6%	-4%	-11%	-8%
Other EU	63	-7%	-15%	-3%	-6%	-14%	-4%
NON EU	91	3%	-9%	-9%	5%	-8%	-9%

Data Source: SNL Financial

Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values. Average value of one country is a ratio of total value for all banks over the number of banks

Table 10: Regional average changes for two consecutive years

Total Assets	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	30	-3%	-6%	-7%
Italy & Spain	24	-3%	-6%	-7%
Norway & Sweden	27	-3%	-13%	-8%
UK	12	-8%	-15%	-2%

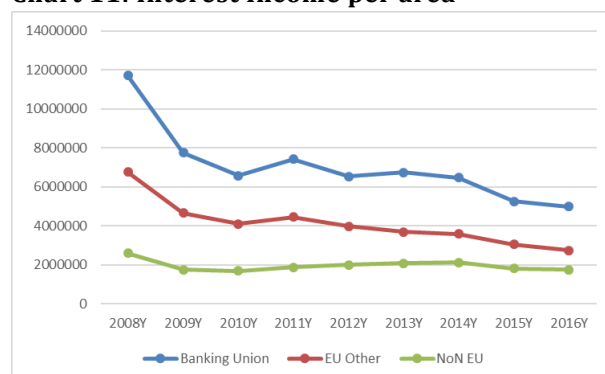
Data Source: SNL Financial

7.6 NET INTEREST INCOME

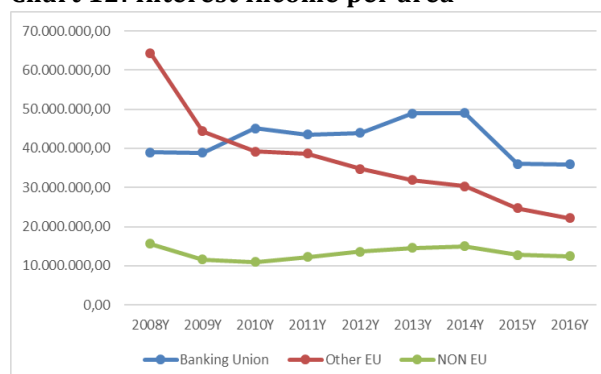
In this section, movements in interest revenues and in net interest income (difference between interest revenues (income) and expenses) are explained.

Results for loans already gave an early indication towards weaker interest income, so the actual negative growth rates from Table 11 did not come as a surprise. Thereby, declines in 2016 among all interest bearing activities were not as strong as they were during 2015 and the same happened with interest income.

Interestingly, NON-EU area recorded an increase in the value of total loan and leases, as well as in the value of its overnight deposits with central banks, yet still not sufficiently large to stimulate the growth in interest revenues compared to the year before. Based on the income values from all interest bearing instruments (see Table 7) the overall growth from 2015 to 2016 is indeed below zero.

Chart 11: Interest Income per area

Data Source: SNL Financials
Notes: Simple Average

Chart 12: Interest Income per area

Data Source: SNL Financial
Notes: Second Approach Average.

Table 11: Yearly Changes in Interest Income

Interest Income	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	85	-5%	-19%	-4%	-5%	-20%	-5%
Other EU	63	-10%	-15%	-3%	-10%	-19%	-5%
NON EU	93	-3%	-14%	3%	-2%	-15%	3%

Data Source: SNL Financial

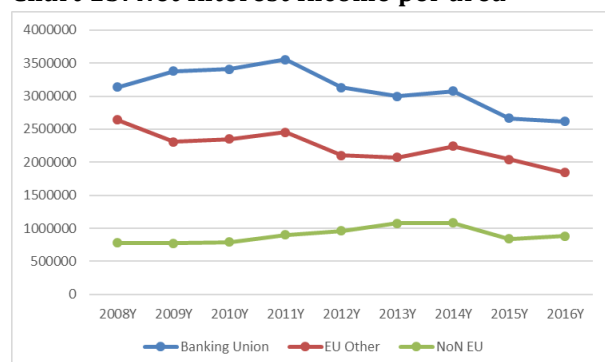
Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values. Average value of one country is a ratio of total value for all banks over the number of banks.

After serious deterioration in 2015, in the following year, the average overall net interest income fell by not more than 2% for the Eurozone. In other EU countries, it decreased by 10%, while it rose by 5% outside the EU (see Table 12). It can also be noticed that if it was not for the declining interest revenue rate of the UK (-11%), which led into 13% less net interest income, the overall performance for the OTHER-EU region would have showed a stagnation and not a decline. This was not only supported by weaker decline in interest income but also by presumably less interest expenses during 2016, given the movement in total deposits and total debt.

Apart from that, NON-EU experienced strong recovery of few individual states. Their ratio even increases to 9%, if total changes are based on country average changes (see Table 12). For the majority of institutions, 2015 was clearly an unsuccessful year, after which declines became substantially smaller and in fact, in 75% cases they turned into positive growth rates. So for instance, in 2015 the interest inflow to a sample of Russian banks on a yearly basis fell by 21%, yet in 2016 it was sustained and shrank by not more than 7%. Furthermore, their net interest income actually increased by 24% in 2016 compared to the year before which ended

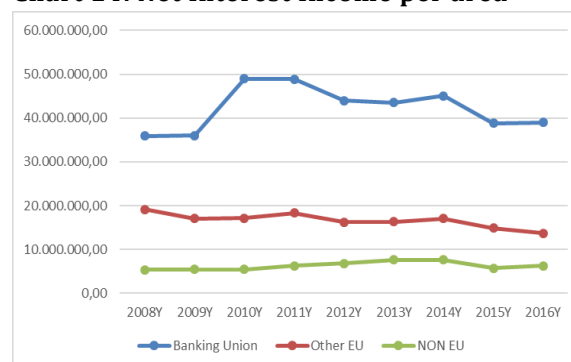
with a 43% decline. A sample of 23 Norwegian banks also showed a strong recovery in 2016 when the interest income dropped by not more than 4% compared to 16% in 2015.

Chart 13: Net Interest Income per area



Data Source: SNL Financials
Notes: Simple Average.

Chart 14: Net Interest Income per area



Data Source: SNL Financial
Notes: Second Approach Average.

Table 12: Yearly Changes in Net Interest Income

Net Interest Income	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3) Country average changes
Banking Union	85	-2%	-13%	3%	0%	-14%	4%
Other EU	63	-10%	-9%	8%	-8%	-13%	4%
NON EU	93	5%	-23%	1%	9%	-25%	-1%

Data Source: SNL Financial

Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values. Average value of one country is a ratio of total value for all banks over the number of banks.

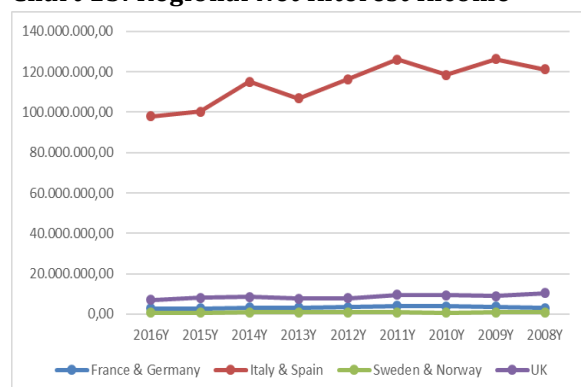
In contrast to this, while supervised countries have also witnessed declining but recovering net interest income, the majority of those countries still move within a downward-oriented movement. Germany's now repeated decline of 9% in two consecutive years was sustained mainly due to the recovery in the interest income, which moved from -17% in 2015 to -7% in 2016. French banks collected 3% less revenue in 2016 than in 2015, while their net interest income stagnated. Italian banks suffered the strongest decline in interest earned of 11%, while the net interest income was pushed by reduced expenses and decreased by 4%. Spain showed weaker declines. Both interest income and net interest income were lower by not more 2% in 2016 than in 2015. Greece also ended 2016 in the better condition than in the periods before. While its revenues fell by 8%, the net interest earnings were prevented from further declines. Results in these two categories correspond to the individual movements of banks from previously discussed subcategories.

Not surprisingly, both interest income as well as net interest income dropped in the UK, by 11% and 13% respectively, more than in 2015 (see Chart 16). As a result, total OTHER-EU area recorded negative growth of 10% in both interest income and net interest income.

Moreover, Denmark experienced declining movements but with less intensity compared to the period before. Swedish banks also managed to control decreasing interest profitability. Revenues fell by 9% in 2016 relative to 19% in 2015. Better situation was in net interest income, which fell only by 2%.

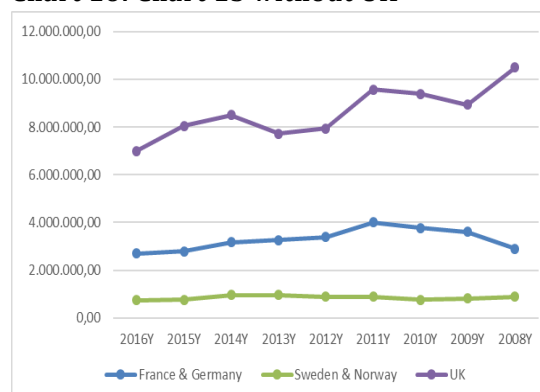
Given the performance of countries outside the scope of the SSM, it seems that Eurozone banks are developing in their own speed. This especially since ECB low interest rate policy and APPs, as key factors, would exist despite the existence of banking supervision.

Chart 15: Regional Net Interest Income



Data Source: SNL Financial
Notes: Simple Average.

Chart 16: Chart 15 without UK



Data Source: SNL Financial
Notes: Second Approach Average.

Table 13: Regional average changes in Interest Income

Interest Income	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	30	-4%	-16%	-2%
Italy & Spain	24	-5%	-19%	-2%
Norway & Sweden	27	-10%	-29%	-6%
UK	12	-11%	-10%	-1%

Data Source: SNL Financials

Table 14: Regional average changes in Net Interest Income

Net Interest Income	Sample	Total Change 2015-2016	Total Change 2014-2015	Total Change 2013-2014
France & Germany	30	-3%	-12%	-3%
Italy & Spain	24	-2%	-13%	8%
Norway & Sweden	27	-3%	-20%	0%
UK	12	-13%	-5%	10%

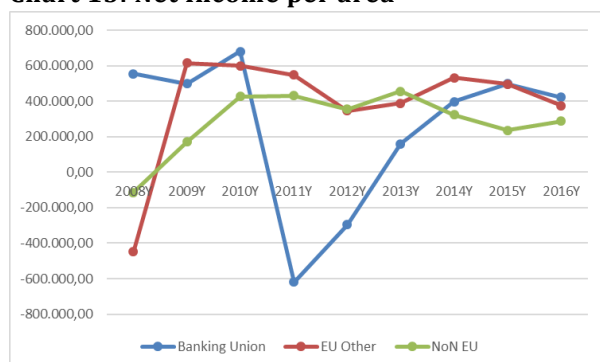
Data Source: SNL Financials

Notes: Changes for 2 consecutive years per region based on sums of countries' average values. Average value of one country is a ratio of total value for all banks of that country over the number of banks.

7.7 NET EARNINGS

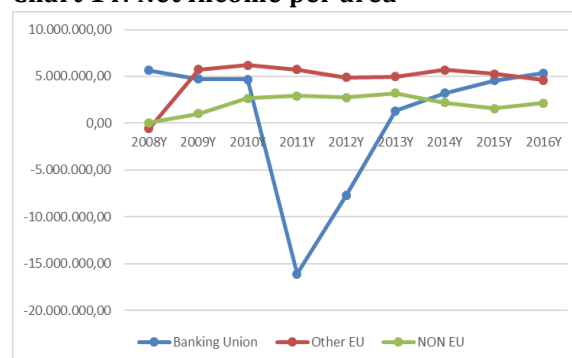
Despite a 13% decline in 2016, the overall net income in Banking Union clearly recovered compared to the low level in 2011. Within NON-EU area profits grew by 22%, so far the best outcome among banks. When it comes to OTHER-EU banks, their results showed significantly stronger decline of 24%, more than expected given all previous results. In particular, both interest income and net interest income did not fall by more than 10%. These values are average values per area and bank.

Chart 13: Net Income per area



Data Source: SNL Financials
Notes: Simple Average.

Chart 14: Net Income per area



Data Source: SNL Financial
Notes: Second Approach Average

However, if we look into the average changes among countries, some of them recorded almost extreme changes. In particular, 2015 net loss of Greek banks declined by 70% in 2016, although they still remained loss-making. Table 16 shows some examples of countries that managed to record positive growth rates, yet they are still moving in the zone of losses. In particular, German banks reduced their losses by 93% in 2016, after a plunge of over 200% in 2015. Actually, among 11 banks in the sample, it is the heavy decline of Deutsche Bank, which has weakened the performance of German banking sector. Its net income from 2014 surged in 2015 into its biggest loss ever, and it declined even further by another 80% last year. Commerzbank whose net income fell by 68% but remained positive recorded second biggest decline in 2016. Italian banks on the other hand entered negative zone by reducing their profits by more than 200%, led by UniCredit (-652%) and Monte dei Paschi di Siena (-926%). Intesa San Paolo managed to increase its profit by 14%. Apart from Greece, Germany and Italy, Cyprus also recorded losses in 2016, while banks from all other countries ended 2016 as profitable. In Austria, earnings rose by 16%, owing to improvements of Erste Group (+20%) and Raiffeisen International (+31%). Finally, the average of all supervised country growth rates from 2015 to 2016 resulted in a 5% decline compared to 12% from the second approach. This outcome also supports more the first approach, which showed a 13% decline.

Similar scenario can be observed within not supervised EU banks. In the OTHER-EU area, the average from the third approach showed a 235% rise, compared to the 24% decline based on sample averages per bank and area. Croatian and Hungarian banks mainly drove that increase. If we neglect those two samples due to smaller number of observations, 235% falls to 66%, now mainly driven by Danish banks. Danske Bank, the biggest bank in the country, generated the highest net income. Since this sample consists of 19 listed banks, there is no reason to further remove Denmark. At the same time, in the UK and Sweden, net income

dropped by 63% and 2% respectively. Average net income per bank in Sweden is also the highest average per bank within OTHER-EU area. In the UK, Royal Bank of Scotland and HSBC Holdings saw biggest declines, while Barclays Plc recorded the highest rise.

Table 15: Yearly Changes in Net Income

Net Income	Sample	Total Change 2015-2016 (1)	Total Change 2014-2015 (2)	Total Change 2013-2014 (3)	(1) Country average changes	(2) Country average changes	(3)Country average changes	(1) Average of YOY changes
Banking Union	85	-13%	31%	133%	12%	88%	63%	-5%
EU Other	63	-24%	-7%	37%	-10%	-7%	11%	235%
NON EU	93	22%	-27%	-29%	38%	-29%	-31%	23%

Data Source: SNL Financial

Notes: Columns 3, 4, 5: Changes for 2 consecutive years in lending per bank and area. Column 6, 7, 8: Changes for 2 consecutive years per area based on sums of countries' average values. Average value of one country is a ratio of total value for all banks over the number of banks. Column 9 is an average of all country annual changes between 2015 and 2016 per one area. YOY stands for year over year.

NON-EU area managed in overall to increase its net income regardless of the approach. Even without countries with smaller samples, the average growth of 23% (Column 9, Table 15), remained positive and amounted to 7%, although individual performances varied. In Russia, banks managed to improve their net income by 136%, while in Norway profits fell by 11%. Russia also recorded highest net income per bank, followed by Turkey. Based on the sample of 13 Turkish banks, overall net income rose by 28%, previously supported by the rise in the net interest income of 7%. In Switzerland, the results for 22 listed banks showed substantial decline in profits of 37%, led by UBS Group, the biggest Swiss bank based on total assets.

Table 16: Regional average changes for two consecutive years

Net Income	Sample	Total Change 2016-2015	Total Change 2015-2014	Total Change 2014-2013
France & Germany	30	34%	-3%	-15%
Italy & Spain	24	-80%	65%	-197%
Norway & Sweden	27	-5%	-17%	13%
UK	12	-63%	-14%	73%
Germany*	12	93%	-237%	102%
Italy*	16	-249%	247%	91%
Spain	8	11%	-8%	36%
Austria	5	16%	210%	-261%
France	18	5%	62%	-27%
Greece*	5	70%	-118%	-169%
Sweden	4	-2%	-17%	12%

Data Source: SNL Financial

Note: A start (*) means that a country had an overall negative net income in 2016.

8.RESULTS II

8.1 RESULTS IN SRISK FROM 2008 TO 2017

Over the period of ten years, aggregate SRISK determines Banking Union (USD 890 trillion) as the most systemically risky area in Europe, followed by EU banks not supervised by the ECB (USD 489 trillion) and banks outside the EU (USD 146 trillion). Indeed Banking Union also has the biggest sample of banks. Nevertheless, the ranking remains the same (see Figure 1) even with average daily values per area (daily sum per area divided by the number of banks per area). In particular, in Banking Union, the cumulative sum of averages amounts at USD 11 trillion, in OTHER-EU at USD 9 trillion and in NON-EU area at USD 2 trillion. NON-EU curve is very flat due to smaller figure, but when observed alone shows the same tendency as two other areas (see Chart 2).

Most of this total shortage originates from their respective financial centers such as France, the UK and Switzerland (see Chart 3). Moreover, France, Germany, Italy and Spain account for the half of the total SRISK outcome in Europe. This makes them biggest contributors in the Eurozone. In the rest of Europe, Sweden and the UK contribute 30% and Switzerland 5% to the overall systemic riskiness. The number of observations varies from country to country, but it also shows how samples with fewer banks can be much more troubled compared to those with more banks. Based on the cumulative sum of average values per country, Finland, Ukraine, Czech Republic, Netherlands and Sweden are countries with the worst exposures per bank.

Chart 1: Development in daily average capital shortfall

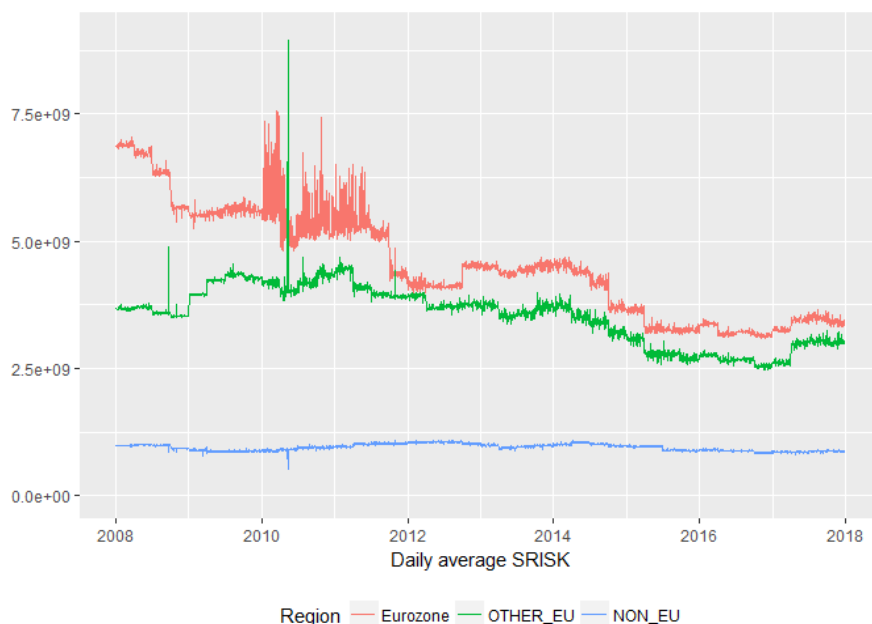


Chart 2: Daily average SRISK in NON-EU area

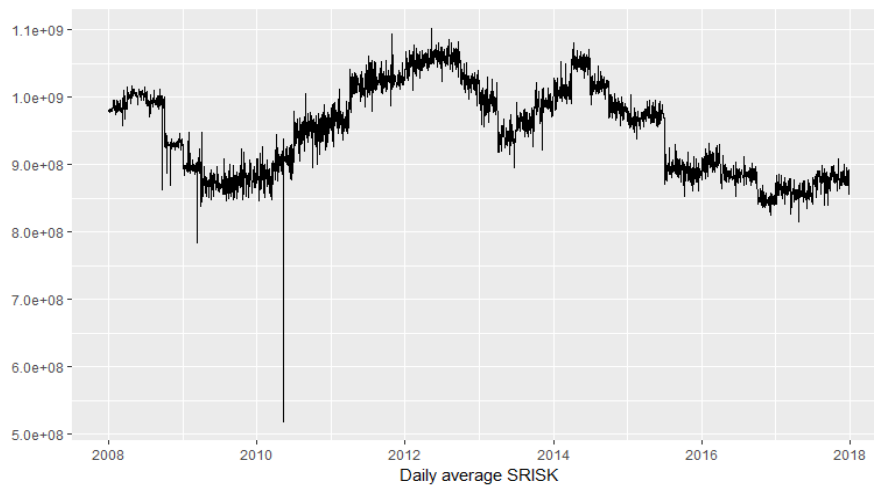


Chart 3: Ranking among countries based on their total contribution in 10 years

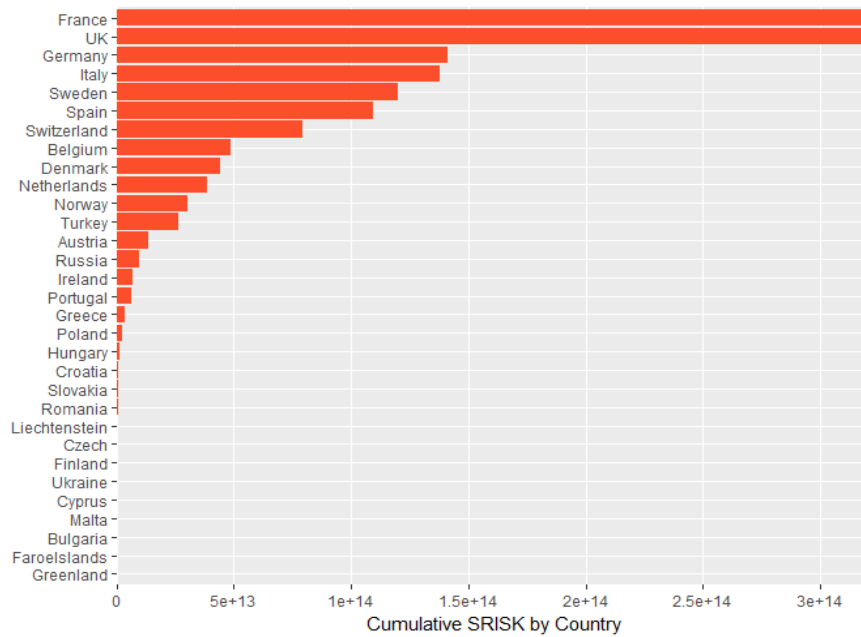
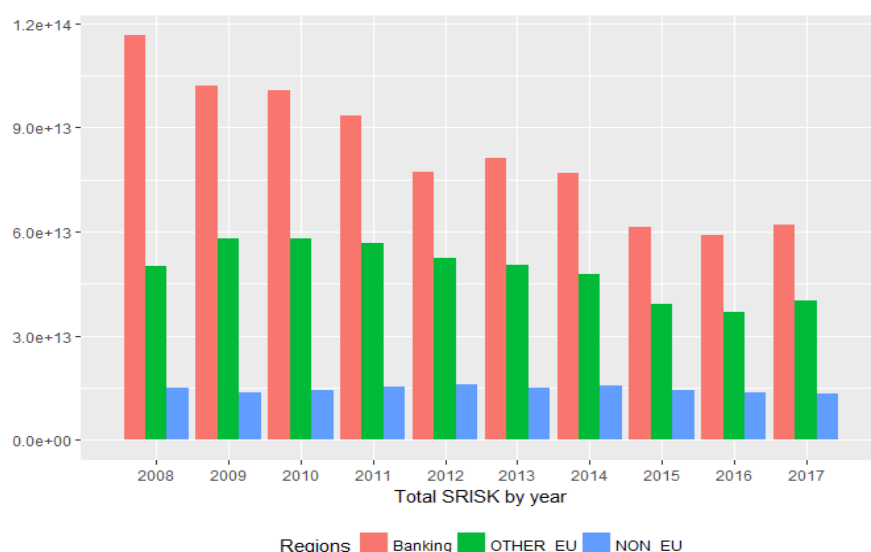


Chart 4: Cumulative capital shortfall by year



As Chart 4 shows, over the years, the level of SRISK declines gradually, while it rises slightly during 2013 and 2014, before again recovering in 2015 and 2016. However, with 2017 it initiates another upward movement and that across all three regions. At the end of 2017, one year SRISK level stands at slightly above USD 60 trillion in Banking Union, at USD 40 trillion in OTHER-EU area and at USD 13 trillion in the NON-EU area. Alone in December 2017, given market decline, Banking Union would have faced 5 trillion in capital shortfall, compared to 3,36 trillion and 1,1 trillion in OTHER-EU and NON-EU areas.

Not just for the period of ten years but also based on the data for 2017, biggest contributors in the Eurozone remain France (USD 29 trillion), Germany (9.7 trillion), Spain (8.3 trillion), Italy (7.4 trillion). The UK (23 trillion) and Sweden (12 trillion) lead OTHER-EU states, whereas Switzerland (6.6 trillion), Denmark (5 trillion) and Turkey (3.4 trillion) the NON-EU area. This country ranking also stays the same when observing SRISK in December 2017 or even on the last trading day in 2017. For some of the most important country contributors, in the following section with more observations, movements in SRISK by year, from 2014 to 2017, will be presented.

When it comes to individual performances, among 183 banks in the sample, 30 most systemically risky banks are responsible for 70% of total conditional capital shortfall in Europe for the period of 10 years. BNP Paribas, Deutschebank, Societe Generale and Credit Agricole generate 26%, and together with Barclays and Credit Suisse Group up to 40%.

Other most systemically risky banks are HSBC Holdings Plc (UK), Banco Santander SA(Spain), Lloyds Banking Group Plc (UK), Royal Bank of Scotland Group Plc (UK), UniCredit SpA (Italy), Nordea Bank AB (Sweden), Intesa San Paolo(Italy) and ING Group NV (Netherlands). Commerzbank ranks as 18th, while Erste Group and Raiffeisen Bank International stand significantly better on 30th place and 42nd place.

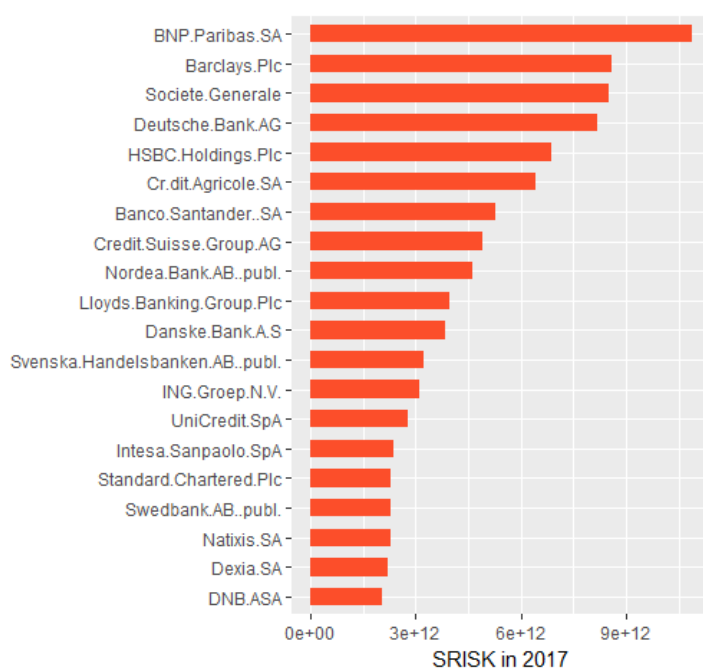
Furthermore, alone in 2017, BNP Paribas, Barclays, Societe Generale, Deutsche Bank, HSBC Holdings and Credit Agricole again record the biggest conditional capital shortfalls. Figure 5

displays 20 most systemically risky banks, which with a contribution of 82% clearly drive and at the same time determine the level of systemic risk in Europe. From that, first four banks account for 31% of the overall conditional market undercapitalization. Moreover, based on the data for 29.12.2017 BNP Paribas would have faced USD 37 billion in capital shortfall, Barclays Plc USD 36 billion and both Societe Generale and Deutsche Bank 32 billion each. All other banks would face below 30 billion.

In fact, these banks are also Europe's biggest banks in terms of total assets. HSBC Holdings, BNP Paribas SA and Deutsche Bank AG in particular lead the ranking. The list further includes banks such as Credit Agricole SA, Barclays Plc, Societe Generale SA, Banco Santander SA, Lloyds Banking Group Plc, Royal Bank of Scotland Group Plc, Uni Credit SpA, Credit Suisse Group AG, Banco Bilbao Vizcaya Argentaria SA, Intesa Sanpaolo SpA, Nordea Bank AB, Standard Chartered Plc, Natixis SA, and Commerzbank AG.

Given the size of their market capitalization, the majority of these financial institutions are also highly influential on equity markets. In particular, HSBC Holdings, Banco Santander SA, Sberbank of Russia, BNP Paribas SA, Lloyds Banking Group Plc, ING Groep NV, UBS Group AG, Intesa Sanpaolo SpA, Banco Bilbao Vizcaya Argentaria SA, Barclays Plc, UniCredit SpA, Credit Agricole SA, Royal Bank of Scotland Group Plc, Societe Generale SA, and Credit Suisse Group AG are banks with the largest market capitalization in Europe. Deutsche Bank ranks on 21st place, Erste Group on 27th, Commerzbank on 30th and RBI on 35th place. In overall, this proves that European largest banks are also most systemically risky banks.

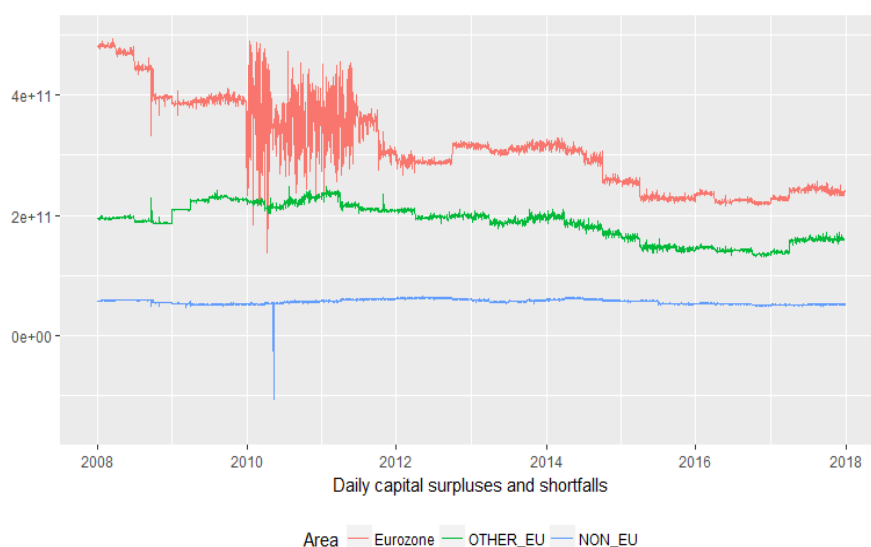
Chart 5: 20 most systemically risky banks in 2017



All previous outcomes are based on daily positive SRISK values, while negative values or capital surpluses were not considered. However, even when considering daily surpluses, overall results do not change (see Chart 6). In particular, with the cumulative sum of USD 815

trillion, Banking Union faces much higher shortfall compared to OTHER-EU (USD 488 trillion) and NON-EU banks (USD 145 trillion). Given the similarity in the outcomes from both scenarios, banks have clearly experienced more conditional daily capital losses than surpluses. The same counts when looking into aggregate average SRISK per bank and area.

Chart 6: Positive and negative daily SRISK



8.1.1LRMES FROM 2008 TO 2017

Stock prices in the relation with the market expected shortfall (based on MSCI Europe Bank Index) show rather constant LRMES over the years (see Chart 7) compared to the movement of SRISK for the same period. However, the cumulative results for each year (see Chart 8) are more volatile and display highest LRMES in 2010, which in the following years declines, yet again in 2017 goes up and thereby almost reaches its second highest level from 2013.

The same tendency is visible among all three areas and furthermore was also observable in the previous results for capital shortfalls. Over the period of 10 years, Banking Union faces the biggest losses, in particular USD 1.5 million, followed by NON-EU (USD 1.3 million) and OTHER-EU (USD 1.07 million) areas. However, it can also be noticed that between 2011 and 2016 the level of LRMES is similar in Banking Union and in NON-EU area. In fact, in the next section, a larger sample of 213 banks shows a worse performance of NON-EU banks compared to Eurozone banks for the period after 2014.

Based on this current sample of 183 banks, in 2017, Eurozone LRMES amounts to USD 150.000, which is by 15% more than in the NON-EU area and by 37% above the level in the OTHER-EU regions. Differences between average values among three areas for the same year are minor, up to 3%. Looking into the cumulative sum of those averages, NON-EU records highest losses, although still tightly followed by Banking Union and the rest of EU banks. Such market penalization for banks outside the EU was firstly observable in higher marginal expected shortfalls (MES), influenced by currency exposures and country risk.

Chart 7: LRMES Moving Average (20 days)

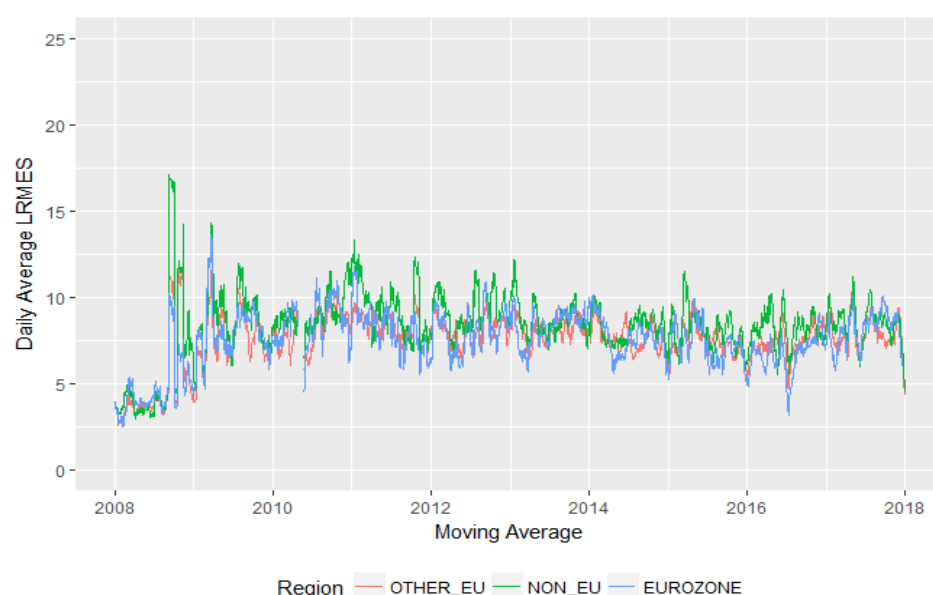
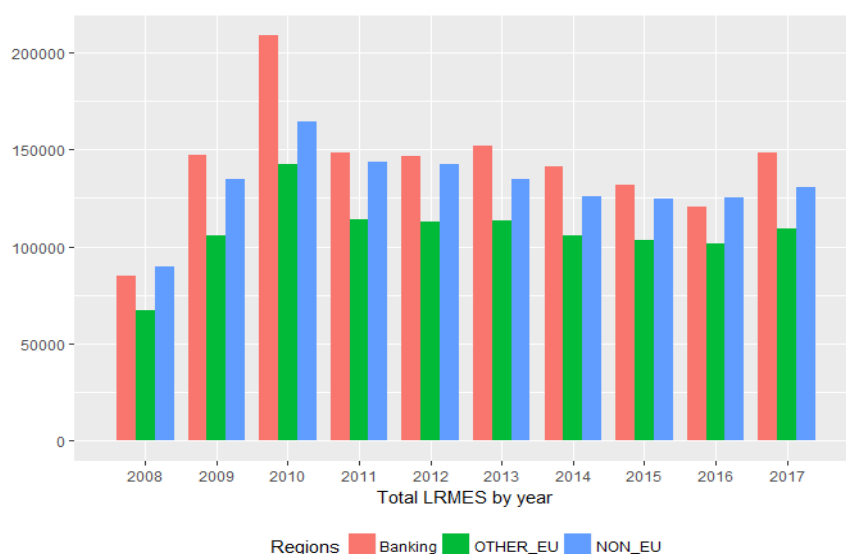
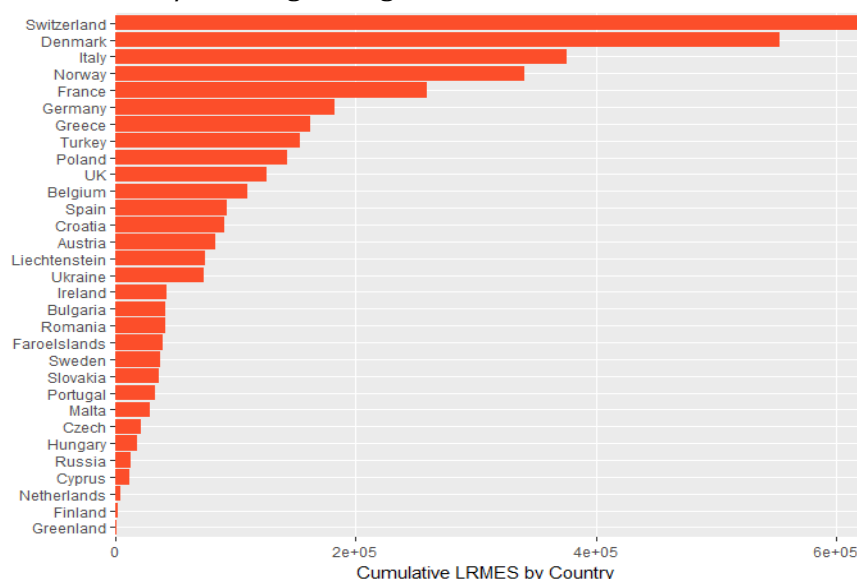


Chart 8: Total LRMES over the years



Among countries, Switzerland, Denmark, Italy and Norway record the biggest loss, which also host individual banks with the biggest equity shortfalls. Swiss and Danish banks have clearly worse performance in terms of LRMES than in SRISK (see Figure 9 and Figure 3). Another surprise is high ranking of Norwegian banks, which in terms of SRISK do not fall into the scope of 20 riskiest banks. Moreover, these countries also host banks with biggest equity losses including Zuger Kantonalbank (Switzerland), Dexia SA (Belgium), Totalbanken (Denmark), Liechtensteinische Landesbank AG (Liechtenstein), Banque Cantonale du Jura SA (Switzerland), National Bank of Greece SA (Greece), Hvidbjerg Bank A/S (Denmark), Oldenburgische Landesbank AG (Germany), Walliser Kantonalbank (Switzerland), Sandnes Sparebank (Norway), PJSC Raiffeisen Bank Aval (Ukraine), Banca Carige SpA - Cassa di Risparmio di Genova e Imperia (Italy), Kreditbanken A/S (Denmark), Luzerner Kantonalbank AG (Switzerland) and Edmond de Rothschild (Switzerland).

Chart 9: LRMES/ Ranking among countries in 2017



While average SRISK determines Banking Union as the most risky one, average LRMES puts more emphasis on the banks outside the EU. This furthermore means that the level of debt in the Eurozone mainly drives its contribution to systemic riskiness. In its model, SRISK rises either with the increasing level of debt and/or LRMES. Given that in case another crisis occurs, current debt level would be the key factor behind the capital shortfall and capital expenditures for the ECB. Also, the findings from the first part of the thesis showed Eurozone banks facing the highest debt levels among European banks. Thereby, there was no difference in number of banks in samples between Banking Union and NON-EU areas.

8.2 RESULTS IN SRISK FROM 2014 TO 2017

For the period of last 4 years, a sample of 213 banks confirms previous results and shows Banking Union as the main driver of systemic risk in Europe, in absolute and average values. Capital shortfall is highest in 2014, after which the level recovers until 2016 when it stagnates and with 2017 initiates another upward movement at across all three areas.

More banks in the second sample push SRISK levels further up. In particular, with 30% more banks in NON-EU second sample, SRISK level goes up by 46% (USD 6 trillion) to USD 19 trillion alone in 2017. In Banking Union, there are now 5 more banks, which generate additional capital shortfall of nearly 8 trillion, while 6 additional OTHER-EU banks contribute USD 4 trillion.

Chart 10: Aggregate capital shortfall by year



From 2014 to 2017, Eurozone banks generate USD 275 trillion in capital shortfall, much more than other banks, in particular, OTHER-EU banks 178 trillion and NON-EU banks 81 trillion. Recalculated in the cumulative sum of daily average values, this means USD 3, 7 billion per one Eurozone bank versus USD 3 billion and USD 1 billion for OTHER-EU and NON-EU bank, respectively. Even with the daily capital surpluses aggregate exposure for the Eurozone stands high at USD 263 trillion, followed by OTHER-EU (USD 169 trillion) and NON-EU (USD 77 trillion) listed financial institutions. On average per bank and area, values are 3.5 trillion, 2.8 trillion and 0.9 trillion, respectively.

Furthermore, among 34 European countries, France Italy, Germany and Spain account for 34% of the 4-year conditional capital shortfall. As such, they remain the most systemically troubled areas in the Eurozone. The UK and Sweden are accounted for 29% and Switzerland alone almost for 10%. Moreover, Chart 12 displays yearly changes in SRISK for those countries and clearly shows growing conditional systemic riskiness in 2017, especially in France.

At the same time, BNP Paribas, Barclays Plc, Deutsche Bank and Société Générale SA together with other biggest Europe's banks remain the biggest contributors. The only difference is that some banks swap their rankings. In particular, Deutsche Bank ranks as 3rd for the period of 4 years, and 4th for the period of 10 years, whereas Societe Generale ranks in the exact opposite way. The same applies to Credit Agricole SA and HSBC Holding as well as Credit Suisse Group AG and Banco Santander SA.

Chart 11: Daily average SRISK since 2014

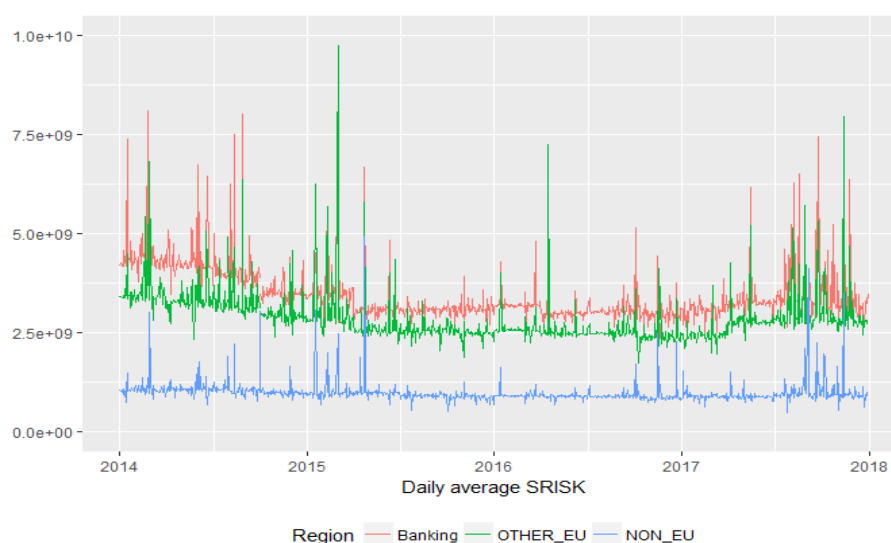
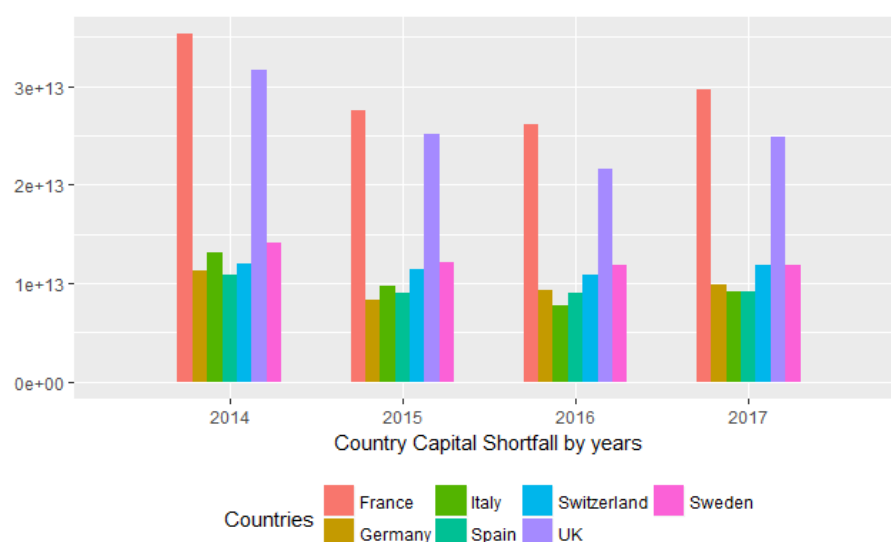


Chart 12: Countries with biggest contribution to SRISK

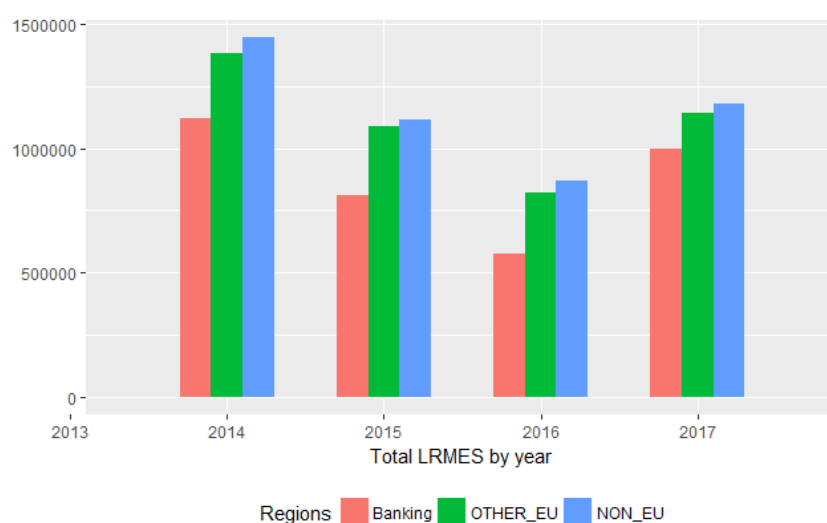


8.2.1LRMES FROM 2014 TO 2017

Since the beginning of 2014, on both levels, aggregate and average, banks outside the Eurozone lead in LRMES. Thereby, NON-EU banks performed worse in the first scenario (see Chart 13) but outperformed OTHER-EU banks in average daily values (see Chart 14). In 2017, equity losses substantially rise compared to 2016, yet remain below the level from 2014 (see also Chart 16). This same tendency was also evident for capital shortfalls (see Chart 10).

Based on the period of 4 years, Denmark, Switzerland, Norway and France experienced 46% of total equity loss in Europe.

Chart 13: Total LRMES over the years



Even though samples for Denmark and Switzerland do not change with the second observation period, based on cumulative results for 4 years, Denmark faces bigger losses than Switzerland (see Chart15), what was not the case for the period of ten years (see Chart 8). This makes Denmark the worse performing country among OTHER-EU states and Switzerland outside the EU. Given values for conditional value-at-risk as well a market beta for 2017, the first faced nearly 18% of the total LRMES level in Europe and the latter 12%. In Banking Union there were no big surprises; 52% of the overall equity loss from last year is found in France, Germany and Italy.

Chart 16 displays LRMES movement from 2014 to 2017 for eight worse performing countries, whose overall ranking does not change when looking into average values per bank and country.

Similar to the previous results for 10 years, also during the second observation period the same banks experienced the biggest losses. Top 15 banks include: Hvidbjerg Bank A/S (Denmark), Totalbanken A/S (Denmark), Všeobecná úverová banka, a.s. (Slovakia), Oldenburgische Landesbank AG (Germany), Walliser Kantonalbank (Switzerland), Djurslands Bank A/S (Denmark), Kreditbanken A/S (Denmark), Salling Bank A/S (Denmark), Nordfyns Bank A/S (Denmark), Arbuthnot Banking Group Plc (UK), Agroindustrijsko komercijalna banka “AIK Banka”(Serbia), Basellandschaftliche Kantonalbank (Switzerland), Hypothekarbank Lenzburg AG (Switzerland), GrønlandsBANKEN A/S (Greenland) and VP Bank AG (Liechtenstein).

Chart 14: Moving Average LRMEs (20 days)

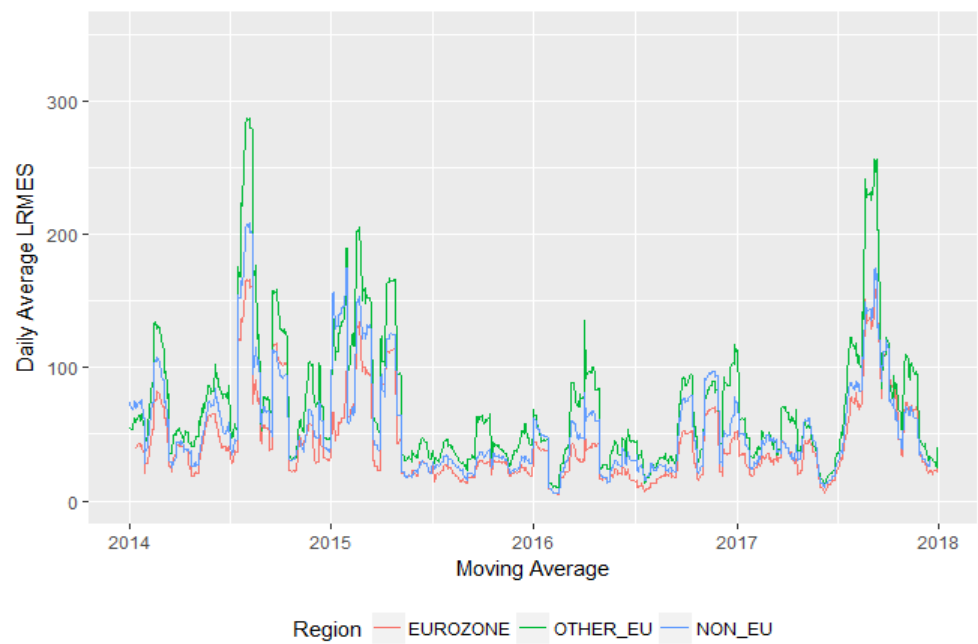


Chart 15: Total 4 years LRMEs by country

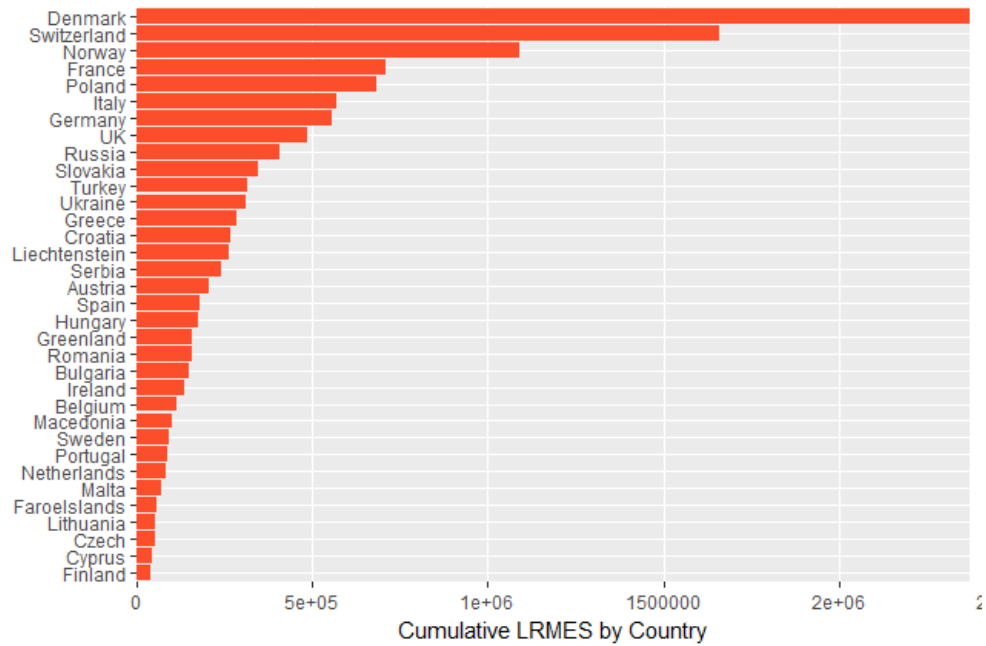
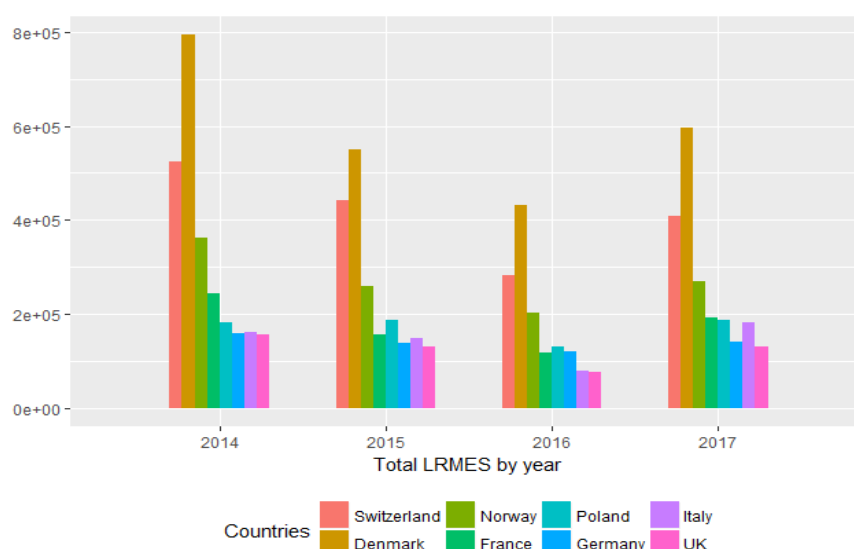


Chart 16: Countries with highest equity losses



9. FURTHER DISCUSSION AND CONCLUSION

This thesis analyses profitability and risk management of the European banking sector, to compare the development of Eurozone banks with OTHER-EU and NON-EU banks, not only at their respective “Area” levels, but also within their individual and country-based performances. At the same time, the thesis investigates the effects of Banking Union, an institution, which since 2014 has focused on keeping Eurozone banks safe. In the case of risk management, instead of looking into capital buffers, another stress test is recreated to estimate the amount of systemic risk. This is based on the value of capital shortfall banks would face if another systemic crisis occurred. Even though profitability and risk management have been outlined as top priorities for the work of the SSM, both issues and especially the systemic risk could receive significantly more research attention. Different samples covered up to 240 banks for the period between 2008 and 2017.

Accounting data and Results I showed three key observations. Firstly, during the observation period from 2013 to 2016, almost all presented variables or drivers of profitability have been constantly declining in their values, including profits. These results partially correspond to those of the ECB, given that the ECB often concludes with either *moderate* or *modest improvements*. In particular, according to the ECB, euro area banks recorded weak loan growth in 2016 of 1.3%⁷⁰ based on 105 banks. This does not correspond to the findings of this thesis. In particular, both average lending to other banks as well as to retail and corporate customers further weakened in 2016. The same counts for net earnings. While the ECB writes about weak profitability in 2016, this thesis actually shows a clear decline. However, most importantly, this declining tendency among all variables becomes weaker with 2016, compared to previous years. This possibly means that 2017 and 2018 might reach stagnation

⁷⁰ See FSR 2017 May, p.69, Footnote 39

and then eventually a positive growth. Indeed, based on the ECB's FSR, for the first half of 2017 return-on-equity grew by nearly 1.5%. However, it is not clear in which range net earnings have moved.

Secondly, among all three areas, banks of NON-EU area showed strongest signs of recovery, including their positive growth rates in retail and corporate loans, total assets as well as in total deposits. This is also the only area, which recorded growing net interest income and net earnings in 2016. Finally, given similarity in the overall results among the supervised and not supervised EU areas, the work done by Banking Union is still far from a great contribution. Supervised institutions would have survived even if SSM had not existed, as it is the case with the majority of other European institutions. Nevertheless, if this mode of recovery can be maintained, a positive rise and stronger recovery can be anticipated rather sooner than later. Therefore, in the next step it would be useful to observe the data for 2017 for further conclusions.

When it comes to systemic risk in Europe, the results correspond to previous findings on profitability. Both samples showed Banking Union as the area with the biggest systemic risk contribution in Europe, which also corresponds with the findings of Gehrig and Iannino (2017). This outcome is evident from absolute and average aggregate values, but also yearly and daily SRISK results. After Banking Union, OTHER-EU is the second most risky area, followed by the NON-EU region.

Furthermore, earlier research (Acharya V. and S. Steffen, 2012; Engle, R.F., E. Jondeau and M. Rockinger, 2015) showed high levels of SRISK between 2008 and 2012, which is also confirmed in this thesis. Based on the findings of Gehrig and Iannino (2017), as well as of V-Lab⁷¹, European SRISK level increases again with 2016, while in this thesis SRISK rises with 2017. However, this thesis estimates SRISK in Europe within three different samples and also does not consider any other financial institution besides banks.

On country based performances, on every level including one year results for 2017, the biggest contributors in the Eurozone are: France (USD 29 trillion), Germany (9.7 trillion), Spain (8.3 trillion) and Italy (7.4 trillion). Moreover, they account for 34% of the 4-year conditional capital shortfall, which makes them the most systemically troubled areas in the Eurozone. At the same time, the UK and Sweden are accounted for 29% and Switzerland alone almost for 10%. This regional ranking also corresponds to the ranking provided by V-Lab, however, with few minor differences in the country ranking, due to a different number of financial institutions in the samples. Also, when looking into SRISK values for Europe on V-Lab, it is not entirely clear for which period the values are measured.

Last but not the least, the results showed that the biggest banks are also the most systemically risky banks. Given ranking in LRMES, SRISK is mainly driven by high debt levels. This means that current level of debt in the euro area might not directly trigger another financial crisis, yet it certainly plays unfavorable role in preventing one. In 2017, BNP Paribas, Barclays, Societe Generale, Deutsche Bank, HSBC Holdings and Credit Agricole face the

⁷¹See Europe Financials Total SRISK, <https://vlab.stern.nyu.edu/welcome/risk/>

biggest conditional capital shortfalls. These findings also correspond with the results of V-Lab, which can be directly compared based on the outcome calculated for the last trading day⁷² in 2017.

Supervised banks are clearly unpredictable in their movement. On the one hand, accounting data showed weaker declines during 2016 compared to earlier years. On the other side, based on rising conditional capital shortfalls in 2017 as well as the latest SREP test outcome, we might as well expect new troubles in balance sheets and in profitability. Even though aiming towards unified and safe euro banking sector is a complex task, which cannot generate fast results, at the moment it does not seem as if Banking Union is putting euro banks in a favorable position compared to other European banks. However, this also does not mean that EU is better off without Banking Union, at least for now.

72 Compare thesis page number 44 and <https://vlab.stern.nyu.edu/analysis/RISK.WORLDFIN-MR.GMES?selectedDate=2017-12-29>

10. APPENDIX

Table 1: Reported NPL (non-performing loans) ratios (in %)

<i>Financial Institution</i>	<i>State</i>	2016	2015	2014
<i>Danske Bank A/S</i>	Denmark	1,6	2	2,5
<i>DNB ASA</i>	Norwegen	1,49	0,76	0,96
<i>Skandinaviska Enskilda Banken AB</i>	Sweden	0,5	0,57	0,76
<i>Swedbank AB</i>	Sweden	0,52	0,4	0,41
<i>Credit Suisse Group AG</i>	Switzerland	0,6	0,5	0,4
<i>UBS Group AG</i>	Switzerland	0,7	0,5	0,5
<i>Barclays PLC</i>	UK	1,5	1,6	2
<i>KBC Group NV</i>	UK	3,9	4,8	5,5
<i>Lloyds Banking Group PLC</i>	UK	1,8	2,1	2,9
<i>Royal Bank of Scotland Group PLC</i>	UK	3,1	3,9	6,8
<i>Erste Group Bank AG</i>	Austria	4,9	7,1	8,5
<i>Nordea Bank AB</i>	Finland	1,63	1,62	1,74
<i>BNP Paribas SA</i>	France	3,8	4	4,2
<i>Credit Agricole SA</i>	France	3,5	3,5	3,6
<i>Societe Generale SA</i>	France	5	5,3	5,6
<i>Commerzbank AG</i>	Germany	1,6	1,6	2,7
<i>Deutsche Bank AG</i>	Germany	1,8	1,9	2,3
<i>Allied Irish Banks PLC</i>	Ireland	14	19	29
<i>Bank of Ireland Group PLC</i>	Ireland	9,6	13,2	17,7
<i>Intesa Sanpaolo SpA</i>	Italy	14,7	16,6	
<i>UniCredit SpA</i>	Italy	11,78	15,97	16,34
<i>Banco Bilbao Vizcaya Argentaria SA</i>	Spain	4,9	5,4	5,98
<i>Banco Santander SA</i>	Spain	3,93	4,36	5,2
<i>ABN AMRO Group NV</i>	The Netherlands	1,4	1,5	2,1
<i>ING Groep NV</i>	The Netherlands	2,1	2,5	3
<i>Average all</i>		4,11	5,11	6,11
<i>Average Eurozone</i>		2,69	3,06	3,72

**Source: Raiffeisen
Equity Research,, 2017**

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