European Syndicated Loan Interconnectedness: Constituents and Its Contribution to Systemic Risk

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Abstract: In this paper, I explore interconnectedness of lead arrangers in the European syndicated loan market, the measure is constructed based on the distance between lenders. To control for different specifications, the interconnectedness is built for various SIC codes, and European country-wise, with different weights assigned. The obtained results show that diversification and lead arrangers' market share are the driving forces for lenders to collaborate. Also, banks prefer creating networks with companies that have similar portfolio allocation. Importantly, the interconnectedness measure significantly impacts the spreading of systemic risk (SRISK) in the real economies during the times of disruption.

Keywords: *Syndicated loan market; interconnectedness measure; bank networks; systemic risk; financial crisis*

JEL Classification: G01; G20: G21

PREFACE AND ACKNOWLEDGEMENTS

The writing process of the thesis has been a very intense and, at times, emotionally draining process, ranging from the moments of self-overconfidence to times of despair. Looking back, it has been an experience that taught me a lot, and proved that everything can be achieved, if you put enough effort and work towards the goal. Through this preface, I want to express my sincere gratitude to Brian Reis, V-Lab NYU Data Analyst for sending me the huge dataset of SRISK measures and making my life a bit easier, and, of course, Dr. J.J.G. Lemmen for his professional advices.

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CHAPTER 1 Introduction

In the modern financial system, the syndicated loan market plays an important role. During the last three decades, syndicated lending has expanded a lot, and now represents a substantial credit vehicle. It can be stated, that syndicated loans are a large and valid source of financing, that exceeds the total volume of annual issues of stock and bond markets. Indeed, since the financial crisis of 2008, the global market of syndicated lending has, by some estimates, grown from $ 1.13 trillion in 2008 to $ 4.6 trillion in 2017 (Bloomberg, 2018). The popularity of syndicated lending is, partially, due to significant benefits that it offers to both borrowers and lenders. Borrowers use syndicated loans for a number of purposes (such as mergers and acquisitions, recapitalization and general day-to-day operations), and have access to more funding in general. The diversification of the international market has been intensifying due to more active participation of borrowers from all over the globe. One of the main benefits for lenders is risks' diversification, while still maintaining close relations with their customers. To minimize credit risk and provide an acceptable level of diversification, lenders control and set limits on their impact on a specific project, as well as the amount of loans granted to specific sponsors (Fabozzi, 2008).

In 2017 the global syndicated market resulted in 9,887 transactions, exceeding more than $ 4.6 trillion. Compared with the previous year, the market showed an increase of 12% in proceeds and a 3% increase in syndication deal completion, with most active deals in energy and power industry. United States is a constant leader and accounts for 68% of total proceeds, Canada finished second in 2017 with 25%, and Europe ranked third respectively. In Europe alone, the total number of lending amounted to $ 893.3 billion, which comprises 18% of the world market. The aggregate European market saw a 6.4% decline, that was caused by enlarged demand of borrowers and, subsequently, resulted in spillover effect and low prices of deals offered. Political uncertainty and fluctuations on the European market led to reductions in the investment-grade market, followed by 6% fall versus 2016.

The top three leading countries United Kingdom, Germany and France accumulatively reached a growth of 5.3% in proceeds compared with 2016. The top lead arranger bank in Europe was HSBC Holdings PLC, accounting for $ 41.9 billion in proceeds, whose market share increased by 0.8% compared with 2016. The key source of current issuance is leveraged buyout (LBO) activities (Marcus, 2017; Maloney, 2017).

The first half of 2018 depicts a slight shift in lending sectors, indicating that media and entertainment industry grew by 42% in proceeds, even though there is a 24% decline in total number of syndicated deals. Nevertheless, energy and power sector remains the leading industry to invest in during the first six months of 2018, issuing more than 544 consummated deals and with 378.7 billion dollars in proceeds. The European syndicated market shows a consecutive drop of 25% compared to last year,

composing 379.1 billion dollars of profit. Unlike the global market, the European region is concentrated in crediting borrowers in industrial and financial segments, energy and power only results in third on the European arena. Most issued loans are distributed for general corporate purposes, making up 58% of the market (Recine, 2018).

In respect that the global financial market has gone through a major disruption, and the European market itself is still recovering from the sovereign debt crisis, European investor are anticipating the syndicated market to grow back, as it historically presents lower return volatilities opposed to other assets classes, since those loans are predominantly designed to hedge lenders' risks. New M&A issuance also provides assurance in significant syndicated lending expansion in Europe. Banks in Europe, in contradistinction to the United States, are politically incentivized by European Central Bank (ECB) to take on loans developed in the integrated European area. Though volatility is still hesitant and yields are relatively low, the European economies are evolving back and syndicated lending is expected to give rise to more stable floating rate profits and allow for more diversification in the market overall (McGairl, 2017; Wiggins, 2018).

When speaking about banks' contribution to contagious events in the world economy and what leads to those dramatic events, systemic risk should be specified, as it is a major source of interlinked bank disruptions. Such important international organizations as IMF, BIS and FSB[1] (IMF, 2009) 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 has the potential to have serious negative consequences for the real economy"*. The emergence of systemic risk is one of the most relevant, yet difficult to accurately and timely detect.

Brunnermeier et al. (2009) expand more on the topic, introducing the requirements for systemic risk measurements determining that *"a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy"*. Certain breaches such as a failure of one institution, market expansions (reductions), changes in ownership and institutional framework, etc. drive harmful effects for other existing participants in the market, leading up to significant spillovers in real economies. It has been justified that systemic risk can derive from any financial channel, meaning that most substantial issue, that the global financial system supervision is facing, is to be able to measure systemic risk without knowing exactly where it is deriving from (Adrian & Brunnermeier, 2011). The current policy, implemented by governments at present, is meant to capture indemnity of each important institution to systemic risk and mitigate this default probability by adjusting macroprudential tools (Tarashev et al., 2009).

[1] International Monetary Fund, Bank for International Settlements and Financial Stability Board

Different researches put effort into constructing models, that can be helpful for retrieving systemic risk. A measure, proposed by Acharya et al. (2010) and amplified by Brownlees & Engle (2017), called SRISK, likewise European stress tests (except the data is publicly available), is designed to evaluate a company's current net worth and future distribution of to-be assets conditional on a systemic event, using a market-based approach. It is comprised as size, leverage and long run marginal expected shortfall function of a company, and is used as a trustworthy indicator of systemically risky firms (Coleman et al., 2018). New York University's Volatility Institute website updates daily SRISK outputs for global systemic risk, various countries and regions, outlining top ten systemically important financial institutions. Normalized data on global systemic risk to GDP by country is also assessable on the website.[2]

Another important constituent systemic risk measure is CoVaR, introduced by Adrian & Brunnermeier (2016). The model itself is designed based on VaR (value-at-risk) measure, that is a statistic financial microprudential tool to capture risk within a company or its specific features like portfolios or positions over a specified period of time, and is used to assess likelihood of default to happen to chosen evaluated institutions (Engle & Manganelli, 2001). Following that, CoVaR is macroprudential quantile percentage distribution VaR applied to financial system conditionally to the company experiencing failures in the economy. CoVaR is a useful forward-looking measure, that shows what institutions maximally contribute to systemic risk and followed contagion in real economies (Adrian & Brunnermeier, 2011). Alike SRISK, CoVaR is built on size and leverage of a bank, meaning that if bank's leverage increases and its correlation in the banking system with other banks is strong, then both measures should lead to similar results, emphasizing that the systemic risk is significant, otherwise they diverge (Benoit et al., 2013). Billio et al. (2012) in their investigation show that combining different risk measures to control for systemically important events and financial system disruptions, give more predictive power weight on explaining distressed banks' performance, than when only applying one model, both ex-post and ex-ante.

After the financial crisis of 2008, a lot of research has been conducted on relationship between different asset classes and their contribution to systemic risk, as it became apparent, that the global system is not hedged against spillovers. Variety of academics found relations between banks' conjoined participation and their direct contribution to systemic risk. For instance, Moghadam & Viñals (2010) find out that due to relations of different transnational companies, countries are strongly interconnected, which leads to global vulnerability, as disruptions or losses in one company, and subsequently country, can create higher risk exposure and inevitable hazards to the whole financial system. Consistent with the previous findings, Corsi et al. (2016) argue that aggregate increase in the exposure of risk and interlinkages between banks generate

[2] For more information check https://vlab.stern.nyu.edu

higher degree of systemic risk in the economies. Expanding the topic more, Billio et al. (2012) probe that networks of interconnected banks and insurance companies provide contagious effects in the system, by constructing Granger-causality networks measure, that reports significant correlation between the two industries and their contribution to distress in real economies.

Considering syndicated loan market as a source of spillovers, De Haas & Van Horen (2012) explore that, even though international syndicated lending diversifies various risks, networks' creation lead to risk compression in a small sample of highly correlated markets, which, therefore, can bring disruptions trans-border. They prove that international banks spread over contagion, by reducing their transboundary crediting and limited their borrowers to small companies. Besides, researches show that the collapse of Lehman Brothers and such gave rise to sovereign debt crisis in Europe. Nirei et al. (2015) contribute to the discussion by adding, that syndicated lending forms partner-dependencies and they cause spillover effects in the system. The syndicated market facilitates crises spreading, especially sensitive during the time of collapse. The academics indicate that breaches in a large bank do not necessarily lash out economic turmoils, yet small disturbance of a less significant bank can be followed by systemic events. Cai et al. (2014) study how the organizational structure of syndicated loans composition affect systemic risk in the U.S. market by developing a brand new measure of syndicated interconnectedness, based on Euclidean distance, and test the relation between this measure and systemic risk measures. They present that, when banks are trying to increase their portfolios' diversification, they actually lower it, due to becoming more alike. The scholars also establish that banks interlinked via syndicated lending vehicle contribute to propagation of systemic risk. Taking it into account, it can be stated that syndicated lending had a significant contribution in increasing the overall risk.

Whilst most research on interlinked syndicated networks has only been done in the realities of the United States, it is important to conduct a study that will show light on whether highly interconnected European syndicated banks contribute to systemic events, their relations and behavior during financial crisis of 2008, and, most importantly and not touched upon before, their contribution to sovereign debt crisis in Europe. The motivation behind the research is to understand the principles of interlinked networks in European Union for Supervisory Board to be able to take actions in monitoring and regulating systemic risk contagion in Europe, and prevent it from happening.

Consistent with literature described above, the research question that I propose is:

"What is the relationship between interconnectedness and systematic risk in the syndicated loan market and how interconnectedness measures impact the systematic risk in Europe?"

I investigate the impact of syndicated European banks interconnectedness on financial crisis of 2008 and sovereign debt crisis of 2011. First, I construct interconnectedness syndicated measure as proposed by Cai et al. (2014), with data on syndicated loans gathered from DealScan Database. Unlike the researchers, I control for European banks at lead arranger levels that give loans to non-financial organizations during 1995-2017. I design the measure specifying in which specialization banks are more interconnected based on primary, secondary, and tertiary SIC codes, and also European country. The more interconnected the banks are, the higher vulnerability they experience towards spreading systemic risks.

Next, I study how the key feature of such market e.g. diversification impacts the construction of syndicated loan deals. I also regress bank's market share and number of specializations each bank is involved in to look for their correlation with interconnectedness measure.

Then, I look for causal relationship between formed interconnected syndicates in GIIPS countries and Western Europe countries during the financial crisis of 2008 and sovereign debt crisis of 2011, to see their contribution to spillover effects, using Granger causality test, as proposed by Billio et al. (2012).

Consequently, I obtained monthly SRISK measures between 2000 and 2018 from NYU V-Lab website, and quarterly CoVaR measures between 1995 and 2013 from Federal Reserve Bank of New York Economic Development Research Group, provided by Adrian & Brunnermeier. After, I explore the relationship between interconnectedness measure and systemic risk measures, first, checking their correlation using Pearson and Spearman correlations, and finally cross-sectional and time-series regressions, also taking into account recession dates according to CEPR website[3].

The carried out multivariate regressions' results suggest that, firstly, diversification matters a lot for lead arrangers, the estimates are economically significant, with 1 unit increase of diversification, leading up to around 0.4 increase in the interconnectedness measure. Market share has even larger substantial impact on interlinkages between lead managers. Next, time-trends of constructed market-aggregate interconnectedness show that banks prefer allying with each other based on the similarity of their portfolio allocations. Granger causality tests for time-specifications of 2011-2013 depict the Granger-prediction power of forecasting increase in Western Europe interconnectedness based on GIIPS countries interconnectedness measure pattern.

And lastly, the results indicate interconnectedness measure's economically and statistically significant impact on the propagation of SRISK measure during the periods of recession. Sadly, mine interconnectedness measure, as constructed in European settings, does not seem to explain CoVaR measure.

[3] Pick/Trough and Announcement days are available on Centre for European Policy Research website: https://cepr.org/content/euro-area-business-cycle-dating-committee

Overall, though diversification and other key elements reduce risk of banks participating in the syndicated loan market, their alliances do bring disruption to the financial market and that should not be ignored.

Having incorporated the studied materials, the contribution to the existing literature is as follows. First, I construct a syndicated interconnectedness measure in Europe, which has not been done before, using 1995-2017 time period. Second, I investigate causality relationship of GIIPS countries interconnectedness on Western Europe counties during the same time sample. And, third, I investigate the impact of the European syndicated interconnectedness on the propagation of systemic risk in the economy, and look for significant correlation during financial crisis of 2008 and, most importantly, during European sovereign debt crisis.

I start with outlining the most important theoretical and empirical literature and hypotheses development in section 2, then section 3 provides data description, variable construction and detailed methodology. Next, section 4 elaborates on empirical results obtained by conducting the study. And, lastly, section 6 gives conclusion, limitations and further implementations of the research.

CHAPTER 2 Literature Review

The thesis contributes to two strands of existing theoretical and empirical literature on the interconnectedness of syndicated loan market and the systemic risk measures. Firstly, it discusses different researches on syndicated loan market, how international banks incorporate networks, and the direct and indirect contribution of interconnectedness on the spreading of systemic events. Secondly, systemic risk measures are introduced and explained why in the paper SRISK and CoVaR are used. The main goal of this chapter is to depict the previous findings by various academics regarding the networks in financial markets and their contribution to systemic risk. The section is separated into four topics: institutional settings of syndicated loan market, syndicated lending, financial networks and systemic risk measures. The hypotheses examined in the research are also established in the later section.

2.1.1 Institutional settings of the syndicated loan market

Syndicated loans are an important part of the financial landscape and has majorly evolved in the recent decades. This kind of lending involves giving a loan to a borrower by several financial institutions that form a group or a kind of "syndicate" for this purpose. The same terms apply to all creditors, creating a single loan agreement. The typical structure involves one or a few lead arrangers, that represent all the participants and act on their behalf. This type of lending allows for risks' reduction by distributing them among the participants, while the borrower can quicker and easier attract money, than if he had to use the services of ordinary investors.

The syndicated loan market is international in nature, because many of the borrowers and financed projects are international. They are carried out in Europe, Africa, Middle East, and so on. In addition, to facilitate these large loans (up to hundreds of millions of dollars) in the market, several banks are required to participate in each transaction. The market accounts for broad types of industries invested in (Fabozzi, 2008).

There are four main types of syndicated loans: revolving lines, that let borrowers to renew their existing loans; term loans, that specify the amount of credit, repayment schedule and the interest rate; letters of credit, that are bank guarantees to meet the borrower requirements, if he is unable to make payments; and acquisition lines, that are issued for a limited amount of time and are specified for particular assets or to make acquisitions (Chew & Miller, 2011). Armstrong (2003) and Nigro et al. (2010) point out that the most used types are term loans and revolving lines. Syndicated loans are utilized for various purposes, the most popular include general corporate purposes, leveraged buyouts (LBO), mergers and acquisitions (M&A), debt repayment, project finance, etc. Ivashina & Kovner (2011) argue that LBO companies act as middlemen to gain access to debt markets. This facilitates information assymetry cost to decrease. The

higher the correlation between LBO companies and syndication agents, the lower the lending spread is. Banks are interested in syndication due to desire to expand in some geographic regions or industries, or just to save up on organization costs (Armstrong, 2003).

As described by Dennis & Mullineaux (2000), in the syndicated deals each borrower is directly assigned with all participating banks by separate agreements, though there is only one loan contract. Usually, one bank acts as lead arranger, which gets mandate and is responsible for the syndicated process: the bank negotiates loan agreement with the borrower, synchronizes the process of gathering documentation, coordinates the loan closing, collects fees and allocates repayments to the involved banks. The syndication agent plays an important role, as his reputation may reflect the volume of borrowed funds. Same is applicable to the information obtained about the borrower, the better and clearer his records, the higher change the loan will be assigned in vast amounts. Nigro et al. (2010) find out, that level of capital also explains these results. Armstrong (2003) contributes more to the discussion, adding that syndicated lending has features closer to investment banks, rather than commercial, as those banks gain profit by earning floating fees. In general, syndicated loan agreements are issued with average maturity of 1-5 years, however, they can be granted just for a couple of month or up to 20 years. Though, more liquid loans have longer maturity of about 20 months than illiquid ones. They are also larger in size (Gupta et al., 2008).

The syndicated loan market is divided into primary and secondary markets. The primary market is highly competitive with lead managers trying to win mandates and manage deals, as they want to share a portion of liquidity advantages with borrowers. Also, incentivized by generating higher yield and dividing the credit risk, there is a high demand for speculative grade loans from investors. Hence, speculative grade loans are more liquid on the primary market than investment grade loans, even though investment grade loans are less risky (Gupta et al., 2008). Secondary market has enlarged over the last decades in comparison with the primary market, furthermore, it operates differently: the allocation is proceeded through loan sales and purchases. The transaction can be made between two existing participants in the syndicated deal, or between one participant and a separate bank via issuing a new agreement between the borrower and a new loan purchaser. The managing agent can also sign a contract with the outside institution, where the new bank gets the participation role in present syndicate. Transactions on the secondary market enable lead arrangers to lower loans' exposure (Armstrong, 2003). Transparency in the secondary market allows lenders to mitigate the credit risk. Banks are able to sell off riskier syndicated portions to others in times of financial disruption. As such, creditors can monitor and adjust to market changes, which led to the innovative development of the secondary market and vast amount of trading. It is also due to increased participation of non-financial companies (Nigro et al., 2010). Gupta et al. (2008) investigate that secondary loan buyers do not have access to borrowers' information, and thus, are more keen on loans with provisions, that reduce agency costs and moral hazard issues. The authors probe that loans with higher liquidity in the secondary

market are charged with smaller spreads in the primary market. Though, De Haas & Van Horen (2010) reveal that higher activities and repurchasing of risker loans in the secondary market were followed by the sharp decline in the market.

2.1.2 Syndicated loan sales and loan renegotiations

Loan renegotiation is a standard procedure in the syndicated loan market and is conducted via loan agreements' initial claims. Roberts & Sufi (2009) examine the renegotiation tendencies and find that renegotiation takes place in the early life of a loan, and way earlier than the maturity date for 75% of credit agreements out of whole constructed sample. The academics also explore the significant impact of renegotiations on principal, spread and interest changes from original contracts, and, subsequently, corporate structure of borrower firms. The explanation behind a decision to renegotiate agreements are the emergence of inconsistent information about both parties' financial health, credit ratings and financial market conditions. Roberts (2015) contributes more to the discussion, stating that most borrowers initiate the renegotiations due to fluctuating market conditions, and only less than one third proceed with the renegotiations in case of covenants breach. The researcher also elaborates on the reasons for renegotiating the loan, namely, uncertainty about borrower's future wealth, as financially weak borrowers speed up the contract renewal process themselves. Paligorova & Santos (2015) probe that the renegotiation can be explained by the share of lead arrangers, as those with larger shares tend to be convincing, when incentivizing the revisal. The participation of non-banks lead arrangers in the syndicated loan market reduces the number of renegotiated contracts.

For the syndicated market participants, the information plays a critical role. Lead arrangers that require borrowers to be more intensely inspected, maintain large shares in, afterwards, higher concentrated syndicates. In terms of times of financial distress, lead managers tend to invite more participants to the deal, so renegotiation conducted is more difficult for borrowers with high chance of default, as the expected payoff by the lender is smaller than (Sufi, 2005).

Another interesting characteristic is the sale of loans in the syndicated market. A loan is defined as sold if at least of one the participants of the original loan is not in the syndicate anymore and, thus, loan is renegotiated. Lenders are stimulated to sell the loan to lower the regulatory taxes. Dahiya et al., (2003) show that the larger the lender bank's portfolio size and trading income, the higher the chance of the loan to be sold by that financial institution. Also, financially constrained lenders are more likely to sell their syndicated shares. Bank-wise, the announcement of loan share sales does not affect stock returns of the bank, nor its reputation.

2.1.3 Syndicated lending

Over the past decades the syndicated loan market has become a major driving source though which banks are lending to many large and middle market companies, such as banks, insurance companies and non-financial firms (Ivashina & Scharfstein, 2010). Syndicated lending also reflects a substantial source of corporate finance (Sufi, Information Assymetry and Financial Arrangements: Evidence from Syndicated Loans, 2007). According to the Markit iBoxxUSD Leveraged Loans Index, syndicated loans are considered prepossessing to firms aspiring secured investments especially with floating interest rates that are rising or are expected to rise. In recent years, the total return on syndicated loans has delivered more than 8%.[4] The importance of such loans has been taken in consideration in both theoretical and empirical studies. Dennis & Mullineaux (2000), Jones et al. (2000) inspect what factors motivate banks to participate in syndicated deals, whereas Lee & Mullineaux (2004) find that syndicated loans are longer maturity loans, hence, credit risk spread between banks is less. Sufi (2007) touches upon this subject, noting that when monitoring becomes a more significant issue for participants, lead arrangers preserve larger portions of loans, thus syndicates turn to be more concentrated. Le (2013) finds out that when the syndicated loan market experiences shocks, lenders with high market exposure do not deteriorate the economic conditions, due to active risk-management strategies. The risk-sharing regulations allow for limited exposure during turmoils. On the contrary, Shan (2017) argues that when large banks experience increased exposure to disruptions, their default probability enlarges, leading up to contagious effects. That means, that size and exposure of syndicates have significant contribution to spillover effects and worsening the real economies via spreading the damage around all the participants from the lead managers.

The syndicated loan market is especially interesting for researchers for several reasons. First, this type of loans acts as a primal source of external finance for variety of companies all around the globe (Thompson et al., 2008). Simons (1993) investigates the reasoning behind syndication and finds diversification to be the main incentive. Boot & Thakor (1997), Boot (2000) describe syndicated loans as a mixture of "relationship loans" and "transactions loans", meaning that they comprise a hybrid between capital market instruments and traditional loans issued by banks. In the research of Nirei et al. (2015), the authors explore that syndicated market facilitates risk-sharing between engaged banks and consequently reinforce the total amount lended in an economy, which determinates higher possibility of financial distress, as syndicated loan sizes are significant, and in a case of default, the whole system can crash, that is why during the financial crisis of 2008 the amount of syndicated deals decreased majorly. One of the main findings of De Haas & Van Horen (2010) detects that the syndicate structure of loans for non-financial organizations changes during financial turmoils. Reduced interconnected market liquidity in the primary

[4] For more information check https://www.businesswire.com/news/home/20161101005953/en/IHS-Markit%E2%80%99s-Syndicated-Loan-Data-Power-Enhanced

syndicated loan market influences increase in the retention rates of syndicate participants. Managers, who want to keep large positions and finish the syndication process, tend to contribute more to the deal, if some participants are limited, thus retention rates go up. Arrangers reputation matters as well: for well-known and proficient banks to retain less of positions is suffice.

Though syndicated lending is a key component in corporate finance, allowing banks to diversify their credit risk and magnifying lending in aggregate, syndicated loans also increase bank interconnectedness via participants' relationships. Onwards, Champagne & Kryzanowski (2007) report that banks that operate on an international arena aim to unite with the same lenders, and such actions lead to higher homogenization of syndicated loan portfolios. Syndicated lending represents a good proxy for estimating connections between banks, as they are comprised of longer maturities and reflect larger committal and opportunity for information flows (Hale et al., 2011), which creates new banking relationships and alleviate foreign trade. Hale et al. (2013) in their investigation of syndicated loans among bank linkages and international trade demonstrate that when banks in one country cooperate with banks in a different country, they become more closely linked, which in return increases the trade between the two by significant amounts.

2.1.4 Financial networks

There is a large theoretical literature devoted to understanding financial connections and how those networks impact the real economy. The findings of some academic papers (Allen & Gale, 2000; Acemoglu et al., 2015; Gupta et al., 2018) suggest that banks cooperate via both direct and indirect connections (for instance, contributions in the primary syndicated market). Networks in the syndicated loan formation procedure are endogenous, due to banking relationship of generating loans for the same borrowers in conjunction (Nirei et al., 2015). The outcome networks comprise the interconnectedness measure, where more interrelated loans have more similar banks and more common exposure. Contributing to the subject, Abbassi et al. (2016) document that bank partners with more corresponding lending experiences tend to be more correlated with each other. Kleimeier et al. (2013) indicate that the international syndicated loan market has evolved to be more interconnected over last decades, which in return increases the density of the syndicated network.

In line with what is mentioned above, is the research conducted by Caballero et al. (2009), in which they prove that connections between banks in different countries appear to be an important indicator of a bank involved to be intermediary in the global financial market. Furthermore, scholars probe that countries with more relations in the syndicated market, before the financial crisis of 2008, were less affected afterwards. Developed countries are more interconnected with each other and struggled less during the

disruption, which is an important distinction. On the contrary, Hale et al. (2016) show that connections between developed and peripheral countries were prone to greater losses during times of recessions.

In the financial networks literature, academics have conducted extensive examinations on banks contribution to financial contagion and systemic risk. Empirical findings of Vivier-Lirimont (2006) indicate that the more banks are correlated with each other, the more those networks facilitate contagion in the financial world. Acemoglu et al. (2015) elaborate on this matter, adding that linkages in financial networks actually absorb shocks, when the damage is relatively small. Espinosa-Vega & Sole (2011) carry out a study on international level interlinkages across countries, and grasp that the banking system itself is resilient and its crash is very unlikely. Cai, Saunders, & Steffen (2011) construct a unique interconnectedness measure and discover that more interrelated financial institutions endow more to systemic risk. Degryse & Nguyen (2007) likewise contribute to the discussion by providing evidence that more interlinked banks have strong influence on risk of their close counterparties. As proposed by Hale et al. (2012) the world financial network framework does dynamically react to shocks and should be considered endogenous. Although, Upper (2011) specify that interbank exposure has little contribution to contagion. Consistent with other researchers, Lane & Miseli-Ferretti (2007) find out that due to global financial integration, spillover effect in Europe is spread through recessions in the United States and economy strengthening in Asian countries. Even though the trans-border trade between countries is somewhat limited, the exposure of Europe via external factors should be a primary concern.

The syndicated lending networks allow small disruptions to outgrow into large common shocks in the banking sector, while independent banks can persevere though major shocks without being prone to systemic risk. The dissolutions in the syndicated loan market occur as an outcome of extensive margin adjustments. The failure of large institutions does not inevitably cause vast distress, however, a small common equity shock can lead to abominable results (Nirei et al., 2015).

Diversification is a key feature of syndicated loans, and Caccioli et al. (2014) in their investigation explore that diversity may give rise to hazardous repercussions and worsen the financial contagion. Corsi et al. (2016) also complement the matter by examining that, when diversification increases in event of large systemic shock, the hazard rate of a single entity and its interlinked institutions goes up, thereby leading to higher degree of systemic risk. Drapeau & Champagne (2015) touch upon the topic as well, noting that lenders participating in several syndications are more exposed to shocks in the market. Following that, syndicated interconnectedness plays an excruciating role as an indicator of systemic risk distribution in the banking system.

2.1.5 Systemic risk measures

The challenge of detecting and mitigating systemic risk is one of the most relevant discussions after the global financial crisis. A lot of academics put effort into developing various measures to capture and handle systemically important institutions and reduce possible instabilities. Systemic risk measures have been developed by researches within different frameworks.

Acharya et al. (2010) in their investigation define SES (systemic expected shortfall) or the systemic-risk component, which equates to the expected undercapitalization amount of a bank, and when the measure increases, it denotes the bank's expected losses during the slump. Likewise, the scholars propose MES (marginal expected shortfall) measure, using cross-sectional regressions, that determinate the dependence of the tail between an institution and the financial system. It is conditional of the system being in collapse. Brownlees & Engle (2012) elaborate on the research, and construct MES in time-varying linear dependencies. Even though MES is now a regulatory measure, Corsi et al. (2016) point out that it does not take diversification impact into consideration, which is crucial in systemic risk dimension.

Using works and measures described above as a theoretical framework, Brownlees & Engle (2017) introduce a market-based macroeconomic measure – SRISK, which is an institution's expected capital shortfall during a turmoil, and is believed to grasp early signals of an upcoming crisis. Unlike MES, SRISK depends on the size and applied leverage of an institution (due to large leverage usage, the financial sector is sensitive to fluctuations). Compared with European stress tests conducted in the examination of Acharya, Engle, & Pierret (2014) and SES from the paper of Acharya et al. (2010), the predictive power of SRISK is significantly higher. Additionally, if SRISK increases, then industrial production is predicted to decline and unemployment rate to rise, especially when considering longer time-horizons. A substantial feature of SRISK is that it accounts for interlinkages between institutions in the whole financial system via LRMES (long-run marginal expected shortfall) (Benoit et al., 2013; Brownlees & Engle, 2017; Coleman et al., 2018).

Despite all the advantages, SRISK estimates bank risk exposure only at macro-level. To determine systemic risk at micro-level, Adrian & Brunnermeier (2016) present CoVaR (conditional value-at-risk), which is an extension of VaR (value-at-risk measure). CoVaR is centered on estimating a bank's failure, and subsequently its contagious impact on the whole banking system. In other words, the financial system is conditional to the collapse of each single bank. The vaster the impact of an institution on the spillover effects in the system, the greater the contribution of that institution to the systemic risk of the whole economy, meaning that CoVaR is used to single out systemically important institutions. This translates the focus of supervision to the overall risk of the financial sector and the actions of individual institutions. Thereafter, the latter measure forecasts contagion effects more accurately, while SRISK shows how the overall exposure to shocks influences the whole system (Adrian & Brunnermeier, 2016; Huang et al. 2012;

Laeven et al., 2016; Shan, 2017). With that in line, both SRISK and CoVaR are essential indicators for monitoring global financial stability.

To sum up, the origination and the impact of systemic risk should be linked, because banks that do not seem contagious, yet impose a superior lender role, may spread additional stresses to the global economy at times of distress. Banks that are highly interrelated contribute the most to systemic risk. Thereto, banks in the syndicated loan market, that are the most contributed to shocks, develop higher credit risks and, hence, demonstrate disruptions in their portfolios and bifurcation in the global economy.

2.2 Hypotheses

The literature presented above serves as foundation for determining the hypotheses of this thesis. These hypotheses described below are going to be developed and examined in the following chapters: Methodology and Data, and Results.

The main drawback of the studied material is lack of investigation of interconnected banks engaged in syndication and their impact on systemic risk in Europe. As stated in European Financial Stability and Integration Review (2017) by European Commission, the members of European Union decided to enhance the level of integration of the financial sector among the countries. This is to ensure high diversification, more efficient transactions and risk reductions. The hypothesis is related to syndicated lending and financial networks, considered in the sections 2.1.1 and 2.1.2. Applying the interconnectedness measure suggested by Cai, Saunders, & Steffen (2014) to the European syndicated loan market, it is very interesting to investigate, whether the interbank integration in Europe is strong and if institutions in the syndicated loan market become more related through their portfolios.

An important characteristic of syndicated lending is risk minimization through diversification (Dennis & Mullineaux, 2000; Simons, 1993). Ren (2014) finds out that diversification increases, when institutions obtain more syndicated partnerships. Conducting the research, Drapeau & Champagne (2015) explore that individual diversity of a bank is also influenced by syndication. Hence, the second null hypothesis is as follows:

$H_0$1: Diversification serves as the main driver for the interconnectedness between banks in the syndicated loan market.

Acharya & Yorulmazer (2008) establish that banks seeking to increase their proceeds tend to gather together with banks that have similar objectives, which is induced by information contagion. Sequentially, systemic risk contributes to the probability of failure of connected banks. Though due to “too-many-to-fail” policy, those financial institutions are saved from collapse by regulatory authorities, Gong (2014) corroborates to

the discussion, indicating that banks become more correlated on purpose, as risk changes to aggregate and it facilitates to increase exposure to aggregate risk for the banks. Therefore, the next null hypothesis to be further examined is:

$H_0$2: Banks establish connections with those institutions that have similar asset allocation in their syndicated loan portfolios, as it matters as much as size of the bank and its exposure to the market.

According to the Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations report (2009), prepared by the Financial Stability Board, the BIS and IMF staff, systemic risk is two dimensional (cross-sectional and time), which implies that interlinked banks' composition can impact the distribution of spillover effects.

Briefly adding to sections 2.1.2 and 2.1.3, Shan (2018) claims that the credit risk of syndicated loan portfolio will expand, if the bank has an impact on global systemic risk. Besides, Ren (2014) discovers that the most interlinked banks in the syndicated loan market give rise to financial distress. Hence, for drawing a conclusion for European syndicated loan market, the forth hypothesis is:

$H_0$3: Syndicated interconnectedness has a strong effect on propagation of systemic risk in the financial system during recessions.

The importance of null hypotheses five and six was discussed in detail in the section 2.1.3, thus they are composed as follows:

$H_0$4: Interconnectedness has a significant and positive effect on SRISK measure during the times of recessions.

$H_0$5: Interconnectedness has a significant and positive effect on CoVaR measure during the times of recessions.

CHAPTER 3 Data and Variable Construction

3.1 Sample collection

The analysis of this paper is determined based on loan syndication in Europe, specifically between 1995 and 2017, thus Thomson Reuters DealScan database was used as a main source of lenders' activity sample gathering. The database contains various data on loan tranches; loan, lender, package and borrower company information.

The data considered for the research is syndicated loan origination information on lenders and loan amounts given to European borrower non-financial companies. To look for different connections in the market, investigation of interlinkages of banks in primary borrower SIC code industry, secondary borrower SIC code industry, tertiary borrower SIC code industry, and, finally, European country are considered, to control for saturation of lenders in specific industries and regional bank-integration. The data on syndication is used to measure interconnectedness between lenders based on their participation in the European syndicated loan market as lead arrangers, since they play the main role in the deal negotiation and managing the syndicate of arrangers. Various lenders participate in different syndications changing from being former average participants to current lead arrangers, which reduces moral hazards, but increases interlinkages, leading up to lenders being potential contributors of contagious effects of systemic risk (Cai, 2010). The largest part of the loan is given to syndication managers, as they play the substantial part, thus the interconnectedness measure constructed at lead arranger-level.

First, the data on facility amount was obtained with the date frame of 1995 to 2017, as the syndicated loan market has been developing relatively recently, compared to other financial markets, so further investigating the syndicated European market, the development and gradual expansion of the market can be observed. All available information on lenders with facility amounts of more than 5 million euros was considered. Also, the country of syndication was chosen to be exclusively European. That means that borrowers are European companies or those firms, that have branches in European countries, other regions were excluded from the sample. The data covers borrowers in 9 SIC codes Industry divisions, as the Finance and Insurance were not included in the research. Companies with codes between 6000-6400 were excluded. After that, the records on lenders were acquired, more specifically lender participation role in the syndicated process. Different lead arrangers participate in various loans. It is important to point out that lenders used come from all around the world, though, because the currency of syndications was chosen to be Euro, most banks are European or have branches there. Finally, linking DealScan information with Compustat database, the data on borrowers was achieved, though it is only used to show some background information on average characteristics of European syndicated loan borrowers, not the primary study. The overall dataset was matched using FacilityIDs, LenderIDs, Ticker, GVKEYs, and months of facility start dates.

The frequency of the data obtained was unbalanced daily at first, then, while creating the measures, was transformed into monthly. The loans, hence, facility amounts are measured in million euros. The list of the borrowers used for descriptions are lenders used for final interconnectedness measures' constructions are presented in Appendix A and Appendix B respectively.

To see what was the effect of lead arrangers' interconnectedness on the financial market during the crises, the systemic risk measures were collected. The data on SRISK measure was obtained from NYU V-Lab website[5] on request, then manually matched with available data gathered prior. For the CoVaR measure, the data was found on the website of Markus K. Brunnermeier[6], then matched as well.

3.2 Data before variables construction

3.2.1 European syndicated loan market data

After collecting all the necessary data for the research, some adjustments were made. In the beginning, the whole dataset on syndication information in Europe in primary, secondary, tertiary SIC codes and country contained 57,325 not balanced daily-observations, though, the minimum loan facility amount, time frame and country of syndication were considered in advance. To control for bank being a lead arranger in the syndication process (as the interconnectedness measure is based on lead arranger-bank level), according to the methodology proposed by Cai et al. (2014) and the Standard and Poor's Guide to the Loan Market (2011)[7], only those banks that have lender titles "Admin agent", "Agent", "Arranger", "Bookrunner", "Co-agent", "Coordinating arranger", "Documentation agent", "Lead arranger", "Lead manager", "Mandated arranger", "Mandated Lead manager" and "Syndication manager" were left, which resulted in the sample decreasing to 31,395 observations. Controlling solely for "Lead Arranger Credit", would result in the sample reduction up to 17,309 observations, which is almost twice as small, and, based on S&P Guide, other mentioned lender titles play significant roles in the syndication process, that is why it was decided to keep them as well.

Just to obtain some general information on borrowers (non-financial European companies), Roberts DealScan-Compustat Linking Dataset Linking Table (Chava, Sudheer, & Roberts, 2008) was used, as it provides matches between loans' FacilityIDs and unique to Compustat borrowers' GVKEYs. It is not used in the main research itself, only needed to show an average borrower statistics. The information was gathered on 1,447 unique borrowers. The borrower information downloaded directly from DealScan together with lender information indicates that, on average sales at closing comprise 15.5 billion euros.

[5] https://vlab.stern.nyu.edu
[6] https://scholar.princeton.edu/markus/publications/covar
[7] Chew, W., & Miller, S. (2011, September). A Guide to the Loan Market. *Standard & Poor's Financial Services*.

Among borrower characteristics from Compustat, the average value of total assets is 13 billion euros and book leverage ratio of 4.79 respectively. The average earnings-to-assets ratio is negative, and is equal to -0.19. Table 1 presented below shows more detailed summary statistics.

It is interesting to indicate, that main industries of borrowers are IT and digital, telecommunications and media, chemical and biotechnological, mining and steel, retail and high fashion, entertainment, printing and publishing, dining and brewery, gas, oil, waste and nuclear, etc.

Table 1: Borrowers summary table based on facility amounts

Average borrower characteristics

	#N	Mean	Standard deviation	10th percentile	50th percentile	90th percentile
Compustat borrowers:						
Total Assets (million €)	25,855	13,000	497,000	178.79	2,735	152,978
Book Leverage ratio	25,806	4.79	371.26	0.58	1.81	10.02
Earnings-to-assets ratio	25,326	-0.19	18.99	18.99	0.06	0.37
DealScan borrowers:						
Sales at closing (milion €)	3,459	15,500	28,600	440	3,760	49,900

The table presents borrowers' summary statistics for the sample of syndicated loan facilities made to non-financial companies situated in Europe between 1995 and 2017. This table reports borrower characteristics, based on 31,395 loan facilities.

Regarding loan characteristics, DealScan provides the research with the information on maturity, deal purpose, each facility amount size and loan type characteristics. There are 31,395 facilities in the sample, 23% of which issued for corporate purposes (7,096 facilities), LBO makes up for 20.8% of deals (6,547 facilities) and debt repayments compose 20.7% (6,529 facilities). The next popular deal purpose is project finance, which comprises 2,645 facilities and 8.4% of the sample. In terms of loan types, term loan contains 47% of all facilities, covering almost a half of the sample, and revolving line, that is equal or more than 1 year draws up 32.8% of all loan types. Description of average maturity and loan facility amount are given in Table 2 below.

Table 2: Loan facility characteristics

Average loan characterisctics

	#N	Mean	Standard deviation	10th percentile	50th percentile	90th percentile
Syndicated loan terms:						
Facility amount (million €)	31,395	744	1,660	26.70	225	1,800
Maturity (months)	30,383	72.68	49.34	18	60	108

The table presents loan summary statistics for the sample of syndicated loan facilities made to non-financial companies situated in Europe between 1995 and 2017. This table reports loan characteristics, based on 31,395 loan facilities.

The subsequent data alteration is directly related to variables construction, thus will be discussed in the following section.

3.2.2 SRISK and CoVaR

The output data, gathered from NYU V-Lab Systemic Risk database, contained 1,299 separate files on different companies and their daily data on LRMES and SRISK measures. Manually matching datasets by lender names, only 57 banks were kept for the empirical research, the names are presented in Appendix C. For better estimations, in terms of SRISK, the data frame considered is from July 2002 until the end of 2017.

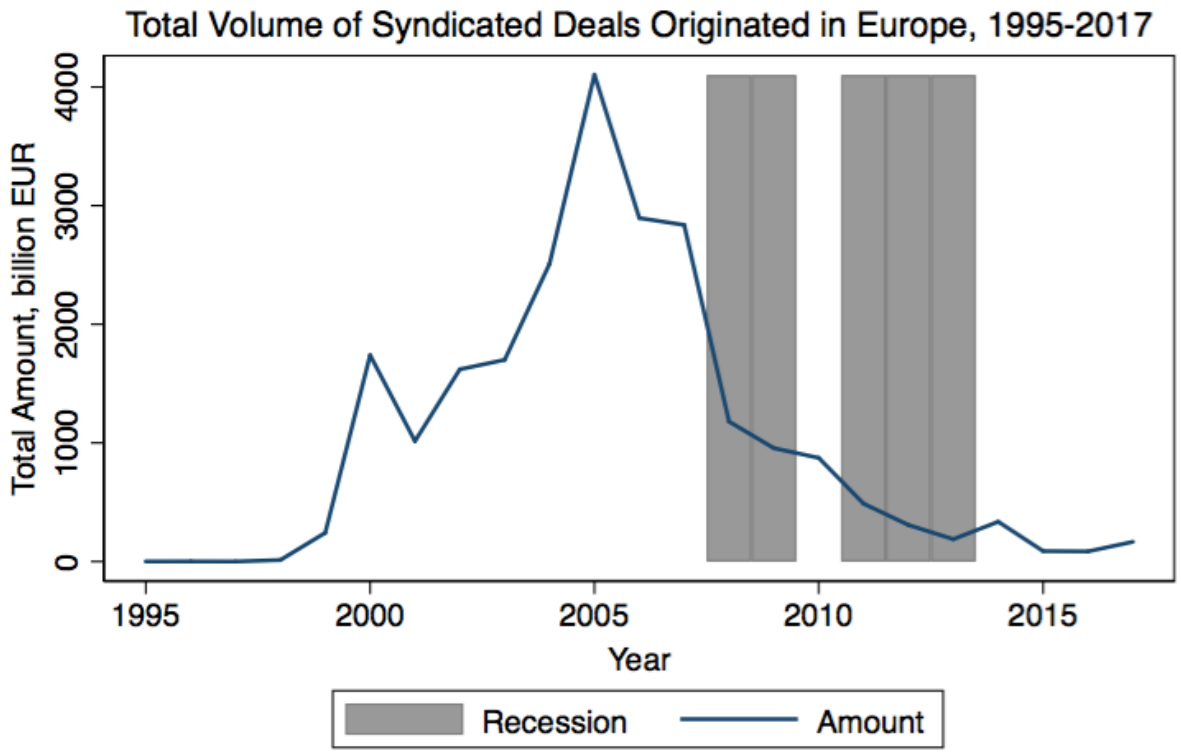
The quarterly CoVaR measure available on Markus K. Brunnermeier's website is mainly calculated for financial institutions situated in the United States, so out of 1,814 companies only 11 were considered valuable for the research, though only one bank is European, the rest of the sample is only American banks. The time span of CoVaR ranges between 1995 and the second quarter of 2013. The matched banks list is in Appendix D.

3.2.3 European syndicated loan market and financial crises

Syndicated lending is an essential vehicle of crediting in the financial market. Thus, during the times of disruption it also reflects the sufferings majorly. Before turning to immediate variable construction, it is vital to pave the trend of how the European syndicated loan market reacts to happening on the international financial arena, especially during the financial crisis of 2008 and the sovereign debt crisis of 2011.

Figure 1 displays the total volume of syndicated deals originated in Europe from 1995 until 2017, controlling for times of recession in European region. Substantial declines can be seen at times of recessions, meaning that during downturns there were much less syndicated deals made and the amounts of loans were smaller. Moreover, the total amount of 2017 is relatively low, implying that the market is still slowly recovering from the outrageous times, though it is more resilient to volatility in comparison with other asset classes (Ronberg, 2018).

Figure 1: Total volume of syndicated deals in Europe in billion euros, 1995-2017



Based on facility amounts of all banks in the sample aggregated by year

Based on data retrieved from Dealscan Database

Table 3 gives yearly descriptive statistics of the facility amounts obtained in the sample. The results shown below are consistent with the graph, with less observations and smaller total facility amounts. Specific years are highlighted and the description of the reasoning behind is given below in the table. It is important to keep in mind that even though the total volume of syndication might seem small, the currency was chosen to be Euro only and it is based on European non-financial borrowers gathered from the DealScan database, and the data does not cover the whole European syndicated market completely.

Table 3: Yearly descriptive statistics of all facility amounts in the sample

Year	Facility Amount, mln €	#N	Mean	Standard deviation	10th percentile	50th percentile	90th percentile
1995	1,250	4	313	0	313	313	313
1996	1,390	5	278	32,6	254	254	314
1997	573	2	287	0	287	287	287
1998	12,800	43	297	200	54,7	200	543
1999	242,000	397	611	1,590	31.8	182	1,060
2000	1,740,000	1,189	1,460	2,730	46.7	393	3,630
2001	1,010,000	1,851	548	819	33,7	255	1,330
2002	1,620,000	2,016	804	1,550	31,3	265	1,920
2003	1,700,000	2,588	657	1,210	29.4	227	1,700
2004	2,510,000	3,451	727	1,670	30,3	213	1,690
2005	4,100,000	4,396	933	1,720	34,4	273	2,430
2006	2,900,000	4,265	679	1,600	26,3	214	1,590
2007	2,840,000	3,659	775	1,940	29,7	249	2,200
2008	**1,180,000**	**2,572**	**459**	**844**	**23,5**	**163**	**1,110**
2009	**956,000**	**1,839**	**520**	**1,310**	**10,9**	**114**	**1,320**
2010	*874,000*	*1,389*	*629*	*1,340*	*14,9*	*130*	*1,600*
2011	**488,000**	**453**	**1,080**	**1,220**	**105**	**526**	**2,700**
2012	**308,000**	**265**	**1,160**	**5,240**	**13,1**	**115**	**965**
2013	**188,000**	**188**	**1,000**	**1,540**	**22,2**	**226**	**4,890**
2014	*335,000*	*220*	*1,520*	*2,050*	*62,2*	*669*	*4,030*
2015	*87,700*	*184*	*476*	*727*	*15*	*153*	*1,890*
2016	*85,500*	*242*	*353*	*631*	*19,6*	*111*	*840*
2017	*166,000*	*177*	*940*	*2,370*	*31,7*	*233*	*2,710*

The table shows yearly summary statistics of facility amounts of syndicated loans originated in Europe between 1995 and 2017 in the sample. The years of financial crises are in bold. It can be seen that during economic disruption the number of issued loans decreases drastically. The aftermath years are in cursive. It can be noted that after the turmoil, there are even less observations, meaning much less syndications and smaller amounts per loan.

3.3 Variables construction

As systemic risk measures were obtained via online resources, the main focus of this section is on the interconnectedness measure construction and the essential features of the syndicated loan market. They are divided into three groups: interconnectedness measure, diversification, and market share and syndicated loan market size. The theoretical background of how SRISK and CoVaR are calculated is also explained in the end of the section respectively.

3.3.1 Interconnectedness measure

As proposed by Cai et al. (2014), interconnectedness is a relatively new measure based on Euclidean distance and collaborations between lenders, when arranging syndicated deals. Thereby, before constructing the interconnectedness, other variables had been created, that are:

- Portfolio weights in specialization/country
- Euclidean distance

Afterwards were constructed:

- Bank-level interconnectedness
- Market-aggregate interconnectedness

The primary objective of the analysis is to see the interconnection patterns in syndication loan giving by lenders in Europe. That is why the measure is conducted for 3 types of SIC codes to find borrower-industry relations and country specific integration. DealScan gives access to information about borrowers' SIC codes and countries, that they are located in. The first type of interconnectedness is based on primary borrower SIC code Industry, which allows to examine in what industries the lenders distribute syndicated loans and how their interlinkages are saturated there. Then, secondary and tertiary borrower SIC codes are studied. Unfortunately, the database does not provide enough information on the secondary and tertiary borrower SIC codes, that is why the constructed sample is afterwards smaller compared to primary borrower SIC code banks' integration. The fourth type of interconnectedness is country-level, based on the European country borrower is situated in. All the steps for calculating the interconnectedness for all four types are the same, the only difference is that all four variables calculations are based either on a certain type of SIC code or European country. Due to information on European lenders not being fully available on some banks and difficulty of computing distance measure, it was decided to use 450 bank-months for the research calculations based on largest facility amounts given by banks, the time frame stays the same.

The first step in computing interconnectedness measure, is portfolio weights monthly estimation for each lead arranger-bank in primary, secondary, tertiary SIC code industries and European countries. Analyzing SIC codes can show in what spheres banks invest the most, while regional (country-based) correlation displays integration. The equation proceeds as follows:

$$\sum_{j=1}^{J} w_{i,j,t} = 1 \,, \qquad \textbf{(1)}$$

where $w_{i,j,t}$ is the weight a lead arranger i has in a specialization j in a month t. There are 9 different categories of SIC codes, though they each comprise a bit different specializations, and the number of j can be up to 100 industries. In total, there are 23 European countries considered and divided by in the sample for the regional measure computation. In total, there are 450 lead arrangers every month with the longitude of 22 years, which comprised in 124,200 observations.

The next step is measuring of Euclidean distance between lead arrangers each month in primary, secondary and tertiary SIC codes and European country. Distance is computed between banks in the same industry (primary, secondary, tertiary) and European country originating syndicated deals. The measure is calculated as follows:

$$Distance_{m,n,t} = \sqrt{\sum_{j=1}^{J} (w_{m,j,t} - w_{n,j,t})^2} \,, \qquad \textbf{(2)}$$

where $w_{m,j,t}$ is the portfolio weight of a lead arranger m at time t and industry code (country) j, and $w_{n,j,t}$ is the portfolio weight of a lead arranger n at time t and industry code (country) j, lead arranger $m \neq$ lead arranger n. The higher the distance between banks, the more they are interconnected with each other. Being a three-dimensional metric magnitude (that lies within the range of 0 and 1.41($\approx\sqrt{2}$)), with 0 - being least connected and 1.41 being the most interlinked with each other, the Euclidean distance measure is difficult to compute and it gives around 53.4 million distances among lead arrangers-months for all years for each SIC code division and country. The Table 4 below shows distance computation among top-10 lead arrangers, based on facility amounts granted, in January 2007 as an example of model construction.

Table 4: Distance measure example calculation based on top-10 lead arrangers in January 2007

	ABN AMRO	Bank of Scotland	Bankia	Barclays Bank	Deutsche Bank	Goldman Sachs	Mediobanca SpA	Merrill Lynch & Co	Portigon	Royal Bank of Scotland
ABN AMRO	-									
Bank of Scotland	1.156	-								
Bankia	1.152	0.083	-							
Barclays Bank	0.792	1.276	1.244	-						
Deutsche Bank	0.496	1.351	1.363	1.287	-					
Goldman Sachs	0.496	1.350	1.362	1.288	0.000	-				
Mediobanca SpA	1.216	0.064	0.098	1.311	1.414	1.414	-			
Merrill Lynch & Co	1.217	0.065	0.097	1.310	1.413	1.417	0.000	-		
Portigon	1.216	0.064	0.098	1.311	1.415	1.415	0.000	0.000	-	
Royal Bank of Scotland	0.547	0.764	0.746	1.006	0.714	0.713	0.823	0.822	0.825	-

The table shows how distance is computed, using the top-10 lead arrangers in January 2007 using borrower primary SIC code as an example. The computation is based on lenders' portfolios of loan amounts originated during the previous 12 months. Distance between two lead arrangers is measured by their Euclidean distance based on their specializations in the European syndicated loan market. Distance is the key component for computing interconnectedness − the smaller the distance between two arrangers, the more interconnected they are.

After obtaining distances among lead arrangers, the prospective move is to carry out a monthly bank-level interconnectedness measure among any given agent and other bank-participants in SIC divisions and country-level. Linearly transforming Euclidean distance measure and adjusting it to the formula, introduced below (3), the interconnectedness measure is normalized on the scale between 0 - not interlinked and 100 - being the most connected, the formula as proposed by Cai et al. (2014):

$$Interconnectedness_{i,t} = \left(1 - \frac{\sum_{k \neq i} x_{i,k,t} * Distance_{i,k,t}}{\sqrt{2}}\right) * 100\,, \qquad \textbf{(3)}$$

where Distance is the obtained results from equation (2), linearly transformed, $x_{i,k,t}$ is the weight of lead arranger k in the calculation of the interconnectedness of bank i.

The interconnectedness measure is very important, as higher participation of lenders leads to higher level of interconnectedness measure, thus, presumably, contributing more to spillover and contagion effects in European market. Is it captured using different types of weights.

There are three types of interconnectedness weighting applied in the research: equal-weighted, size-weighted and relationship-weighted. First, equal-weighted interconnectedness is the benchmark of the

banks' interlinkages, where the weights for all banks are assigned to be the same. To control for direct relationships between large lead banks in the syndication process in Europe, size-weighted interconnectedness is computed based on the total facility amount of bank *i* to the sum of total facility amounts of other participating banks each month, as larger banks should have more impact on contagion spreading in syndicated loan market. Simply speaking, it has been accounted for difference in size of lead arranger financial institutions by including the weights of an individual manager measured by its individual contribution to the total syndicated market per month. The last measure - relationship-weighted - is computed based on prior syndicated loan collaboration relationships between bank *k* and *i* each month, the weight is conducted based on the number of prior relationships among each bank in each month. That is supposed to portray different interconnectedness measures between banks and their levels of connections. As a result, there 124,200 observations in total for each SIC division and European country.

After that, to control for time-series of bank interlinkages on the aggregate level, the market-level interconnectedness measure is constructed, following the proposed methodology of Cai et al. (2018):

$$Market - aggregate\ Interconnectedness_t = \sum_i \frac{1}{N_t} * Interconnectedness_{i,t}\ , \quad \textbf{(4)}$$

where the bank-level interconnectedness of bank *i* at time *t*, and N_t - the amount of collaborations between banks at time *t*. The sample size is also 124,200 observations for each SIC code and European country. It is simply the aggregated monthly average of all banks interconnectedness measures. The time trends of the market-aggregate interconnectedness by industries and European country are presented in Chapter 5.

3.3.2 Diversification

To control whether diversification plays a crucial role in banks decisions to collaborate with each other on the syndicated market arena, as it is one of the primary reasons of why banks agree to participate in syndicated lending, the diversification measure in the interconnected European syndicated market is constructed, different for each SIC code industry and country as before. The equation is:

$$Diversification_{i,t} = \left[1 - \sum_{j=1}^{J} (w_{i,j,t})^2\right] * 100\ , \quad \textbf{(5)}$$

where the weight assigned to bank *i* for each month in each SIC division and country obtained before (equation 1) is subtracted from 1 and multiplied by 100. As the weights are squared - the smaller weight becomes, the higher level of diversification for the chosen bank. As well as measures, calculated prior,

diversification is scaled between 0 and 100. The amount of observations is the same as for previously constructed measures.

3.3.3 Additional variables

For the extensive research in the European syndicated loan market additionally constructed variables are:

- *Market Share*$_{i,t}$
- *Market Size*$_{t}$
- *Number of Specializations*$_{i,t}$

Market share represents the share of a chosen bank *i* in month *t* based on the facility loan amounts during the month and is the proxy for lender size. Market Size accounts for the total amount of facilities in month *t* across all the participating banks in the sample. Number of Specializations indicates the number of different specializations that bank *i* is involved in during each month *t*. As controlling for contagious events in Europe and conducting a research on whether interconnectedness of banks magnifies disruptions, such indicator variables as Recession and Expansion are introduced, they are downloaded from CEPR website. Due to choosing large banks for the investigation, Lead Arranger fixed effects are also considered.

3.3.4 Systemic risk measures

As the part of the study is on interconnectedness of banks concentrated in European loan syndication impact on the spreading of systemic risk, it is important to introduce SRISK and CoVaR, as they are two of the most popular systemic risk measures proposed by various academics, as described in the Literature review. Though those measures were not constructed manually, but received ready directly, they still have to be defined.

3.3.4.1 SRISK

Proposed by Acharya et al. (2010) and further developed by Brownlees & Engle (2017), SRISK is a market-based measure that is a capital shortfall of a bank in an event of systemic risk hazards, that is 40% decrease in the cumulative banking system equity over prior 6 months. Brownlees & Engle (2017) depict their measure as:

$$SRISK = E\big((k(D + MV) - MV)\big|Crisis\big) = kD - (1 - k) * (1 - LRMES) * MV\ , \qquad \textbf{(6)}$$

where *k* is the prudential capital ratio of 5.5% for European banks based on accounting standards of IFRS and 8% if the bank is American based on US-GAAP, *D* - value of debt of a given bank, *LRMES* - long run marginal expected shortfall, that moves accordingly to market index changes, when it drops by 40% during

the period of distress, *MV* represents the market value loss of a bank in the moment of disruption. As larger and more well-known banks are involved in vaster transactions and have higher levels of equity - their SRISK during turmoils is greater, thus to control for contagion spillover effects, LRMES is also used as a methodology variable to make sure results are not driven by large sizes of chosen banks. The sample contains 57 banks with their monthly SRISK and LRMES ratios, and total of 10,590 monthly observations.

3.3.4.2 CoVaR

As mentioned earlier, CoVaR is the market-based microlevel quantile measure proposed by Adrian & Brunnermeier (2016), that is VaR of a bank conditional on being in distress, thus CoVaR is the bank's immediate contribution to systemic risk worsening. For the research CoVaR of 1% quantile is used. The authors define the measure as:

$$Prob\left(L \geq CoVaR_q \middle| L^i \geq VaR_q^i\right) = q\ , \tag{7}$$

where L is the financial losses of the whole financial system, L^i - financial losses of a given bank. CoVaR does not state that the given bank in disruption is the primary cause of economic conditions worsening, yet it can be interpreted as a connection between systemic risk increasing and company's conditions deterioration. For the study, only 11 banks were considered based on the data availability and the final sample contains only 749 observations on 1% CoVaR.

3.4 Descriptive statistics

After gathering, altering and constructing all the needed variables, and merging all required datasets for further analysis, descriptive statistics of necessary for methodology variables is created. Table 5 represents definitions of constructed variables required for further regressions and Table 6 is the summary statistics of those variables.

Table 5: Variable description

Variable	Definition
CoVaR	1% contagion value-at-risk of a bank
Diversification	Diversification of a bank based on its syndicated loan portfolio
Expansion	An indicator variable for whether a month falls into an expansion period, defined as a month not identified as a recession by CEPR
Interconnectedness	Bank-level interconnectedness
Market-Aggregate Interconnectedness	Market-aggregate interconnectedness Index
Lead arranger (bank) fixed effect	Lead Arranger Fixed Effect
Market Share	Market share of a bank in the European syndicated loan market based on the total facility loan amount the bank originated as a lead arranger
Market Size	The size of the European syndicated loan market measured by the total newly originated syndicated loan amount in millions of euros
Number of Specializations	Number of specializations a bank is engaged in as a lead arranger
Recession	An indicator variable for whether a month falls into recessions as identified by CEPR
SRISK	Systemic capital shortfall of a bank measured in millions of U.S. dollars

Table 6 depicts the descriptive statistics of all the different characteristics of the necessary variables. Since the number of lenders for interconnectedness construction was limited to 450 financial institutions based on the largest loan facilities issued by the lenders, the total quantity of the bank-level interconnectedness measures for all SIC codes and European country is comprised of 124,200 observations.

It is shown that on average, the bank-level relationship-weighted interconnectedness for all SIC codes and European country is the highest, so is the standard deviation. It emerges as the relationship-weighted is the most relevant weighting scheme for the interconnectedness measure. Size-weighted appropriateness comes second, and the baseline equal-weighted interconnectedness for all SIC codes and European country is the lowest and is the least significant, meaning it matters the least as the measure.

Regarding market-aggregate interconnectedness measures, they are built up as the total average of all banks equal-, size-, relationship-weighted interconnectedness based on primary, secondary and tertiary borrower SIC codes and European country. That is why the acquired results follow the same pattern as the bank-level interconnectedness measure, with relationship-weighted interconnectedness having the highest mean and standard deviation and equal-weighted having the lowest records respectively. The number of observations is 276 due to dividing 124,200 monthly lender observations by 450 lenders.

Because of less available information assembled on secondary and tertiary borrower SIC codes, for both bank-level and market-aggregate interconnectedness primary SIC code and European country possess similar and higher results, and secondary and tertiary codes hold almost twice smaller outcomes.

SRISK and 1% CoVaR are created at the lead manager-level, with 57 matched banks between SRISK and original 450 lender sample, resulting in 10,590 bank-monthly observations and the mean of 10.3 million dollars, and only 11 matched banks between 1% CoVaR and the sample, obtaining 769 bank-monthly observations. The CoVaR measure is depicted at 99% level, thus the mean and standard deviation are 0.01 and 0.007 accordingly. The systemic risk measures do not overlap, as SRISK contains only 2 American banks out of 57 in the sample (the rest is primarily European banks or with branches in Europe) and 1% CoVaR has only 1 European bank out of 11 in the dataset.

The main lead arranger characteristics describe market share, number of specializations and diversification. As for some observations, the data was missing, the mean of market share has a positive sign only at European country-level. The number of specializations does not show very sufficient results as well, however, diversification does. The most diversified are primary borrower industry division and European country once again. The market characteristics are represented by yearly market size of European syndicated market in million euros, with the exact same mean of 188 million euros for both primary SIC code and European country. Secondary SIC code has the highest standard deviation that is equal to 280 million euros.

Table 6: Descriptive statistics

Variables	#N	Mean	Standard deviation	10th percentile	50th percentile	90th percentile
Bank-level Interconnectedness:						
Equal-weighted primary SIC code	124,200	19.82	7.52	7.91	20.29	29.68
Size-weighted primary SIC code	124,200	31.18	10.42	11.69	31.24	44.39
Relationship-weighted primary SIC code	124,200	39.13	13.39	14.98	39.48	55.58
Equal-weighted secondary SIC code	124,200	11.05	11.02	0	13.82	25.23
Size-weighted secondary SIC code	124,200	17.41	16.83	0	27.47	39.28
Relationship-weighted secondary SIC code	124,200	20.64	20.23	0	28.56	46.05
Equal-weighted tertiary SIC code	124,200	7.23	10.51	0	0	23.78
Size-weighted tertiary SIC code	124,200	10.78	15.26	0	0	33.29
Relationship-weighted tertiary SIC code	124,200	12.41	17.69	0	0	38.81
Equal-weighted European country	124,200	18.67	9.65	0	20.05	29.80
Size-weighted European country	124,200	29.38	14.14	0	30.51	44.91
Relationship-weighted European country	124,200	34.82	17.27	0	37.34	54.07
Market-aggregate Interconnectedness:						
Equal-weighted primary SIC code	276	17.74	5.58	6.59	17.92	24.56
Size-weighted primary SIC code	276	28.25	8.98	10.39	28.24	39.49
Relationship-weighted primary SIC code	276	35.63	11.29	13.11	35.76	49.77
Equal-weighted secondary SIC code	276	9.84	5.85	0	11.46	15.91
Size-weighted secondary SIC code	276	15.62	9.29	0	18.12	25.31
Relationship-weighted secondary SIC code	276	18.64	11.08	0	21.75	30.16
Equal-weighted tertiary SIC code	276	7.11	5.63	0	9.98	13.11
Size-weighted tertiary SIC code	276	13.63	11.16	0	16.57	25.32
Relationship-weighted tertiary SIC code	276	14.56	11.74	0	19.09	27.16
Equal-weighted European country	276	16.77	7.67	0	17.50	24.76
Size-weighted European country	276	26.79	12.36	0	27.78	39.97
Relationship-weighted European country	276	31.83	14.59	0	33.18	47.26
Systemic Risk Measures:						
SRISK (million $)	10,590	10.70	26.9	-4.60	1.50	39.60
1% CoVaR	769	0.01	0.007	0.006	0.012	0.022
Lead Arranger Characteristics:						
Market Share as Lead Arranger (%)						
Primary SIC code	124,200	-0.14	0.35	-1	0	0
Secondary SIC code	124,200	-0.47	0.50	-1	0	0
Tertiary SIC code	124,200	-0.66	0.48	-1	-1	0
European country	124,200	0.09	0.46	0	0	0
Number of Specializations as Lead Arranger						
Primary SIC code	124,200	0.09	0.47	0	0	0
Secondary SIC code	124,200	0.05	0.30	0	0	0
Tertiary SIC code	124,200	0.03	0.31	0	0	0
European country	124,200	0.09	0.46	0	0	0
Diversification						
Primary SIC code	124,200	54.63	12.39	48.27	56.51	64.61
Secondary SIC code	124,200	53.75	12.03	48.11	55.64	63.09
Tertiary SIC code	124,200	52.83	11.69	47.68	54.77	61.61
European country	124,200	54.33	12.28	48.19	56.22	64.22
Market Characteristics:						
Market Size (million €)						
Primary SIC code	276	188	273	0	76.60	576
Secondary SIC code	276	174	280	0	50.80	534
Tertiary SIC code	276	141	256	0	29	475
European country	276	188	273	0	76.60	576

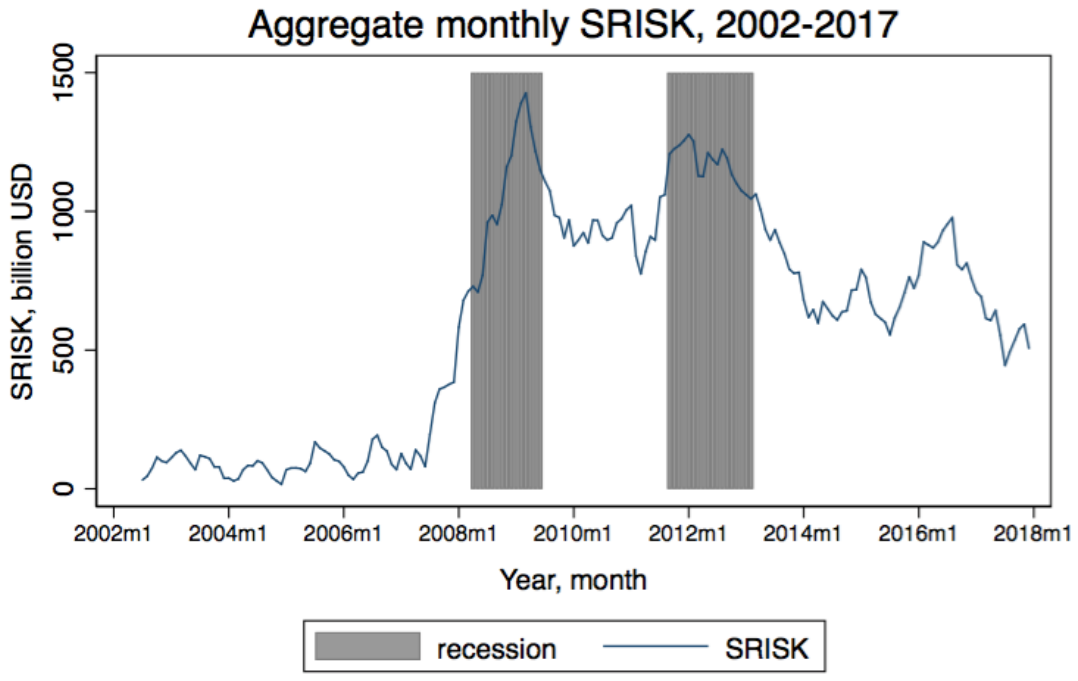
The table reports summary statistics of various interconnectedness and systemic risk measures together with lead manager and market characteristics. Interconnectedness measure is computed based on the distance between lead arrangers in primary, secondary and tertiary borrower SIC industry and the European country of origination, and can be equal-, size-, or relationship-weighted. Market-aggregate Interconnectedness is the equally weighted average of all bank's bank-level interconnectedness for each month within the time frame of the sample. Systemic risk measures used are SRISK and CoVaR. The summary statistics shows the bank-level interconnectedness measures of 124,200 lead arranger-months, the market-aggregate interconnectedness measure of 276 month, the SRISK measures of 10,590 lead arranger-months, and the CoVaR of 769 lead arranger-quarters. Lead manager characteristics are reported of 124,200 lead arranger-months, and market characteristics are reported of 276 months.

3.5 SRISK and CoVaR time trends

SRISK and CoVaR measures are both used to monitor systemic risk build ups and how various financial institutions suffer from shocks and further propagate collapses all around the financial system and different entities (Arias et al., 2011). By definition, both SRISK and CoVaR should be the highest during the times of recession, in particular, the financial crisis of 2008 and the sovereign debt crisis of 2011.

Figures 2 and 3 show the time trends of the aggregated mean of both values among all banks in the two samples. It is worth noting, that both graphs show results that are consistent with the research. The highest level of SRISK is precisely at the time of collapse of mortgage backed securities market, that occurred between 2007 and 2009, and the Greek government default, further followed by the sovereign debt crisis of 2011. Though, another SRISK spike can be seen around the beginning of 2017, which implies the continuous fluctuation in the financial market. The banks are still recovering from recent backwash and investors keep scrutinizing the market, as they are still reluctant to make vast investments in the financial system. However, financial analysts predict that the overall economy should gradually return to normal, and post consistently solid growth feasible in the near future (Weik, 2017). Though, without the appropriate micro and macro regulations, the financial crisis can always come back and destroy the system, so the governments need to have extensive control and mitigate systemic risk uprisings (Buch, 2017).

Figure 2: Aggregate monthly SRISK measure in billion dollars, 2002-2017

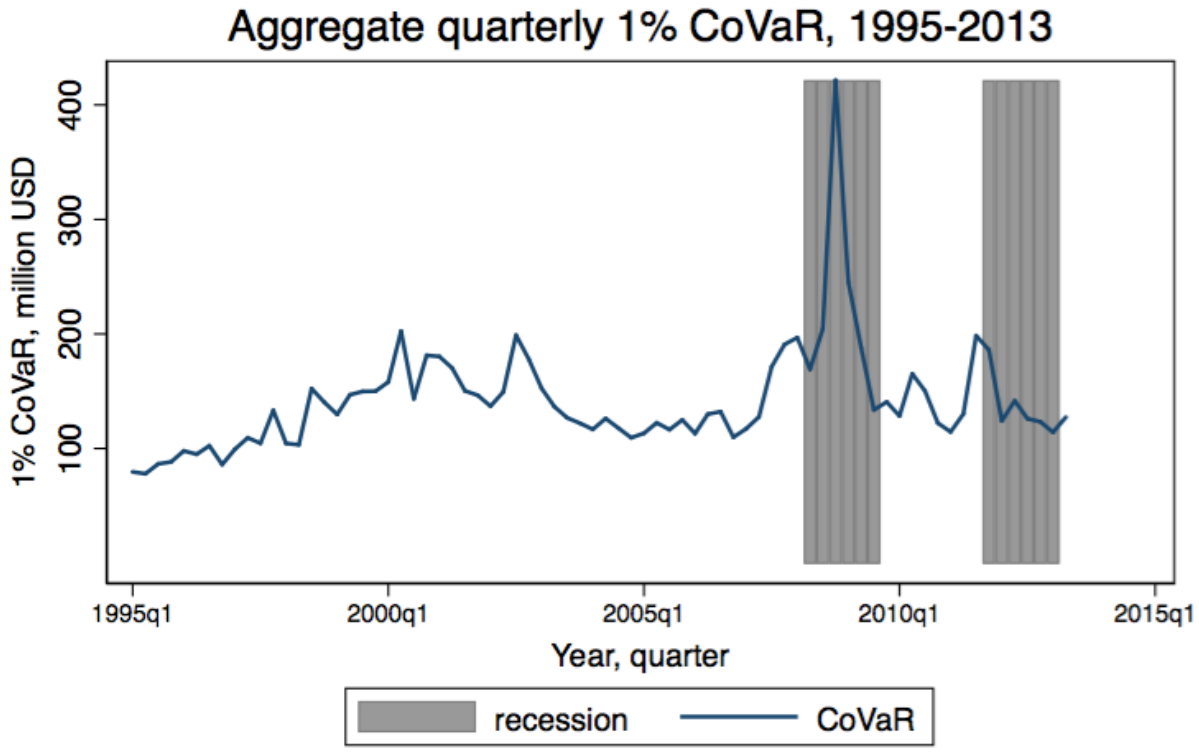


Based on aggregate monthly SRISK of all banks in the sample between 2002-2017

The acquired data is given on demand by Brian Reis, V-Lab NYU Data Analyst

As for the CoVaR measure, the highest increment is during the financial crisis of 2008. The sample is comprised of mostly American banks, so maybe that is why the sovereign debt crisis is not reflected in the change of 1% CoVaR measure movements. Furthermore, the sample is relatively small, having only 11 banks and 769 observations in total. Yet, the increase of the unit during the end of 2010 and the beginning of 2011 is visible and the rise can be traced at the exact time of recession start in Europe in 2011, it is just half the size of the previously mentioned increase.

Figure 3: Aggregate quarterly 1% CoVaR measure in billion dollars, 1995-2013



Based on aggregate quarterly 99% CoVaR of all banks in the sample between 1995-2017

The acquired data is gathered from Markus K. Brunnermeier website

CHAPTER 4 Methodology

The dataset in the research is time-series cross-sectional data, which has a panel structure. The dataset on interconnectedness measure is strongly balanced data, and datasets used for CoVaR and SRISK are both unbalanced panel data, due to the deficit of available data for all banks for all required periods of time.

The analysis is carried out using fixed effects model, because it is needed to control for banks' size in the regressions. Fixed effects model is suitable for all three datasets contained. Also, as the study is conducted on banks', many researches in their papers use fixed effects model.

When accessing for autocorrelation, heteroscedasticity and standard errors cluster, it was found, that in the chosen regression model except for fixed effects, there should be robust function for heteroscedasticity and clustered standard errors, so robust cluster standard error function was used. Due to interposal of dummy variables, logit and probit regressions cannot be used, as they both omit dummy variables, referring to collinearity.

To check for the correlation between independent and dependent variables, extreme Pearson and extreme Spearman correlations are used. The Pearson correlation is adjusted for values that come from tail distribution, so the covariance and variance are only based on the values, that are above a certain weight. Li (2000) investigates several methods of calculating relationships for non-linear tail dependence for default-dependence measures. The formula proposed by Li (2000) for extreme Pearson correlation is as follows:

$$\text{"Threshold" } \mathrm{Cov}(X_k, Y_k) = \frac{\sum_{i=0}^{k}(x_{n-i,n}-\bar{x}_{n-i,n})(y_{n-i,n}-\bar{y}_{n-i,n})}{N-1}, \quad \textbf{(1)}$$

where the observations are ranked from the smallest to largest using the formula below:

$$X_{1,n} \leq X_{2,n} \leq \cdots \leq X_{n-1,n} \leq X_{n,n}, \quad \textbf{(2)}$$

where the value of *k* is thresholded. The "threshold" is applied for both variances of X and Y, which gives:

$$Var(X_k) = (x_{n-i,n} - \bar{x}_{n-i,n}), \quad \textbf{(3)}$$

$$Var(Y_k) = (y_{n-i,n} - \bar{y}_{n-i,n}), \quad \textbf{(4)}$$

where those thresholds are the extreme Pearson correlation.

As proposed by another paper of Li (2000), for the extreme Spearman correlation the same rule is applied. The formula is defined as:

$$p_k = \frac{Cov\,(X_k, Y_k)}{\sqrt{Var(X_k)Var(Y_k)}}\,. \quad \textbf{(5)}$$

After that, the multivariate regressions, Granger causality tests and interconnectedness measure time-trends are performed depending on the type of the model specification, all described below.

4.1 Bank-level Interconnectedness

In this section, the investigation on what drives banks to cooperate with each other is conducted, specifically it is desired to figure out what determines interconnectedness more: diversification or other market constituents. Even though number of specializations and diversification have similar notions computation-wise, diversification considers individual loan amounts of a bank to account for each bank's weight in the specialization. As the research is conducted to investigate the impact of syndicated interlinkages between lenders on the contagious effects of spillovers in the financial market, such variables as recession and expansion are added to manage for the largest build ups of the systemic risk. The model used is as follows:

$$\text{Interconnectedness}_{i,t} = \alpha + \beta_1 * \text{MarketShare}_{i,t} + \beta_2 * \text{MarketSize}_t + \beta_3 * \text{Diversification}_{i,t} + \beta_4 * \text{Number of Specializations}_{i,t} + \beta_5 * \text{Recession}_t + \beta_6 * \text{Expansion}_t + \text{Lead Arranger'}_i + e_{i,t} \quad \textbf{(6)}$$

As the $H_0 1$ states that the main incentive for lenders to cooperate in the syndicated loan market is the portfolio diversification, it is controlled in the regression to see whether the diversification does have a significant impact on banks' participation networks (interconnectedness) in the European syndicated loan market or whether another market components affect interconnectedness more.

The constructed bank-level interconnectedness measures in primary, secondary and tertiary borrower SIC codes industries, and European country interconnectedness measures are used. That is done to see the impact on different borrower industries, as well as European country of syndication and look for similar patterns in the behavior.

First, extreme Pearson correlation is used to access the correlation between dependent variable bank-level interconnectedness and independent variables market share, market size and diversification in each SIC code industry, as well as European country. Next, extreme Spearman correlation is used. After that, multivariate regression is performed. The detailed results of the correlation and regression are introduced and explained in section 5.

4.2 Market-aggregate Interconnectedness and time trends

To determine how much banks in the European syndicated market are interconnected throughout the whole time-sample, market-aggregate interconnectedness of three types of weights (equal-, size-, relationship-weighted) is examined in each SIC code division and European country-wise. To do so, in each type of SIC code and country, the time trends and all three types of weights are graphed and examined together.

The $H_0 2$ specifies that for the collaborations, lead managers like establishing relationships with those lenders that have similar asset allocation. Thus, as the interconnectedness is created in different borrower industries and European countries using three types of weights, especially the size-weighted and relationship-weighted measures, as relationship-weighted is constructed using the previous banks' collaborations and size-weighted is based on the size each lead manager has in the borrower industry or European country, it can indicate whether financial institutions ally with each other based on their portfolio allocations in the European syndicated loan market.

To create market-aggregate interconnectedness measures for all borrower SIC codes and European country, the simple average of the interconnectedness measures of all banks in the sample for each month (124,200 observations for each SIC industry and European country) is used. The monthly average of each SIC code industry and European country of all banks is plotted against the time frame of the sample and recession bars are included to examine how the market-aggregate interconnectedness changes throughout the times of financial disruption in the European syndicated loan market and whether it can be connected to the propagation of risks within the participating lead arrangers. The referred graphs can be found in the Chapter 5.

4.3 Granger causality bank-level Interconnectedness between GIIPS countries and Western European countries

As proposed by Billio et al., (2012) using Granger caulsality tests is suitable for distinguishing interconnectedness relationships between the financial institutions and examining the directionality of such relationships. To find out whether there is a connection between banks' networks saturated in the GIIPS part of the European Union and Western European countries and if there is an interrelation, then how it explains correlations in the European syndicated loan market, the linear Granger causality test is performed. The Granger causality test is useful for determining whether one variable can granger-cause another one. The test is executed for different time periods to study whether during different phases, the impact changes. Granger causality does not mean direct effect of one value on another, however, if there is a causation, it implies that X is a good predictor of Y, as it is a Chi-squared test. The variables are tested for stationarity and unit root prior to creating the causality test (Stock & Watson, 2015).

For different bank-level interconnectedness measures within different SIC codes specifications and European country, distinct lags are used to make sure that the chosen samples are not biased due to the residuals' autocorrelation. The number of observations is ranging from 33 to 275 observations depending on the time frame. The formula used is as follows:

$$y_{i,t} = \alpha + \sum_{l=1}^{p} \beta_l y_{i,t-l} + \gamma_l x_{i,t-l} + \epsilon_{i,t} \,, \quad \textbf{(7)}$$

where *p* is the past values of both variables in the model and *l* are lagged values. To inspect how many lags to implement, such tests as the final predictor error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC) are accomplished (Hamilton, 1994).

4.4 Bank-level Interconnectedness and Systemic Risk Measures

The next step is to examine whether constructed bank-level interconnectedness measures impact the spreading of systemic risk and bring contagion to real economies. The $H_0$3 asserts the strong influence of interconnectedness measures obtained on systemic risk measures during the times of financial turmoils, thus, this is further studied in the research and divided into separately checking the interconnectedness measures' power on systemic risk variables.

It is a very important part, as Europe is integrated anyway, and if there are factors leading to worsening the financial conditions in the Union, they should be mitigated immediately. In the study, first, impact on SRISK is investigated, after 1% CoVaR is tested.

4.4.1 Bank-level Interconnectedness and SRISK

Performing statistical analyses on the relationships between SRISK and interconnectedness related variables is substantial to understand if there is a direct respect between the increase of participating arrangers' networks and the growth of the systemic risk measure. The fourth hypothesis tested says that interconnectedness positively and significantly affects the risk.

The following steps are applied: first, Pearson correlation is used to access the correlation between dependent variable SRISK and independent variables types of interconnectedness, recession, market share and market size in each SIC code industry, as well as European country. After that, multivariate regression is performed. The detailed results of the correlations and regression are introduced and explained in the Empirical Results section. The model is as follows:

$$SRISK_{i,t} = \alpha + \beta_1 * Interconnectedness_i + \beta_2 * (Interconnectedness_{i,t} \times Expansion_t) + \beta_3 * (Interconnectedness_{i,t} \times Recession_t) + \beta_4 * (Interconnectedness_{i,t} \times MarketShare_{i,t}) + \beta_5 * (Interconnectedness_{i,t} \times MarketSize_t) + \beta_6 * Recession_t + \beta_7 * MarketShare_{i,t} + \beta_8 * MarketSize_t + LeadArranger'_i + e_{i,t}. \quad \textbf{(8)}$$

4.4.2 Bank-level Interconnectedness and CoVaR

Accosting CoVaR measure, the fifth hypothesis is consistent with interconnectedness having positive and large power on the measure. However, CoVaR was obtained mostly for American banks, with the exception of one European bank "Deutsche Bank", and the study is conducted primarily for European borrowers and lenders. That is why, the expected results of the regressions are not supposed to be in line with the assumption, as the banks in the sample are primary in the American financial arena and their correlation with interconnectedness measure specified in Europe is insufficient.

Yet, it is still interesting to test the hypothesis and see whether the European syndicated loan networks affect CoVaR measure for the American financial institutions. The following formula is used:

$$1\%\ CoVaR_{i,t} = \alpha + \beta_1 * Interconnectedness_{i,t} + \beta_2 * (Interconnectedness_{i,t} \times Expansion_t) + \beta_3 * (Interconnectedness_{i,t} \times Recession_t) + \beta_4 * (Interconnectedness_{i,t} \times MarketShare_{i,t}) + \beta_5 * (Interconnectedness_{i,t} \times MarketSize_t) + \beta_6 * Recession_t + \beta_7 * MarketShare_{i,t} + \beta_8 * MarketSize_t + LeadArranger'_i + e_{i,t}. \quad \textbf{(9)}$$

CHAPTER 5 Empirical results

The empirical results in this section are divided into four parts. The first part is the results interpretation of what factors affect banks more to be interlinked in the European syndicated loan market. Secondly, the time trends of market-aggregate Interconnectedness are shown and explained. Next, the results of Granger Causality test among different European countries are presented. And lastly, the impact of bank-level interconnectedness measures on the expansion of systemic risk are interpreted.

5.1 Constituents of bank-level Interconnectedness

As described in the methodology chapter, the first part of the analysis is dedicated to understand the impact of diversification and various market constituents on the alliance decisions of lead arrangers in the European syndicated loan market. For the assessment were taken primary, secondary and tertiary borrower SIC codes, and European country of loan origination. Constructed interconnectedness measures are computed to be equal-weighted, size-weighted and relationship-weighted, as reported in the data and methodology sections in detail. The outcome results are depicted in Table 7 and Table 8, the former shows results of running tests on primary and secondary borrower SIC codes, and latter depicts the effects on tertiary SIC code and European country, with constructed interconnectedness measures being dependent variables and market characteristics and diversification - independent variables.

The Table 7 shows all 3 steps of the research carried out. First, Panel A exhibits Pearson correlation to check for the correspondence of dependent and independent variables between each other. As can be seen, in the primary borrower SIC codes, all estimates are significant at 1% level, which implies a high correlation between equal-, size- and relationship-weighted interconnectedness in the primary borrower SIC codes and lenders' market share, market size, diversification, number of specializations, as well as recession and expansion control variables. Variables are positively associated with each other, except for the expansion, the test portrays negative correlation between the interconnectedness measures and expansion, meaning that when interconnectedness increases, expansion decreases, that can be explained as the European market saturates more lead arranger networks, the development in the market reduces. Consistent with $H_0 1$, the strongest correlation is between diversification and dependent variables, with more than 0.9 of all coefficients value. The coefficients of determination, thereafter, are around 87%, stating signified explanatory power in a univariate setting. Market share is the next variable that has strong correlation with the primary interconnectedness measures. Pearson coefficients are significant and roughly range from 0.7 to 0.8. The adjusted R^2, thus, ranges from 49% to 64%, having strong explanatory power accordingly.

Number of specializations, recession and expansion all correspond to have small, yet significant correlation with the primary interconnectedness measures. Recession and expansion possess the same values, but with different signs - recession increases with higher interconnectedness. The square of Pearson correlation depicts explanatory power of around 4% (number of specializations) and 3% (recession and expansion). And lastly, market size does have a significant correlation with the primary interconnectedness among all three types of weighting schemes, however, it is very low, only around 0.1 coefficient value, which results in adjusted R^2 of barely 1%. Overall, diversification and market share are the most important constituents for financial institutions to collaborate in the European syndicated market, with market size being the least deterministic.

Turning to secondary SIC code interconnectedness, it follows similar patterns, with diversification and market share being the crucial components of collaboration incentives among lenders. Most values are significant at 1% level, but the size- and relationship-weighted interconnectedness does not correlate with recession and expansion. Though, for the secondary borrower SIC codes, market share is the strongest and is above diversification coefficients, with approximately 90% strong explanatory power of coefficient determination. Diversification shows almost the same results, where the coefficients have strong explanatory power and adjusted R^2 of 88% respectively. Market size and number of specializations are little correlated with the secondary borrower SIC code interconnectedness measure consistently.

Panel B portrays Spearman correlation results of the sample. It can be seen, that the coefficients are generally a bit lower, compared with Pearson correlation outcomes, yet they possess very similar consequences and coefficients, having a strong monotonic relationship of the variables between each other. Describing the primary borrower SIC code interconnectedness, diversification and market share hold to be the most valuable determinants for banks to ally (Spearman's rhos of roughly 0.91 and 0.52 accordingly) and market size appears to matter the least (0.05). Spearman correlation table of secondary interconnectedness measure slightly changes, having recession and expansion significant at 1%, strangely, recession's coefficient sign is negative and expansion's is positive. Other values explain the correlation compatible with the prior conducted research.

The last step of looking for collaboration dispositions is performing multivariate OLS regressions with lead arranger fixed effects and robust cluster standard errors (due to heteroscedasticity, autocorrelation and clustering). Panel C of Table 7 presents the outcomes; everything is statistically significant, meaning that all constituents do have an impact on banks desire to interconnect. The results show the same patterns as the previously performed correlation tests. In the primary borrower SIC codes size-weighted interconnectedness has the highest adjusted R^2 of 62% implying strong explanatory power of the model. As for equal- and relationship-weighted measures, the R^2 is 48% and 59% respectively. Market share regression output results show that for 1 unit increase in market share there is 14.7, 23.1 and 29 increase in

the primary SIC code interconnectedness equal-weighted, size-weighted and relationship-weighted accordingly. 10% increase in diversification is followed up by 3.7%, 3.1% and 3.4% increase in the subsequent interconnectedness measures. As for number of specializations, 10% increase creates 4.2%, 8% and 9.9% increase in the interconnectedness thereafter. Market size output is also significant, though an increase or decrease does not lead to any changes for the lead arrangers' network creations. Both recession and expansion have negative coefficients, implying increase in the independent variables should be followed by decrease in the dependent variables.

Looking at the Panel C results for secondary borrower SIC codes, the effects are consistent and show similar paths, adjusted R^2 is even higher for this model, having 80%, 89% and 85% explanatory power for the equal-weighted, size-weighted and relationship-weighted interconnectedness. The main difference from the results obtained in primary borrower SIC code the multivariate regression is that an increase in the number of specializations drives secondary interconnectedness measures to increase by 3 times more.

Table 8 represents the results of the same steps conducted for tertiary borrower SIC code interconnectedness measures and European country of loan origination. They are very similar to what was obtained and described in Table 7, thus, it is not necessary to give detailed depiction, as they continue to prove the same.

The results are consistent with the hypothesis, that diversification drives the desire of banks to be interlinked with each other in the European syndicated market. It can be also considered, that market share has huge impact on lenders, as the 1% increase in the shares of banks leads to vast increases in the interconnectedness measures based on different weights. Results are 99% significant (p-values) and hold for all three weighting types of interconnectedness measure constructed and within all SIC divisions and country. Likewise, it is very interesting to investigate the connection between market share of participants and the interconnectedness measures, as it turns out that, at least for this research specifications, market share of lead arrangers economically has higher impact on the independent measures, thereby, for syndication arrangers in the European market it is important to mainly create networks with such institutions, that have similar market share in different types of industries and considering country saturation. Though, all independent variables have a direct impact on the banks' interconnectedness, so lenders do review shares and specializations of financial institutions to examine the possible future partnership, regarding the European syndicated market.

Comparing the gathered outcomes with the paper of Cai et al. (2018), for the European syndicated loan lead arranger participants' diversification does play a substantial role of a main driver for making decisions to collaborate together, the results are similar to the United States syndicated loan market research made by the authors.

Table 7: Constituents of Interconnectedness

A. Pearson's Correlation

	#N	Primary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.6840***	0.7761***	0.7572***
Market Size	124,200	0.0995***	0.1124***	0.1099***
Diversification	124,200	0.9254***	0.9308***	0.9301***
Number of Specializations	124,200	0.1760***	0.1875***	0.1853***
Recession	124,200	0.1520***	0.1583***	0.1572***
Expansion	124,200	-0.1520***	-0.1583***	-0.1572***

A. Pearson's Correlation

	#N	Secondary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.9400***	0.9677***	0.9558***
Market Size	87,768	0.0946***	0.1027***	0.1005***
Diversification	124,200	0.9396***	0.9436***	0.9425***
Number of Specializations	124,200	0.1306***	0.1365***	0.1344***
Recession	124,200	0.1003***	0,1001	-0.1001
Expansion	124,200	-0.1003***	-0,1001	0.1001

B. Spearman Correlation

	#N	Primary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.5112***	0.5270***	0.5218***
Market Size	124,200	0.0323***	0.0641***	0.0535***
Diversification	124,200	0.9036***	0.9124***	0.9088***
Number of Specializations	124,200	0.1306***	0.1622 ***	0.1516***
Recession	124,200	0.1376***	0.1204***	0.1263***
Expansion	124,200	-0.1376***	-0.1204***	-0.1263***

B. Spearman Correlation

	#N	Secondary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	87,768	0.7055***	0.7168***	0.7117***
Market Size	87,768	0.0802***	0.1136***	0.0986***
Diversification	87,768	0.9571***	0.9711***	0.9639***
Number of Specializations	87,768	0.1788***	0.2118***	0.1970***
Recession	87,768	-0.1151***	-0.1317***	-0.1265***
Expansion	87,768	0.1151***	0.1317***	0.1265***

C. Multivariate Regression

Bank-Level Interconnectedness	Primary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Market Share	14.709*** (0.027)	23.129*** (0.034)	29.031*** (0.045)
Market Size	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Diversification	0.368*** (0.003)	0.309*** (0.005)	0.337*** (0.006)
Number of Specializations	0.421*** (0.108)	0.802***(0.172)	0.989*** (0.216)
Recession	-0.679*** (0.038)	-1.090*** (0.030)	-1.355*** (0.047)
Expansion	-1.206*** (0.065)	-1.873*** (0.091)	-2.363*** (0.017)
Lead Fixed Effects	Yes	Yes	Yes
#N	124,200	124,200	124,200
Adjusted R^2	0.4843	0.6241	0.5941

C. Multivariate Regression

Bank-Level Interconnectedness	Secondary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Market Share	20.781*** (0.028)	32.734*** (0.039)	38.786*** (0.048)
Market Size	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Diversification	0.313*** (0.002)	0.321*** (0.004)	0.323*** (0.005)
Number of Specializations	1.479*** (0.012)	2.265*** (0.074)	2.765*** (0.058)
Recession	-0.790*** (0.037)	-1.255*** (0.034)	-1.510*** (0.009)
Expansion	-0.010*** (0.009)	-0.005 (0.141)	0.009 (0.069)
Lead Fixed Effects	Yes	Yes	Yes
#N	87,768	87,768	87,768
Adjusted R^2	0.8044	0.8906	0.8526

The table shows results after conducting Pearson and Spearman correlations and Multivariate OLS regressions with lead arranger fixed effects and robust cluster standard errors. Interconnectedness is the dependent variable. Panel A shows Pearson correlation coefficients between interconnectedness and independent variables, Panel B displays Spearman correlation coefficients between dependent variable and lead bank characteristics, and Panel B represents results from multivariate regressions. Robust cluster standard errors are in parentheses. The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 8: Constituents of Interconnectedness

A. Pearson's Correlation

	#N	Tertiary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.9532***	0.9793***	0.9727***
Market Size	6,480	0.1164***	0.1253***	0.1253***
Diversification	124,200	0.9988***	0.9027***	0.9017***
Number of Specializations	124,200	0.1722***	0.1775***	0.1772***
Recession	124,200	-0.1052*	-0.1054*	-0.1052*
Expansion	124,200	0.1052*	0.1054*	0.1052*

A. Pearson's Correlation

	#N	Country Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.7976***	0.8561***	0.8306***
Market Size	124,200	0.0949***	0.1014***	0.0973***
Diversification	124,200	0.9406***	0.9451***	0.9437***
Number of Specializations	124,200	0.1553***	0.1594***	0.1564***
Recession	124,200	0.1539***	0.1588***	0.1566***
Expansion	124,200	-0.1539***	-0.1588***	-0.1566***

B. Spearman Correlation

	#N	Tertiary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	63,480	0.8051***	0.8144***	0.8120***
Market Size	63,480	0.1311***	0.1664***	0.1574***
Diversification	63,480	0.9900***	0.9039***	0.9980***
Number of Specializations	63,480	0.2300***	0.2650***	0.2561***
Recession	63,480	-0.1217***	-0.1513***	-0.1393***
Expansion	63,480	0.1217***	0.1513***	0.1393***

B. Spearman Correlation

	#N	Country Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
Market Share	124,200	0.4991***	0.5061***	0.5019***
Market Size	124,200	0.0138***	0.0007*	0.0080***
Diversification	124,200	0.9129***	0.9084***	0.9102***
Number of Specializations	124,200	0.1157***	0.1014*	0.1099***
Recession	124,200	0.1169***	-0.1006	-0.1082***
Expansion	124,200	-0.1169***	-0.1006	0.1082***

C. Multivariate Regressions

Bank-Level Interconnectedness	Tertiary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Market Share	21.037*** (0.030)	31.389*** (0.036)	36.132*** (0.044)
Market Size	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Diversification	0.301*** (0.002)	0.308*** (0.003)	0.326*** (0.003)
Number of Specializations	1.763*** (0.037)	2.710*** (0.022)	3.126*** (0.011)
Recession	-0.970*** (0.048)	-1.448*** (0.032)	-1.648*** (0.049)
Expansion	0.168* (0.087)	0.252** (0.027)	0.281* (0.047)
Lead Fixed Effects	Yes	Yes	Yes
#N	63,480	63,480	63,480
Adjusted R^2	0.8362	0.9251	0.9015

C. Multivariate Regressions

Bank-Level Interconnectedness	Country Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Market Share	22.134*** (0.031)	34.827*** (0.044)	41.277*** (0.004)
Market Size	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Diversification	0.396*** (0.003)	0.315*** (0.005)	0.383*** (0.007)
Number of Specializations	0.263 (0.038)	0.355 (0.035)	0.467* (0.005)
Recession	-1.244*** (0.046)	-1.915*** (0.049)	-2.298*** (0.069)
Expansion	-1.604*** (0.012)	-2.565*** (0.015)	-3.012*** (0.008)
Lead Fixed Effects	Yes	Yes	Yes
#N	124,200	124,201	124,202
Adjusted R^2	0.6589	0.7596	0.7149

The table shows results after conducting Pearson and Spearman correlations and Multivariate OLS regressions with lead arranger fixed effects and robust cluster standard errors. Interconnectedness is the dependent variable. Panel A shows Pearson correlation coefficients between interconnectedness and independent variables, Panel B displays Spearman correlation coefficients between dependent variable and lead bank characteristics, and Panel B represents results from multivariate regressions. Robust cluster standard errors are in parentheses. The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

5.2 Market-aggregate interconnectedness time trends

To conduct an investigation on whether lead arrangers create networks based on the similarity of their portfolios' allocation, time-series trends of monthly market-aggregate interconnectedness are drawn. As reported in the data and methodology chapter, to create market-aggregate interconnectedness the simple monthly average of all banks in the sample of all three weighting types of interconnectedness measures for all four specifications was taken. Also, as the topic is related to systemic risk, recession bars (downloaded from CEPR website) are plotted to look for the behavior of interlinked relationships in the European syndicated loan market during 1995-2017, and especially the times of financial turmoil in Europe (financial crisis of 2008 and sovereign debt crisis of 2011).

Equal-weighted, size-weighted and relationship-weighted interconnectedness measures have different notions behind them. For the equal-weighted interconnectedness the weights are appointed to be the same for all lenders in the sample. Size-weighted interconnectedness implies that the measure is loaded by the individual contribution of lenders in terms of facility amounts granted by a lender to the total amount of facility amounts issued every month in the sample. Relationship-weighted measure is the most considerable one, as it calculated based on monthly syndicated collaborations of financial institutions prior to the new syndication deal date, the measure accounts for closely and distinctly related banks to examine whether collaborations based on asset allocation similarity have significant effects on the network creations in Europe.

Figures 4-7 below outline the time-trends between 1995 and 2017 of all market-aggregate interconnectedness measures. Syndicated loan market has been developing relatively recently, compared to other asset classes and the graphs depict the rise and development of the market in Europe from the end of 1990s to the highest spikes of 2005. As the first recession period in the sample starts in 2008 and is shown via grey recession bars, the market interconnectedness decrease during the times of turmoils accordingly, though, it can be traced that the decrease during that period of recession was not that substantial, however, as the crisis was caused by crisis in America and did not affect Europe straight away, slow but consistent downswing is noticeable. Turning to the second indicated recession period of sovereign debt crisis of 2011, the decline is significant, due to sufferings on the European banking arena. After the disruption times, in around 2015 the increase in the collaboration is monitored again. As for 2017, the interconnectedness stays at nearly the same level, as the European financial market is still in recovery.

It can be seen that for all borrower industry SIC codes and European country-wise the equal-weighted measure is the lowest, as it is baseline-weighted. Equal-weighted interconnectedness is comparatively low for all borrower industry codes and European countries. Size-weighted interconnectedness is consistently greater then equal-weighted, and this can be interpreted as large lenders' tendency to collaborate with financial institutions of similar size, hence, also large companies. The

relationship-weighted interconnectedness is even larger than size-weighted, meaning that syndicated lead arrangers prefer allying in syndicates with those banks, that have corresponding portfolio allocation. With that being said, as syndicated loan landscape's objective is combining a group of lenders to reduce their risks and diversify their loan portfolios, when those lenders decide to become a part of the syndicate, especially as lead managers, they chose to collaborate with similar asset-wise institutions.

Looking at graphs separately, the highest level of interconnectedness is noticed for primary borrower SIC codes, as it had the most data available. It describes the main borrower industries of establishment as well, and, presumably, that is why the relationship-weighted level of interconnectedness is the greatest. European country interconnectedness has similar highest values, though, the difference between relationship-weighted and size-weighted measures is not as great.

It is important to point out, that while doing the sample collection, a lot of data on secondary and tertiary borrower SIC code industry was missing, meaning there was no available information on the codes (described in limitations section), and, though, it does not change the regression output results for other hypotheses, the Figures 5 and 6 presented below do show the similar patterns as primary borrower SIC code and European country-wise, it is a bit tricky to make sufficient conclusions, as approximately 10% and 20% of the secondary and tertiary code samples are missing values.

The tested hypothesis ($H_0 2$) of creating banks' networks based on the similarity of portfolio allocation is consistent and proven.

Figure 4: Monthly Time Series Market-Aggregate Interconnectedness, Primary Borrower SIC Codes, 1995-2017

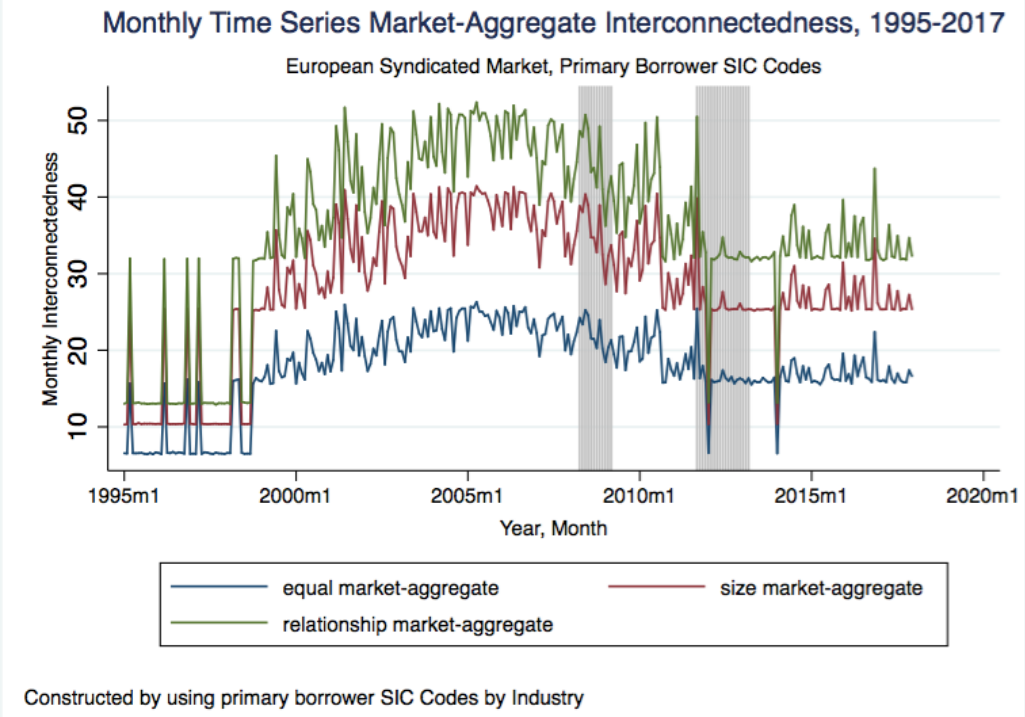


Figure 5: Monthly Time Series Market-Aggregate Interconnectedness, Secondary Borrower SIC Codes, 1995-2017

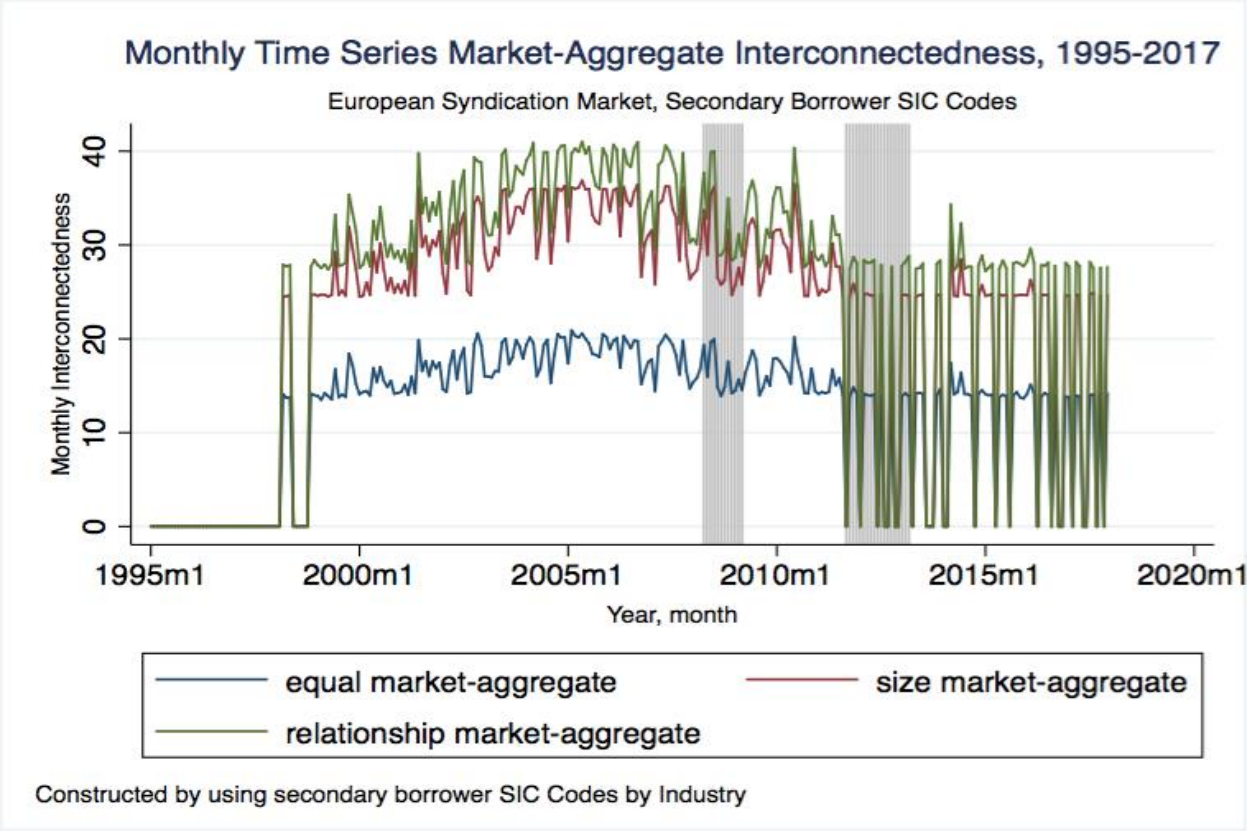


Figure 6: Monthly Time Series Market-Aggregate Interconnectedness, Tertiary Borrower SIC Codes, 1995-2017

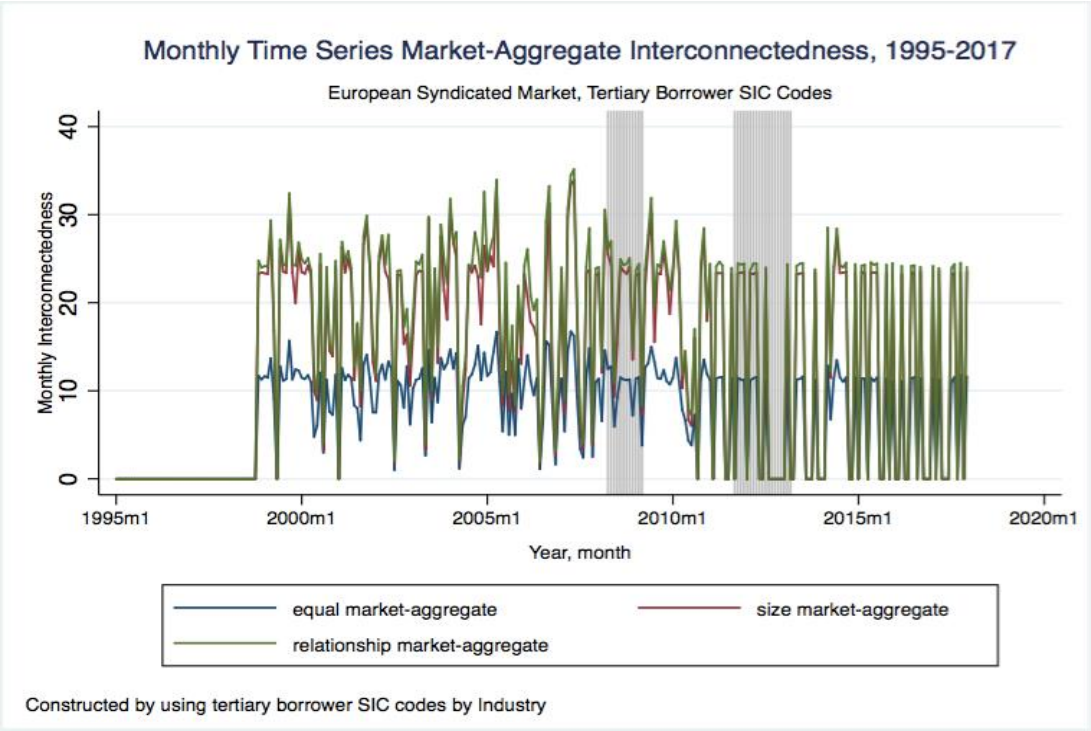
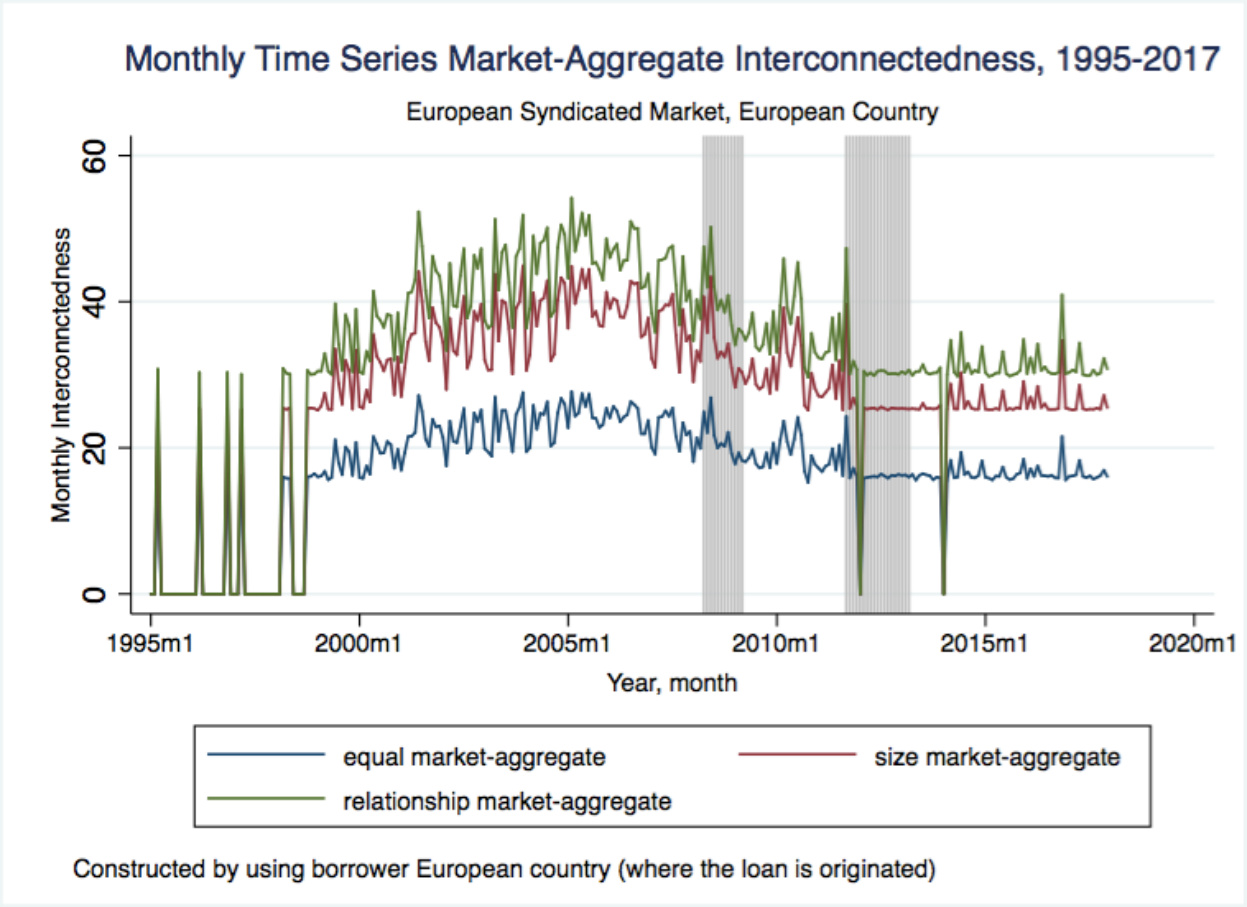


Figure 7: Monthly Time Series Market-Aggregate Interconnectedness, European Country, 1995-2017



5.3 Granger causality test

As the research sample includes various lenders from European countries, it is interesting to examine the nature of forming interconnected networks between GIIPS and Western Europe countries to investigate whether the saturated interconnectedness of one group predicts the degree of the other. The list of countries used as Western European are presented in Appendix E.

To perform the Granger causality tests, two samples were constructed: one with bank-level interconnectedness measures of GIIPS countries and the second one with bank-level measures of Western European countries, then transformed by simple average into monthly market-aggregated samples and merged respectively. To control for different Granger causes, the tests are conducted for 3 time periods: 1995-2017, 2007-2009 and 2011-2013.

The purpose of Granger causality test in the settings of the research is to understand if GIIPS interconnectedness measure can be used as a predictor for future forecasting of interconnectedness in Western Europe. As GIIPS countries have gone through major financial crisis, to study the possible

connections is intriguing, because not only banks should be monitored for systemic risk uprisings, but syndicated networks regionally as well.

Table 9 shows the results after conducting the Granger causality test for the time span of the whole sample, where GIIPS countries are independent variables and Western Europe countries as dependent variables. An interesting pattern is found. GIIPS countries interconnectedness measure Granger predicts interconnectedness in the Western European countries between 1995 and 2017 only in primary borrower SIC code industry and country-wise. For both primary code and country equal-weighted measure is significant at 10% level. Size-weighted interconnectedness is significant at 10% and 5% level accordingly. relationship-weighted interconnectedness measure is only significant for country specification. There is no direct connection to create banks' interlinkages between GIIPS-countries and Western European countries in the full time period sample.

Table 9: Granger causality test, 1995-2017

Granger Causality			
1995-2017			
	Western Europe Interconnctedness Measures		
	Primary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
GIIPS Countries Interconnectedness Measures			
Primary SIC code Interconnectedness:			
equal-weighted	8.758*		
size-weighted		3.217*	
relationship-weighted			2.493
#N = 275, 4 lags			
	Secondary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Secondary SIC code Interconnectedness:			
equal-weighted	0.791		
size-weighted		1.811	
relationship-weighted			1.997
#N = 272, 4 lags			
	Tertiary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Tertiary SIC code Interconnectedness:			
equal-weighted	3.921		
size-weighted		1.359	
relationship-weighted			3.550
#N = 273, 3 lags			
	Country Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Country Interconnectedness:			
equal-weighted	8.265*		
size-weighted		10.179**	
relationship-weighted			8.109*
#N = 272, 4 lags			

The table shows Granger causality chi-square statistics between GIIPS-countries interconnectedness measures (X) and Western Europe countries interconnectedness measures (Y). The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

As for Granger causality between GIIPS and Western Europe countries between 2007 and 2009, the prediction is more significant, and is also significant for secondary borrower SIC codes. Size-weighted interconnectedness is significant at 10% level for all three specifications, relationship-weighted at 5% for primary and secondary SIC codes, and 10% significant country-wise. That is, GIIPS countries interconnectedness for the times of financial crisis of 2008 is a better predictor of banking networks in Western European countries.

Table 10: Granger causality test, 2007-2009

Granger Causality			
2007-2009			
	Western Europe Interconnctedness Measures		
	Primary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
GIIPS Countries Interconnectedness Measures			
Primary SIC code Interconnectedness:			
equal-weighted	2.923*		
size-weighted		10.111**	
relationship-weighted			11.385**
#N = 32, 4 lags			
	Secondary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Secondary SIC code Interconnectedness:			
equal-weighted	1.281		
size-weighted		5.004**	
relationship-weighted			6.093**
#N = 35, 4 lags			
	Tertiary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Tertiary SIC code Interconnectedness:			
equal-weighted	0.857		
size-weighted		3.796	
relationship-weighted			0.339
#N = 35, 3 lags			
	Country Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Country Interconnectedness:			
equal-weighted	7.367**		
size-weighted		8.137**	
relationship-weighted			5.749*
#N = 34, 4 lags			

The table shows Granger causality chi-square statistics between GIIPS-countries interconnectedness measures (X) and Western Europe countries interconnectedness measures (Y). The asterisks indicate the significance lev els of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

For the time frame of 2011-2013, the correlation is the most significant for primary SIC code and country-wise and is at 1% level, both size-weighted and relationship-weighted. In these settings, GIIPS interconnectedness predicts the nature of Western Europe interconnectedness the most relevantly.

Table 11: Granger causality test, 2011-2013

Granger Causality			
2011-2013			
	Western Europe Interconnctedness Measures		
	Primary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
GIIPS Countries Interconnectedness Measures			
Primary SIC code Interconnectedness:			
equal-weighted	4.287		
size-weighted		9.467***	
relationship-weighted			16.448***
#N = 34, 3 lags			
	Secondary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Secondary SIC code Interconnectedness:			
equal-weighted	4.928		
size-weighted		5.472	
relationship-weighted			3.206
#N = 33, 4 lags			
	Tertiary SIC code Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Tertiary SIC code Interconnectedness:			
equal-weighted	3.402*		
size-weighted		2.163	
relationship-weighted			7.894***
#N = 35, 1 lag			
	Country Interconnectedness		
	equal-weighted	size-weighted	relationship-weighted
Country Interconnectedness:			
equal-weighted	7.118*		
size-weighted		9.567***	
relationship-weighted			11.083***
#N = 34, 3 lags			

The table shows Granger causality chi-square statistics between GIIPS-countries interconnectedness measures (X) and Western Europe countries interconnectedness measures (Y). The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

5.4 Bank-level Interconnectedness and Systemic Risk

The last part of the research is dedicated to examining whether constructed bank-level interconnectedness measures impact the contagion spreading and increase of the systemic risk measures during the times of disruption.

First, to study the correlation between dependent variables, e.g. SRISK and 1% CoVaR, and independent variables, that are: primary, secondary and tertiary borrower SIC code interconnectedness and European country interconnectedness measures, Pearson's and Spearman's methods are carried out.

Table 12 shows the results. All coefficient estimates are positive and significant at 1% level between most specifications' interconnectedness and weighting schemes, and systemic risk measures, though between SRISK and tertiary SIC code interconnectedness the coefficients are statistically insignificant. The correlation between variables is small. Between SRISK and secondary and tertiary SIC codes the coefficient of determination is almost 0. Regarding the impact of secondary and tertiary interconnectedness on 1% CoVaR, the square of the correlation coefficient is around 1%, indicating very small correlation. Regarding the effect of primary SIC codes and European country interconnectedness on both systemic risk measures, the coefficients value and R^2 range between 0.11 and 0.3, and 1.2% and 9%, accordingly. The strength of indicated correlation is small, yet economically and statistically significant.

As for Spearman correlation, the rank order coefficients are slightly higher, with all results significant at 1% level. For some reason, the Spearman rho is twice as high compared to Pearson coefficient estimates for the relation between SRISK (and 1% CoVaR) and secondary (and tertiary) interconnectedness. Concerning the output effects of primary SIC codes and European country on systemic risk measures, the coefficients and, therefore, correlation are more consistent with what was obtained using Pearson techniques.

Afterwards, it was decided to leave secondary and tertiary SIC code measures out of the multivariate regressions, as they possess less explanatory power over contagious effects spreading in the European syndicated loan market and the further gotten investigation can be redundant and irrelevant. Also, the primary borrower SIC codes represent the major industry groups and initial business establishments of borrowers, so it makes more sense to examine the larger and more compatible industry-wise sample. The next is the passage of multivariate regressions that are described in the sections below.

Table 12: Interconnectedness and systemic risk measures

A. Pearson's Correlation

	#N	Primary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.1084***	0.1317***	0.1258***
1% CoVaR	769	0.2933***	0.2843**	0.2945***

B. Spearman Correlation

	#N	Primary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.1790***	0.2181***	0.2153***
1% CoVaR	769	0.2482***	0.2654***	0.2347***

A. Pearson's Correlation

	#N	Secondary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.0506***	0.0546***	0.0574***
1% CoVaR	769	0.1063***	0.0938***	0.1009***

B. Spearman Correlation

	#N	Secondary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.1189***	0.1555***	0.1438***
1% CoVaR	769	0.2891***	0.2547***	0.2130***

A. Pearson's Correlation

	#N	Tertiary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.0008	0.0034	0.0042
1% CoVaR	769	0.1085***	0.0970***	0.0956***

B. Spearman Correlation

	#N	Tertiary SIC code Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.0325***	0.0570***	0.0447***
1% CoVaR	769	0.2005***	0.2811***	0.2553***

A. Pearson's Correlation

	#N	Country Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.1060***	0.1202***	0.1109***
1% CoVaR	769	0.2116***	0.2997***	0.2099***

B. Spearman Correlation

	#N	Country Interconnectedness		
		equal-weighted	size-weighted	relationship-weighted
SRISK	10,590	0.1780***	0.2136***	0.2003***
1% CoVaR	769	0.2135***	0.2809***	0.2520***

The table reports Pearson and Spearman correlation coefficient estimates between lead arranger's systemic risk measures and his interconnectedness measure. The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

5.4.1 Bank-level Interconnectedness and SRISK

Table 13 presents the multivariate regression output results. It can be seen that interconnectedness itself for all specifications does have a statistically significant effect on SRISK. A 10% increase in primary equal-, size- and relationship-weighted SIC codes Interconnectedness is followed up by 1.7%, 1.6% and 2% increase in SRISK respectively. Relationship-weighted interconnectedness has the highest impact, as when lenders collaborate with other financial institutions, with whom they have already worked together before, more and more in the syndicated loan market, those networks become more exposed and directly contribute to spreading of systemic risk, SRISK measure in these settings. Together with expansion, interconnectedness measure does not explain the spreading of systemic risk in the economy for all specifications as well. As for interconnectedness during recession periods in Europe, the regression gives statistically and economically significant results at 5% level for both primary borrower SIC codes and European country-wise. When interconnectedness increases by 10% during the recession periods, SRISK increases by 0.46% for equal-weighted, 0.29% for size-weighted and 0.24% for primary SIC codes. Those interactions are very important, as during the times of recession unemployment rate rises, thereby increasing the amount of non-performing loans. That is why for the times of recession, the interaction between the dummy variable recession, and interconnectedness shows the materialization of systemic risk.

It is very interesting that, interaction term between interconnectedness and market share substantially affect the rise of SRISK, meaning that if a bank has a large share in a specific industry, it amplifies the effects of interconnectedness on the systemic risk, that can result in huge capital losses of the company, especially if participating in loan syndication in specified industries more frequently. A 10% increase of interconnectedness in industries lead up to around 6% increase of the dependent variable for all specifications. However, the other size-weighted interaction term between interconnectedness and market size of industries does not provide any economically or statistically significant results and does not explain the relation. The very similar pattern is noticed for European country specification. The results are consistent with Cai et al. (2018), showing that interconnectedness has marginal economic influence on the systemic risk evolvement in Europe and, subsequently, in the international financial market. The more lead arrangers ally with each other, the more contribution they bring to the spreading of contagion and turmoil in the financial system. Thus, larger banks, in particular at times of recession, contribute to systemic shock propagation. Lenders interconnectedness should be monitored to, be able to decrease dangerous collaborations of loans given in vast amounts, that increase systemic risk, and possible financial damage. The $H_0 4$ is proven.

Looking at other characteristics, recession periods increase SRISK measure in all specifications at 1% and 5% significance level. The relation between SRISK and primary SIC codes states that for equal-weighted, size-weighted and relationship-weighted, when there is 1 unit recession increase, it is followed

up by 0.3, 0.3 and 0.4 increase in SRISK respectively. European country-wise for all weighting schemes, the SRISK rise is around 0.3 for 1 unit recession increase. In terms of market share interconnectedness impact on systemic risk, the results that lender that have larger market share in SIC codes or European country, they are more hazardous than smaller companies and a breach in one of those banks can bring collapse of the whole syndicated loan market. Market size impact is economically and statistically insignificant, meaning increase or decrease in the size of the market is not followed up by changes in systemic risk measure, even though SRISK measure is sensitive to size.

Table 13: Interconnectedness and SRISK

Multivariate Regressions			
2002-2017			
SRISK	**Primary SIC code Interconnectedness**		
	equal-weighted	size-weighted	relationship-weighted
Interconnectedness	0.169* (0.091)	0.159** (0.077)	0.199* (0.100)
Interconnectedness * Expansion	-0.188 (0.108)	-0.206 (0.085)	-0.071 (0.100)
Interconnectedness * Recession	0.046** (0.099)	0.029** (0.057)	0.024** (0.046)
Interconnectedness * Market Share	0.635* (0.180)	0.571*** (0.085)	0.453*** (0.169)
Interconnectedness * Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Recession	0.323*** (0.211)	0.301** (0.238)	0.387** (0.229)
Market Share	0.323* (0.022)	0.323* (0.022)	0.337* (0.023)
Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Lead Fixed Effects	Yes	Yes	Yes
#N	10,590	10,590	10,590
Adjusted R^2	0.1445	0.1558	0.1537

Multivariate Regressions			
2002-2017			
SRISK	**Country Interconnectedness**		
	equal-weighted	size-weighted	relationship-weighted
Interconnectedness	0.263*** (0.065)	0.190*** (0.066)	0.132** (0.050)
Interconnectedness * Expansion	-0.112 (0.067)	-0.103 (0.062)	-0.075 (0.045)
Interconnectedness * Recession	0.045** (0.083)	0.042** (0.062)	0.075** (0.045)
Interconnectedness * Market Share	0.605*** (0.198)	0.402*** (0.138)	0.339** (0.119)
Interconnectedness * Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Recession	0.770*** (0.177)	0.654*** (0.187)	0.706*** (0.180)
Market Share	0.321*** (0.094)	0.504*** (0.159)	0.372*** (0.124)
Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Lead Fixed Effects	Yes	Yes	Yes
#N	10,590	10,590	10,590
Adjusted R^2	0.1467	0.1577	0.1534

The table shows coefficient estimates from regressions with lead arranger fixed effects and robust cluster standard errors (in parentheses) regarding lead arranger's SRISK to his interconnectedness measure. The dependent variable is SRISK. The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

5.4.2 Bank-level Interconnectedness and CoVaR

The final multivariate regression applied is to test the impact of interconnectedness measures on 1% CoVaR systemic risk dependent variable. As it was mentioned before, while gathering the sample of banks' systemic risk measure, it was found that out of 11 banks matched with the sample, 10 are American and only 1 is European. Thus, it is insufficient to say with 100% confidence how the interconnectedness measure constructed in the settings of European borrowers can describe the relation effects on changes in 1% CoVaR measure, that is calculated primarily for American lenders. Maybe, if the study was conducted in American syndicated borrower market settings, the results would be different. Yet, the relation does not seem to find any real effect of European lead arrangers' interconnectedness patterns on 1% CoVaR measure used.

Table 14 depicts the results. For all specifications neither interconnectedness, nor interconnectedness in times of expansion has explanatory power over 1% CoVaR changes. As for interconnectedness during recession, the coefficient estimates are statistically significant, however, an increase or decrease in interconnectedness during recession does not affect the systemic risk measure. Market share has a small, yet not measurable impact on CoVaR. Other specifications also do not provide any valuable estimates. Overall, the findings do not capture the effect of any type of interconnectedness on CoVaR. The $H_0 5$ does not hold.

Table 14: Interconnectedness and CoVaR

Multivariate Regressions			
1995-2013			
1% CoVaR	**Primary SIC code Interconnectedness**		
	equal-weighted	size-weighted	relationship-weighted
Interconnectedness	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Interconnectedness * Expansion	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Interconnectedness * Recession	0.001** (0.000)	0.001* (0.000)	0.001** (0.000)
Interconnectedness * Market Share	0.000 (0.000)	0.001** (0.000)	0.000 (0.000)
Interconnectedness * Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Recession	-0.009*** (0.002)	-0.017** (0.003)	-0.020*** (0.005)
Market Share	0.003 (0.001)	0.011*** (0.003)	0.007** (0.003)
Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Lead Fixed Effects	Yes	Yes	Yes
#N	769	769	769
Adjusted R^2	0.1823	0.2129	0.2326

Multivariate Regressions			
1995-2013			
1% CoVaR	**Country Interconnectedness**		
	equal-weighted	size-weighted	relationship-weighted
Interconnectedness	0.000*** (0.000)	0.000** (0.000)	0.000 (0.000)
Interconnectedness * Expansion	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Interconnectedness * Recession	0.000* (0.000)	0.000* (0.000)	0.000** (0.000)
Interconnectedness * Market Share	0.000** (0.000)	0.000*** (0.000)	0.000 (0.000)
Interconnectedness * Market Size	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)
Recession	-0.009** (0.003)	-0.010** (0.004)	-0.019*** (0.005)
Market Share	0.003*** (0.000)	0.004*** (0.001)	0.004*** (0.001)
Market Size	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Lead Fixed Effects	Yes	Yes	Yes
#N	769	769	769
Adjusted R^2	0.1909	0.1744	0.2318

The table shows coefficient estimates from regressions with lead arranger fixed effects and robust cluster standard errors (in parentheses) regarding lead arranger's 1% CoVaR to his interconnectedness measure. The dependent variable is 1% CoVaR. The asterisks indicate the significance levels of the coefficients: *** significant at 1% level, ** significant at the 5% level, * significant at the 10% level.

CHAPTER 6 Conclusion

6.1 Conclusion

The research studies the interconnectedness of lead arrangers in the European syndicated market, based on what characteristics lenders create interlinked networks, and the impact of those interconnectedness measures on the amplification of systemic risk in the European financial market. The interconnectedness measure is constructed based on the methodology of Cai et al. (2010).

The extensive literature on syndicated loans, banks' interconnectedness and systemic risk measures was analyzed. Interestingly, in the European market, the most popular borrower industries to take out a loan are chemical and biotechnological, mining and steel, gas and oil, telecommunications are media, and entertainment industries. As for countries, the greatest deal of syndicated borrowers are companies with headquarters in Austria, France, Germany, Italy, the Netherlands and Spain.

The examination provides an empirical framework to investigate the patterns of reasons why lead managers ally with each other, how GIIPS countries predict the alliance creation in Western Europe and whether interconnectedness in primary, secondary and tertiary borrower SIC codes, and European country is the major source of economic disruption in the financial world, that leads to contagious propagation and increase of systemic risk. The role of lead arrangers is very important for systemic risk coming from syndicated loan market, because, as I found out, they ally based on size and asset allocation similarities, and saturation of lenders' collaborations in specific industries or countries can bring the possibility of collapse of one financial institution to spread the damage across the real economies. Also, banks with larger market share in the industry or country in the European syndicated loan market tend to contribute even more to contagious effects, due to having higher credit exposure, distributing larger loans.

As the question for my research was to investigate what is the relationship between interconnectedness and systemic risk, and whether interlinkages of banks in various SIC code industries and counties contribute to spreading of financial distress. I obtained interesting results. Interconnectedness does have an impact on systemic risk measures, though, in the settings of European syndicated loan market, banks' networks facilitate spillovers via increasing SRISK, while having little impact on CoVaR measure. I conclude that, even though creating syndicates and allying into groups is beneficial for both borrowers and lead arrangers, the risk of repeating a crisis situation can be very high. The negative effects of interconnectedness, especially repetitive collaborations of lenders of similar size, large market share and allocation should not be ignored, but monitored and mitigated.

The examination was carried based on 5 hypotheses. First hypothesis states that diversification is the major motivation to create syndicated interconnectedness. I conclude that diversification and market share are the most important constituents for lead managers to collaborate in the European syndicated loan

market, thus lead arrangers not only consider diversification benefits for their portfolios, but also look for banks with similar market shares to collaborate with. The results are economically and statistically significant for all built specifications. Market size does not have an impact on lenders' desire to participate together in a syndicate. In other words, lead managers with diversified portfolios are more interconnected with each other, then those with concentrated loan portfolios. Market share explains that larger banks prefer working with financial institutions that have similar asset allocation in borrower industries. A very important distinction is that, even though banks become more diversified eventually, their portfolios shift to be more alike, thus providing contagion and reducing overall diversity in the European syndicated market. Thus, the hypothesis holds. The second hypothesis is aimed to investigate whether lead arrangers ally based on their asset allocation alikeness. Interconnectedness aggregated at market level displays lenders' incentive to collaborate with banks of similar size and portfolio allocation, proving the hypothesis. I find out that lead arrangers prefer to unite in the European syndicated loan market based on size (in my sample are only large banks, hence, large lenders consider large banks for syndicates) and their previous relationships, meaning corresponding asset allocation.

Next, Granger causality tests propose that saturation of interlinkages in GIIPS countries between the time span of 2011-2013 significantly predicts the interconnectedness in the Western European countries, suggesting that there is a certain pattern for syndication managers to collaborate in Europe and their migration from one European country to another, also as an aftermath of integration.

The third hypothesis says that interconnectedness has a strong effect on the spreading of systemic risk during the times of recession in the European syndicated market. As having two market-based systemic risk measures, e.g. SRISK and CoVaR, I decided to split the hypothesis into two, checking for the relation and impact on SRISK ($H_0$4) first, and then on CoVaR ($H_0$5) respectively.

Different results are obtained. Unfortunately, the impact of interconnectedness on CoVaR is not found. Some of the results are significant, yet they do not possess any economical or statistical power to explain the effect of interconnectedness on the spreading of systemic risk, using CoVaR. A possible explanation for that is incompetent sample. The study is conducted based on European borrowers, yet, all tranches were chosen to be made in EUR only, thus, most lead arrangers are also European or have branches in Europe, there are not many American companies in the interconnectedness sample. On the other hand, the obtained and then matched CoVaR dataset contained only 1 European bank, with the rest being American. That is why my explanation for the results is insufficient explanatory power of American banks to interpret the times of disruption in Europe. The fourth hypothesis is rejected.

Conversely, the different pattern for SRISK is found. During the times of recession, interconnectedness does have a direct and positive effect on the increase of systemic risk, thus can be used as explanatory measure for understanding exposure decrease of lead arrangers used in the sample. In

specified periods higher portfolio overlap of lead arrangers leads to increased systemic risk in real economies. Also, interconnectedness in terms of market share of lead arrangers amplifies the influence on systemic risk, meaning that banks with large market shares contribute more to shocks, when allying in syndicates. The more lead managers collaborate in the European syndicated loan market, the more their interconnectedness contribute to propagation of systemic shocks in Europe and the entire financial system. The fifth hypothesis is proven. To sum up, in my opinion, interconnectedness does build up systemic risk during times of recession, but large lead arrangers' market shares are also important, as they contribute to enlarged interconnectedness's impact on shock propagation as well. Likewise, as the syndicated loan market is based on lenders' collaborations, repetitive interactions with same borrowers can contribute more to systemically risky outcomes. Thus, the third hypothesis holds.

After conducting the study, I can conclude that in the European syndicated loan market settings, SRISK is a better systemic risk measure compared with CoVaR, as the former has a direct and positive relation with interconnectedness, and is amplified when interconnectedness increases, and the latter changes are not explained by interconnectedness.

Turning to the current settings of the European syndicated market, I can establish that the syndicated market is safer now, as the financial system is in recovery so far, there are still fewer facility amounts, then during the rise of syndicated loan market in Europe and times of recession. Besides that, market-aggregate interconnectedness graphs in section 5 show that interconnectedness of banks based on their commonalities in asset holdings through syndicated loans has decreased. Both size- and relationship-weighted interconnectedness measures of 2017 are comparably lower then during crises and even declined compared with 2016. Yet, that does not mean that systemic risk cannot repeat itself again. As banks like creating syndicate networks, it is important to take interconnectedness as a serious measure to help mitigate systemic shock spillovers.

6.2 Limitations, further research and implications

The main limitation of the research is the difficulty of obtaining and matching the data. The LenderIDs provided by DealScan are specifically for that dataset only, and as the required sample needed a lot of lender names, and a great deal of Tickers were missing, it was insubstantial to merge the data with other datasets to get more financial information on the lead arrangers. Due to that some interesting ideas, that could have made the study a lot better, had to be dropped as unmanageable for self-capacity, as the SRISK and CoVaR data had to be manually matched with the lenders name in the final sample of interconnectedness construction, and that is very time-consuming alone.

Thus, as being personally unavailable to construct some variables, for the future research I would suggest including lead arrangers' leverage and exposure measures, as both are great for shock propagation

investigations. Also, as the dataset used for CoVaR mostly accounts for American companies, using a smaller sample and building up the measure by oneself can significantly change the results for the syndicated market in Europe.

Another interesting examination can be conducted on separating SIC code industries and controlling for in which industry the interconnectedness and exposure are the highest and, thereafter, if the relation with systemic risk measures is corresponding to understand more patterns of both syndicated interconnectedness and shock propagation.

The results have several crucial implications for regulators. It is important to take interconnectedness measure of banks giving out large corporate loans into account for the design of macroprudential policies, as it can be used as a useful predictor of the systemic risk build up. Moreover, stress tests are still mostly performed on individual bank-level, instead of considering banking networks of systemically important institutions. Thus, the common exposure and interlinkages' effect on the aggregate is not considered, rather, stress tests are calculated on the idiosyncratic level. That is why, interconnectedness via the interbank market can be a potentially appropriate complementary measure to distinguish systemically important institutions to add more insight to already existing stress tests.

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APPENDIX A. Borrower company names of the sample before measure construction

BORROWER NAME									
1	11880 SOLUTIONS AG	41	AIRBUS SE	81	APCOA PARKING AG	121	AUTOGRILL SPA	161	BERGESEN DY A/S
2	2WAYTRAFFIC N.V.	42	AKASTOR ASA	82	ARBED SA	122	AUTOHELLAS SA	162	BERKELEY GROUP HLDGS PLC
3	3I GROUP PLC	43	AKER EXPLORATION ASA	83	ARBONIA AG	123	AUTOLOGIC HOLDINGS PLC	163	BERKELEY TECHNOLOGY LTD
4	3I INFRASTRUCTURE LTD	44	AKER MARITIME ASA	84	ARC INTERNATIONAL PLC	124	AUTOMATED SECURITY HLDGS PLC	164	BERTELSMANN SE & CO KGAA
5	A-TEC INDUSTRIES AG	45	AKTIV KAPITAL ASA	85	ARCADIA GROUP PLC	125	AUTONOMY CORP PLC	165	BET PLC
6	A.G. PETZETAKIS SA	46	AKZO NOBEL NV	86	ARCADIS NV	126	AUTOROUTES PARIS-RHIN RHONE	166	BG GROUP PLC
7	A.P. MOLLER - MAERSK A/S	47	ALAIN AFFLELOU SA	87	ARCANDOR AG	127	AVA-ALLGEM HANDELSG VERBR AG	167	BHP BILLITON GROUP (GBR)
8	A2A SPA	48	ALBIOMA	88	ARCELORMITTAL	128	AVENIR TELECOM	168	BIBBY (J) & SONS PLC
9	AA PLC	49	ALBRIGHT & WILSON PLC	89	ARCON INTL RESOURCES PLC	129	AVENTIS SA	169	BIG FOOD GROUP
10	ABB LTD	50	ALCATEL-LUCENT	90	AREVA SA	130	AVERYS	170	BIG YELLOW GROUP PLC
11	ABBOT GROUP PLC	51	ALEA GROUP HLDGS LTD	91	ARJO WIGGINS APPLETON PLC	131	AVIO SPA	171	BILFINGER SE
12	ABENGOA SA	52	ALFA LAVAL AB	92	ARKEMA	132	AVIS EUROPE PLC	172	BILLERUDKORSNAS AB
13	ABERDEEN ASSET MANAGEMENT	53	ALFESCA HF	93	ARNOLDO MONDADORI EDITORE SP	133	AVON RUBBER PLC	173	BIOGLAN PHARMA PLC
14	ABERTIS INFRAESTRUCTURAS SA	54	ALGECO SA	94	ARRIVA PLC	134	AWG PLC	174	BIOMERIEUX
15	ABO WIND AG	55	ALIAXIS SA	95	ARYZTA AG	135	AXEL SPRINGER SE	175	BLACKS LEISURE GROUP PLC
16	ACCES INDUSTRIE	56	ALLDERS	96	ASCOM AG	136	AZ ELECTRONIC MATERIALS SA	176	BLUE CIRCLE INDUSTRIES PLC
17	ACCIONA SA	57	ALLIANCE BOOTS PLC	97	ASHTEAD GROUP PLC	137	AZKOYEN SA	177	BODY SHOP INTERNATIONAL PLC
18	ACCOR SA	58	ALLIED DOMECQ PLC	98	ASIAKASTIETO GROUP	138	AZLAN GROUP PLC	178	BODYCOTE PLC
19	ACEA SPA	59	ALLIED LEISURE PLC	99	ASK CENTRAL PLC	139	BABCOCK & BROWN ENV INV LTD	179	BOLLORE SA
20	ACEGAS-APS	60	ALPHA AIRPORTS GROUP PLC	100	ASM INTERNATIONAL NV	140	BABCOCK & BROWN LTD	180	BOOKER GROUP PLC
21	ACTAVIS GROUP	61	ALPIQ HOLDING AG	101	ASSA ABLOY AB	141	BABCOCK INTERNATIONAL GROUP	181	BOREALIS
22	ACTIVIDADES CONSTR Y SERVICI	62	ALSTOM SA	102	ASSICURAZIONI GENERALI SPA	142	BAE SYSTEMS PLC	182	BOSKALIS WESTMINSTER NV
23	ADECCO GROUP AG	63	ALTADIS SA	103	ASSIDOMAN AB	143	BAKKAVOR GROUP PLC	183	BOUYGUES SA
24	ADIDAS AG	64	ALTANA AG	104	ASSOC BRITISH PORTS HLDG PLC	144	BALFOUR BEATTY PLC	184	BOVIS HOMES GROUP PLC
25	ADT LTD	65	ALTEN SA	105	ASSOCIATED BRITISH FOODS PLC	145	BAMI SA	185	BP PLC
26	ADVAL TECH HOLDING AG	66	ALVIS PLC	106	ASTALDI SPA	146	BARRATT DEVELOPMENTS PLC	186	BPB PLC
27	ADVANCED COMPUTER SFTWR GRP	67	AMADEUS GLOBAL TRAVEL DISTR	107	ASTICUS AB	147	BARRY CALLEBAUT AG	187	BRAATHENS ASA
28	ADVEO GROUP INTERNATIONAL	68	AMADEUS IT GROUP SA	108	ASTRAZENECA PLC	148	BASF SE	188	BRAKE BROS PLC
29	ADWEST AUTOMOTIVE PLC	69	AMEC FOSTER WHEELER PLC	109	ASTURIANA DE ZINC SA	149	BAYER AG	189	BRAMMER PLC
30	AEA TECHNOLOGY GROUP PLC	70	AMER SPORTS CORP	110	ATH RESOURCES PLC	150	BAYER MOTOREN WERKE AG	190	BRAUEREI MONINGER AG
31	AERO INVENTORY PLC	71	AMERSHAM PLC	111	ATKINS (WS) PLC	151	BBA AVIATION PLC	191	BREEDON GROUP PLC
32	AEROPORTS DE PARIS	72	AMEY PLC	112	ATLANTIC TELECOM GROUP PLC	152	BE GROUP AB	192	BRENNTAG AG
33	AGFA-GEVAERT NV	73	AMG ADVANCED METALLURGICAL	113	ATLAS COPCO AB	153	BEATE UHSE AG	193	BRISA-AUTO-ESTRADAS PORTUGAL
34	AGGREGATE INDUSTRIES PLC	74	AMICA SA	114	ATOS SE	154	BEFESA MEDIO AMBIENTE SA	194	BRITISH AMER TOBACCO PLC
35	AGGREKO PLC	75	ANF IMMOBILIER	115	ATTENDO AB	155	BEGHIN-SAY SA	195	BRITISH ENERGY GROUP
36	AGIE CHARMILLES HOLDING AG	76	ANGLIAN GROUP PLC	116	ATTICA HOLDINGS SA	156	BEIERSDORF AG	196	BRITISH LAND CO PLC
37	AHLSELL AB	77	ANGLO AMERICAN PLC	117	AUGUSTA TECHNOLOGIE AG	157	BEKAERT SA/NV	197	BSS GROUP PLC
38	AHLSTROM (A) OY	78	ANHEUSER-BUSCH INBEV	118	AUROBINDO PHARMA LTD	158	BELL FOOD GROUP AG	198	BT GROUP PLC
39	AHTIUM OYJ	79	ANTALIS INTL SA	119	AURUBIS AG	159	BENETTON GROUP SPA	199	BT INDUSTRIES AB
40	AIR FRANCE - KLM	80	ANTOFAGASTA PLC	120	AUSY SA	160	BERENDSEN PLC	200	BTR PLC

BORROWER NAME												
201	BUCHER INDUSTRIES AG	241	CARRIER1 INTERNATIONAL SA	281	CNH GLOBAL NV	321	D&S EUROPE AG	361	DNA LTD
202	BUFFALO GRILL	242	CASTELLUM AB	282	COATS PLC	322	DAEWOO CORP	362	DOCKS LYONNAIS SA
203	BULGARI SPA	243	CATHAY PACIFIC AIRWAYS LTD	283	COBHAM PLC	323	DAILY MAIL & GENERAL TRUST	363	DOF ASA
204	BULL SA	244	CDC POINT SPA	284	COCA-COLA AMATIL LTD	324	DAIMLER AG	364	DOOSAN HEAVY INDS & CONSTR
205	BUNZL PLC	245	CEGEDIM	285	COCA-COLA HBC AG	325	DAIRY CREST GROUP PLC	365	DORMAKABA HOLDINGS AG
206	BURBERRY GROUP PLC	246	CEGID GROUP	286	CODERE S.A.	326	DAISY GROUP PLC	366	DOUGLAS HOLDING AG
207	BUREAU VERITAS SA	247	CELANESE AG	287	COFINIMMO SA	327	DAMM SA	367	DRAKA HOLDING NV
208	BURFORD HOLDINGS PLC	248	CEMENTOS MOLINS SA	288	COFLEXIP SA	328	DANA PETROLEUM PLC	368	DRILLISCH AG - OLD
209	BURMAH CASTROL PLC	249	CEMENTOS PORTLAND VALDERRIVA	289	COLOPLAST A/S	329	DANISCO A/S	369	DRUCKFARBEN HELLAS SA
210	BURNDENE INVESTMENTS PLC	250	CEMEX SAB DE CV	290	COMPAGNIE DES ALPES	330	DANKA BUSINESS SYSTEMS PLC	370	DUCATI MOTOR HOLDING SPA
211	BURREN ENERGY PLC	251	CENTAUR MEDIA	291	COMPASS GROUP PLC	331	DANONE	371	DUERR AG
212	BURTONWOOD PLC	252	CENTER PARCS (UK) GROUP PLC	292	COMPLETEL EUROPE NV	332	DANSKE TRAELAST A/S	372	DUFRY AG
213	BUZZI UNICEM SPA	253	CENTERPULSE AG	293	COMPONENTA OYJ	333	DART GROUP PLC	373	DUNI AB
214	BWIN PARTY DIGITAL ENTMT PLC	254	CENTRICA PLC	294	COMPUGROUP MEDICAL SE	334	DARTY PLC	374	DX SERVICES PLC
215	C D BRAMALL PLC	255	CERMAQ ASA	295	CONCENTRIC AB	335	DAWSON HOLDINGS PLC	375	DYCKERHOFF AG
216	C F A O	256	CFF RECYCLING	296	CONCORDIA MARITIME AB	336	DE DIETRICH ET CIE	376	DYNACTION SA
217	C&C GROUP PLC	257	CGG	297	CONERGY AG	337	DE LA RUE PLC	377	DYNO NOBEL LTD
218	CABLE & WIRELESS COMM PLC	258	CHARGEURS INTERNATIONAL SA	298	CONNAUGHT PLC	338	DE LONGHI SPA	378	E.ON SE
219	CADBURY PLC	259	CHARLES VOGELE HLDG AG	299	CONNECT GROUP PLC	339	DEBENHAMS PLC	379	E2V TECHNOLOGIES PLC
220	CAFFE NERO GROUP PLC	260	CHELSFIELD PLC	300	CONTINENTAL AG	340	DEBITEL AG	380	EAST SURREY HOLDGS PLC
221	CAMAIEU SA	261	CHEMRING GROUP PLC	301	COOR SERVICE MANAGEMENT	341	DECEUNINCK NV/SA	381	EASTERN DRILLING ASA
222	CAMAS	262	CHORION PLC	302	CORDIANT COMMUNICATIONS GRP	342	DELANCEY ESTATES PLC	382	EASTERN GROUP PLC
223	CAMPOFRIO FOOD GROUP SA	263	CHORUS LTD	303	CORIO NV	343	DELFT INSTRUMENTS NV	383	EASTERN MERCHANTS LTD
224	CANNONS GROUP PLC	264	CHR.HANSEN HOLDINGS AS	304	CORPORATE EXPRESS NV	344	DELTA CORP	384	EASYJET PLC
225	CAPGEMINI SE	265	CHRISTIAN DIOR SE	305	CORTEFIEL SA	345	DELTA HOLDING SA	385	EBRO FOODS SA
226	CAPIO AB	266	CIBA HOLDING AG	306	CORUS GROUP PLC	346	DELTA PLC	386	ECIA SA
227	CAPITA PLC	267	CIE AUTOMOTIVE SA	307	COSMOTE MOBILE TELECOMMNICTN	347	DERICHEBOURG	387	ECONOCOM GROUP BV
228	CAPITAL & REGIONAL PPTYS PLC	268	CIMENTS FRANCAIS	308	COUNTRYWIDE PLC	348	DEUTSCHE BOERSE AG	388	ECONOSTO (KONINKLIJKE) NV
229	CAPITAL SHOPPING CENTRES PLC	269	CIMPOR-CIMENTOS DE PORTUGAL	309	COURTS PLC	349	DEUTSCHE LUFTHANSA AG	389	EDEL MUSIC AG
230	CARD FACTORY PLC	270	CINEWORLD GROUP	310	CPP GROUP PLC	350	DEUTSCHE OFFICE TRUST	390	EDF ENERGIES NOUVELLES
231	CARDO AB	271	CITYCON OYJ	311	CRANSWICK PLC	351	DEUTSCHE POST AG	391	EDISON SPA
232	CARE UK PLC	272	CIVICA PLC	312	CREATIVE PUBLISHING PLC	352	DEUTSCHE TELEKOM	392	EDISON SPA - OLD
233	CARETECH HOLDINGS	273	CLAAS KG	313	CREMONINI SPA	353	DEUTZ AG	393	EDP ENERGIAS DE PORTUGAL SA
234	CARGOTEC OYJ	274	CLARIANT AG	314	CREST NICHOLSON PLC	354	DEVRO PLC	394	EDSCHA AG
235	CARILLION PLC	275	CLARINS SA	315	CRH PLC	355	DEWHIRST GROUP PLC	395	EEMS ITALIA SPA
236	CARL ZEISS MEDITEC AG	276	CLINTON CARDS PLC	316	CRODA INTERNATIONAL PLC	356	DFDS AS	396	EFES BREWERIES INTL
237	CARLSBERG A/S	277	CLOSE BROTHERS GROUP PLC	317	CROPENERGIES AG	357	DFS FURNITURE CO PLC	397	EI GROUP PLC
238	CARLTON COMMUNICATIONS PLC	278	CLUB MEDITERRANEE SA	318	CROWN SPORTS PLC	358	DIAGEO PLC	398	EIFFAGE
239	CARNIVAL CORP/PLC (GBR)	279	CLYDE PETROLEUM PLC	319	CVS GROUP PLC	359	DLH-DALHOFF LARSEN & HORNEMA	399	EIRCOM GROUP PLC
240	CARREFOUR SA	280	CMG PLC	320	CYPRUS AIRWAYS PUBLIC LTD	360	DMG MORI AG	400	ELAN CORP PLC

BORROWER NAME												
401	ELCOTEQ SE	441	EQUANT NV	481	FERGUSON PLC	521	G4S PLC	561	GRANDVISION NV
402	ELECNOR SA	442	ERAMET	482	FERRETTI SPA	522	GALERIES LAFAYETTE SA	562	GRANDVISION SA
403	ELECTRA PRIVATE EQUITY PLC	443	ERG SPA	483	FERREXPO PLC	523	GALLAHER GROUP PLC	563	GRANINGE AB
404	ELECTRABEL SA/NV	444	ERIDANIA BEGHIN-SAY SA	484	FERROVIAL SA	524	GALP ENERGIA SGPS SA	564	GREAT PORTLAND ESTATES PLC
405	ELECTROCOMPONENTS PLC	445	ERIKS NV	485	FIAT CHRYSLER AUTOMOBILES NV	525	GAMBRO AB	565	GREEN PROPERTY PLC
406	ELECTROLUX AB	446	ESAOTE SPA	486	FIBERWEB PLC	526	GAME DIGITAL PLC	566	GREENCORE GROUP PLC
407	ELEKTA AB	447	ESAT TELECOM GROUP	487	FINAXA	527	GAMMA HOLDING NV	567	GREENE KING PLC
408	ELEMENTIS PLC	448	ESPORTA PLC	488	FINDEL PLC	528	GARDENA HOLDING AG	568	GRESVIG ASA
409	ELF AQUITAINE SA	449	ESPRINET SPA	489	FINDEXA AS	529	GAS NATURAL FENOSA	569	GRIFOLS SA
410	ELIA SYSTEM OPERATOR SA	450	ESSILOR INTERNATIONAL SA	490	FINELIST GROUP PLC	530	GAUMONT SA	570	GRONTMIJ NV
411	ELIOR GROUP SA	451	ETEX GROUP SA	491	FINNAIR OYJ	531	GAZPROM PJSC	571	GROUPE FLO SA
412	ELIS	452	EURASIAN NATURAL RESOURCES	492	FIRST CHOICE HOLIDAYS PLC	532	GC RIEBER SHIPPING ASA	572	GROUPE GASCOGNE
413	ELISA CORP	453	EURO CARGO SERVICES	493	FIRST TECHNOLOGY PLC	533	GEA GROUP AG	573	GROUPE GO SPORT
414	ELLAKTOR SA	454	EUROBIKE AG	494	FIRSTGROUP PLC	534	GEBERIT AG	574	GROUPE STERIA
415	ELOS MEDTECH AB	455	EUROFINS SCIENTIFIC	495	FIRTH RIXSON PLC	535	GECINA	575	GRUPO EMPRESARIAL SAN JOSE
416	EM TV & MERCHANDISING AG	456	EUROMEDICA SA	496	FISHER (ALBERT) GROUP PLC	536	GEEST PLC	576	GRUPO FERROVIAL SA
417	EMI GROUP PLC	457	EURONAV	497	FITNESS FIRST PLC	537	GEMALTO	577	GRUPPO COIN SPA
418	EMMI AG	458	EUROPCAR GROUPE SA	498	FKI PLC	538	GEMINA	578	GUALA CLOSURES SPA
419	EMS-CHEMIE HOLDING AG	459	EUROPEAN LEISURE PLC	499	FLENDER (A FRIEDRICH) AG	539	GEMPLUS INTERNATIONAL SA	579	GUCCI GROUP NV
420	ENAGAS SA	460	EUSKALTEL SA	500	FLEXTECH PLC	540	GENTING BHD	580	GULLANE ENTERTAINMENT PLC
421	ENBW ENERGIE BADEN	461	EVANS ANALYTICAL GROUP LTD	501	FLSMIDTH & CO AS	541	GENUS PLC	581	GUNNEBO AB
422	ENCE ENERGIA & CELULOSA	462	EVANS OF LEEDS PLC	502	FNAC DARTY SA	542	GEODIS	582	GUS PLC
423	ENDEMOL ENTERTAINMENT HLDNG	463	EVN-ENERGIE-VERSORG NIEDEROS	503	FOMENTO DE CONSTRUC Y CONTRA	543	GEORG FISCHER AG	583	GYRUS GROUP PLC
424	ENDESA SA	464	EVONIK INDUSTRIES AG	504	FONCIERE EURIS	544	GERMANOS SA	584	H&R GMBH & CO KGAA
425	ENEL AMERICAS SA	465	EVRAZ PLC	505	FONCIERE EUROPE LOGISTIQUE	545	GERRESHEIMER GLAS AG	585	HAFSLUND ASA
426	ENEL SPA	466	EVRY ASA	506	FORBO AG	546	GESTAMP AUTOMOCION SA	586	HALDEX AB
427	ENERGIS PLC	467	EWE-ENERGIEVERSORGUNG WESER	507	FORTH PORTS PLC	547	GETRONICS NV	587	HALFORDS GROUP PLC
428	ENGIE SA	468	EXEL PLC	508	FORTHNET SA	548	GFK SE	588	HALL ENGINEERING (HLDGS) PLC
429	ENGLISH CHINA CLAYS PLC	469	EXOVA GROUP LTD	509	FORTUM OYJ	549	GIVAUDAN SA	589	HALMA PLC
430	ENI LASMO PLC	470	EXPAMET INTERNATIONAL PLC	510	FOSECO PLC	550	GLAXOSMITHKLINE PLC	590	HAMLEYS PLC
431	ENI SPA	471	EXPERIAN PLC	511	FRANCOTYP POSTALIA HLDG AG	551	GLENCORE PLC	591	HAMMERSON PLC
432	ENIRO AB	472	EXPRIVIA SPA	512	FRED OLSEN ENERGY ASA	552	GLENMARK PHARMACEUTICALS LTD	592	HAMMONIA SCHIFFSHOLDING AG
433	ENITEL ASA	473	EXPRO INTERNATIONAL GRP PLC	513	FREENET AG	553	GLOBAL STEEL WIRE SA	593	HANJIN SHIPPING CO LTD
434	ENK PLC	474	FAIVELEY TRANSPORT	514	FROGMORE ESTATES PLC	554	GO-AHEAD GROUP PLC	594	HANOVER INTL PLC
435	ENNSTONE PLC	475	FALCK RENEWABLES SPA	515	FROMAGERIES BEL SA	555	GOLDSMITHS GROUP PLC	595	HANSEN TRANSMISSIONS INTL NV
436	ENODIS PLC	476	FASHION BEL AIR	516	FUGRO NV	556	GONDOLA HOLDINGS	596	HANSON PLC
437	ENTERPRISE OIL PLC	477	FASTIGHETS AB TORNET	517	FUJITSU LTD	557	GRAMMER AG	597	HAPAG-LLOYD AG
438	ENTERPRISE PLC	478	FASTWEB	518	FULLER SMITH & TURNER PLC	558	GRANADA GROUP PLC	598	HARDY OIL & GAS PLC
439	ENTREPOSE CONTRACTING	479	FAURECIA SA	519	FUTURE PLC	559	GRAND METROPOLITAN PLC	599	HARGREAVES SERVICE
440	EPCOS AG	480	FENNER PLC	520	FUTUREN SA	560	GRANDI NAVI VELOCI SPA	600	HARWORTH GROUP PLC

BORROWER NAME							
601	HAULOTTE GROUP	641	HOMAG GROUP AG	681	INMARSAT PLC	721	JOHNSON MATTHEY PLC	761	KTM AG
602	HAVAS	642	HOMEBUY GROUP PLC	682	INMOBILIARIA COLONIAL	722	JOHNSON SERVICE GROUP PLC	762	KUKA AG
603	HAVELLS INDIA LTD	643	HOMESERVE PLC	683	INNOGY SE	723	JOHNSTON PRESS PLC	763	KUNICK PLC
604	HAYS PLC	644	HOMESTYLE GROUP PLC	684	INSTRUMENTARIUM CORP	724	JOST WERKE AG	764	KVAERNER ASA
605	HAZLEWOOD FOODS PLC	645	HORNBACH-BAUMARKT AG	685	INTEGRATED DENTAL HLDGS PLC	725	JOY CITY PROPERTY LTD	765	KVERNELAND ASA
606	HBOS PLC	646	HOUSE OF FRASER PLC	686	INTENTIA INTERNATIONAL AB	726	JSW STEEL LTD	766	KWIK-FIT HOLDINGS PLC
607	HCL TECHNOLOGIES LTD	647	HSS HIRE GROUP PLC	687	INTERBULK GROUP PLC	727	KABEL DEUTSCHLAND HOLDING AG	767	KWS SAAT SE
608	HEADLAM GROUP PLC	648	HUGO BOSS AG	688	INTERCONTINENTAL HOTELS GRP	728	KAESSBOHRER GELAENDEFAHRZEUG	768	L'AIR LIQUIDE SA
609	HEIDELBERGCEMENT AG	649	HUHTAMAKI OYJ	689	INTERNATIONAL POWER PLC	729	KAMPS AG	769	LA FITNESS PLC
610	HEIDELBERGER DRUCKMASCHINEN	650	HUNTING PLC	690	INTERSERVE PLC	730	KAUFMAN & BROAD SA	770	LA SEDA DE BARCELONA SA
611	HEIJMANS NV	651	HURTIGRUTEN GROUP ASA	691	INTL CONSOL AIRLINES GROUP	731	KAZ MINERALS PLC	771	LADBROKES CORAL GROUP PLC
612	HEINEKEN NV	652	HUSQVARNA AB	692	INTL GAME TECHNOLOGY PLC	732	KELLER GROUP PLC	772	LAFARGE SA
613	HELLA GMBH & CO. KGAA	653	HUTCHISON PORT HLDGS TRUST	693	INTL PUBLIC PARTNERSHIPS LTD	733	KEMIRA GROWHOW OYJ	773	LAFARGEHOLCIM LTD
614	HELLAS ONLINE SA	654	HUTCHISON WHAMPOA LTD	694	INTRUM JUSTITIA AB	734	KEMIRA OY	774	LAGARDERE (GROUPE)
615	HELLENIC CARRIERS LTD	655	IBERDROLA SA	695	INTU PROPERTIES PLC	735	KERRY GROUP PLC	775	LAING (JOHN) PLC
616	HELLENIC PETROLEUM SA	656	IBERIA LINEAS AEREAS ESPANA	696	INVENSYS PLC	736	KESKO OYJ	776	LANDIS & GYR AG
617	HELLERMANNTYTON GRP PLC	657	IBERPISTAS-IBERICA AUTOPISTA	697	IONICA GROUP PLC	737	KIDDE PLC	777	LANDIS GROUP NV
618	HENKEL AG & CO KGAA	658	IBSTOCK PLC	698	IPSEN SA	738	KIEKERT AG	778	LANXESS AG
619	HENLYS GROUP PLC	659	ICADE	699	IPSOS SA	739	KIER GROUP PLC	779	LAPORTE PLC
620	HERCULES PROPERTY SERVICES	660	ICI-IMPERIAL CHEM INDS PLC	700	IRISH CONTINENTAL GROUP PLC	740	KINEPOLIS GROUP NV	780	LAURA ASHLEY HOLDINGS PLC
621	HERKULES SA	661	IFA HOTELS & TOURISTIK AG	701	ISA INTERNATIONAL PLC	741	KINGFISHER PLC	781	LAVENDON GROUP PLC
622	HEXAGON AB	662	IFCO SYSTEMS NV	702	ISOFT GROUP PLC	742	KINGSPAN GROUP PLC	782	LEGRAND
623	HEYWOOD WILLIAMS GROUP PLC	663	ILIAD	703	ISS WORLD SERVICES A/S	743	KION GROUP GMBH	783	LEGRAND SA
624	HIBU PLC	664	IMAGINARIUM SA	704	ISTITUTO MOBILIARE ITALIANO	744	KLEPIERRE SA	784	LEICA GEOSYSTEMS HOLDING AG
625	HICKSON INTERNATIONAL PLC	665	IMCD NV	705	ITALCEMENTI SPA	745	KLM-ROYAL DUTCH AIRLINES	785	LEIF HOEGH & CO ASA
626	HIESTAND HOLDING AG	666	IMERYS SA	706	ITALIAONLINE SPA	746	KLOCKNER & CO SE	786	LEONARDO SPA
627	HIGH CO SA	667	IMI PLC	707	ITINERE INFRAESTRUCTURAS SA	747	KLOECKNER-WERKE AG	787	LESIEUR CRISTAL
628	HIGHBURY HOUSE COMMUNICATION	668	IMPERIAL BRANDS PLC	708	ITOCHU CORP	748	KLONATEX GROUP SA	788	LG ELECTRONICS INC
629	HILL & SMITH HOLDINGS PLC	669	IMPLENIA AG	709	ITV PLC	749	KM EUROPA METAL AG	789	LINDAB INTL AB
630	HILLSDOWN HOLDINGS PLC	670	IMPRINT	710	IWP INTERNATIONAL PLC	750	KOC HOLDING AS	790	LINDE AG
631	HIT ENTERTAINMENT PLC	671	IMS-INTL METAL SERVICE SA	711	JAPAN AIRLINES CO LTD	751	KONE OYJ	791	LINEDATA SERVICES
632	HKSCAN OYJ	672	INCISIVE MEDIA PLC	712	JAPAN TOBACCO INC	752	KONGSBERG GRUPPEN ASA	792	LISI
633	HOCHTIEF AG	673	INDEPENDENT ENERGY HOLDINGS	713	JARVIS PLC	753	KONINKLIJKE AHOLD DELHAIZE	793	LIVE COMPANY GROUP PLC
634	HOECHST AG	674	INDESIT CO SPA	714	JASPER INVESTMENTS LTD	754	KONINKLIJKE BAM GROEP NV	794	LOEWE AG
635	HOGANAS AB	675	INDO INTERNACIONAL SA	715	JAZZTEL PLC	755	KONINKLIJKE DSM NV	795	LOGICA PLC
636	HOGG ROBINSON GROUP PLC	676	INDRA SISTEMAS SA	716	JC DECAUX SA	756	KONINKLIJKE KPN NV	796	LONDON CLUBS INTL
637	HOLIDAYBREAK PLC	677	INDUSTRIVARDEN AB	717	JD SPORTS FASHION PLC	757	KONINKLIJKE NEDSCHROEF HLDG	797	LONDON ELECTRICITY PLC
638	HOLLAND CHEMICAL INTL NV	678	INFINEON TECHNOLOGIES AG	718	JEFFERSON SMURFIT GROUP PLC	758	KONINKLIJKE PHILIPS NV	798	LONDON INTERNATIONAL GROUP
639	HOLMEN AB	679	INFORMA PLC	719	JELMOLI HOLDING AG	759	KORIAN SA	799	LONMIN PLC
640	HOLMES PLACE PLC	680	INGENICO GROUP	720	JOHN LEWIS PARTNERSHIP PLC	760	KPNQWEST NV	800	LONRHO PLC

BORROWER NAME												
801	LONZA GROUP AG	841	MEDIDEP SA	881	MOUCHEL GROUP PLC	921	NOKIA CORP	961	ORANGE SA
802	LOOKERS PLC	842	MEGGITT PLC	882	MR BRICOLAGE SA	922	NOKIAN TYRES OYJ	962	ORANJEWOUD NV
803	LOULIS MILLS SA	843	MELIA HOTELS INTL SA	883	MTG-MODERN TIMES GROUP AB	923	NOMURA HOLDINGS INC	963	ORCHESTRA-PREMAMAN
804	LOW & BONAR PLC	844	MELROSE INDUSTRIES PLC	884	MTU AERO ENGINES AG	924	NORCROS PLC	964	ORELL FUESSLI HOLDING AG
805	LUMINAR GROUP HOLDINGS PLC	845	MENTMORE PLC	885	MUEHL PRODUCT & SERVICE AG	925	NORD-EST	965	ORIFLAME HOLDING AG
806	LUNDIN OIL AB	846	MEPC PLC	886	MUNKSJO AB	926	NORD/LB	966	ORIOLA OYJ
807	LUNDIN PETROLEUM AB	847	MERCK KGAA	887	MUNTERS AB	927	NORDEX SE	967	ORKLA ASA
808	LUXOTTICA GROUP SPA	848	MERLIN ENTERTAINMENTS PLC	888	MYCRONIC AB	928	NORDIC ALUMINIUM OY	968	ORSTED A/S
809	LVMH MOET HENNESSY LOUIS V	849	MERSEN	889	MYTRAVEL GROUP PLC	929	NORIT NV	969	OTE - HELLENIC TELECOM ORG
810	M.J. MAILLIS SA	850	METALRAX GROUP PLC	890	N BROWN GROUP PLC	930	NORMA GROUP SE	970	OTOR SA
811	MACFARLANE GROUP PLC	851	METROVACESA SA	891	NATIONAL EXPRESS GROUP PLC	931	NORSK HYDRO ASA	971	OUE LTD
812	MACINTOSH NV	852	METSA BOARD CORP	892	NATIONAL GRID	932	NORSKE SKOGINDUSTRIER A/S	972	OUTOKUMPU OY
813	MAISONS DU MONDE SAS	853	METSA TISSUE OYJ	893	NATUREX SA	933	NORTHERN FOODS PLC	973	P&O-PENIN & ORIENT STEAM NAV
814	MAN GROUP PLC	854	METSO OYJ	894	NAVAN RESOURCES	934	NORTHERN LEISURE PLC	974	PACE PLC
815	MAN ROLAND DRUCKMASCHINEN AG	855	MEYER INTERNATIONAL PLC	895	NAVIGAZIONE MONTANARI SPA	935	NORTHERN ROCK PLC	975	PADDY POWER BETFAIR PLC
816	MANSFIELD BREWERY PLC	856	MICE GROUP PLC	896	NEC CORP	936	NORTHGATE INFO SOLUTIONS PLC	976	PALADIN RESOURCES PLC
817	MAREL HF	857	MICRO FOCUS INTL PLC	897	NEDERLANDSE SPOORWEGEN	937	NORTHGATE PLC	977	PANASONIC CORP
818	MARIE BRIZARD & ROGER INTL	858	MICRONAS SEMICONDUCTOR AG	898	NEMETSCHEK SE	938	NORTHUMBRIAN WATER GROUP	978	PARKDEAN HOLIDAYS LTD
819	MARIE BRIZARD WINE & SPIRITS	859	MIKRON HOLDING AG	899	NEOCHIMIKI IND AND COMMERCIA	939	NORWEGIAN ENERGY CO AS	979	PARMALAT SPA
820	MARIELLA BURANI FASHION GRP	860	MILLICOM INTL CELLULAR SA	900	NEOPOST SA	940	NOS SGPS SA	980	PARQUES REUNIDOS SA
821	MARKS & SPENCER GROUP PLC	861	MINERVA PLC	901	NESTE OYJ	941	NOVAR PLC	981	PARTOUCHE
822	MARR	862	MINOAN LINES SA	902	NESTLE SA/AG	942	NOVARTIS AG	982	PAYZONE PLC
823	MARSTON THOMPSON & EVERSHED	863	MINORCO SA	903	NESTOR HEALTHCARE GROUP PLC	943	NOVO NORDISK A/S	983	PCAS
824	MARSTONS PLC	864	MIRROR GROUP PLC	904	NEUF CEGETEL	944	NOVOZYMES A/S	984	PEACOCK GROUP
825	MARTINSA FADESA SA	865	MISYS PLC	905	NEW LOOK GROUP PLC	945	NUTRECO NV	985	PEARSON PLC
826	MASMOVIL IBERCOM SA	866	MITCHELLS & BUTLER PLC	906	NEW SKIES SATELLITES HLDGS	946	NYCOMED ASA	986	PECHINEY SA
827	MATRIX LABORATORIES LTD	867	MITIE GROUP PLC	907	NEW WORLD RESOURCES PLC	947	NYNEX CABLECOMMS GROUP PLC	987	PEEL HOLDINGS PLC
828	MAX PETROLEUM PLC	868	MITSUI & CO LTD	908	NEWCASTLE UNITED PLC	948	O2 PLC	988	PELIKAN AG
829	MAYFLOWER CORP PLC	869	MODELO CONTINENTE SGPS SA	909	NEWSQUEST PLC	949	OASIS STORES PLC	989	PENDRAGON PLC
830	MCALPINE (ALFRED) PLC	870	MOELVEN INDUSTRIER ASA	910	NEX GROUP PLC	950	OBERTHUR TECHNOLOGIES	990	PERKINS FOODS PLC
831	MCBRIDE PLC	871	MONEYSUPERMARKET.COM GRP	911	NEXANS	951	OBRASCON HUARTE LAIN SA	991	PERMANENT TSB GROUP HLDGS
832	MCCARTHY & STONE PLC	872	MONOPRIX SA	912	NEXT PLC	952	OC OERLIKON CORP AG	992	PERNOD RICARD SA
833	MCGREGOR FASHION GROUP NV	873	MONSOON PLC	913	NH HOTEL GROUP SA	953	OCE NV	993	PERSIMMON PLC
834	MCKECHNIE PLC	874	MONTEDISON SPA	914	NIELSEN HOLDINGS PLC	954	OCEAN RIG ASA	994	PESCANOVA SA
835	MCKESSON EUROPE AG	875	MONUMENT OIL & GAS PLC	915	NIPPON SHEET GLASS CO LTD	955	ODFJELL SE	995	PETER BLACK HOLDINGS PLC
836	MECALUX SA	876	MORGAN ADVANCED MATERIALS	916	NISSHA CO LTD	956	OIL & NATURAL GAS CORP LTD	996	PETROLATINA ENERGY PLC
837	MECOM GROUP PLC	877	MORLAND PLC	917	NISSHIN OILLIO GROUP LTD	957	OMEGA PHARMA NV	997	PETROPLUS INTL NV
838	MEDA AB	878	MORRISON (WM) SUPERMARKETS	918	NOBEL BIOCARE HOLDING AG	958	OMV AG	998	PETS AT HOME GROUP PLC
839	MEDEVA PLC	879	MOTA-ENGIL SGPS SA	919	NOBIA AB	959	ORANGE	999	PEUGEOT SA
840	MEDIACONTECH SPA	880	MOTOR OIL CORINTH REFINERIES	920	NOBINA AB	960	ORANGE BELGIUM S.A.	1000	PFAFF (GM) AG

BORROWER NAME												
1001	PFLEIDERER AG	1041	PUNCH TAVERNS	1081	RETELIT SPA	1121	SAINT-GOBAIN (CIE DE)	1161	SELECTA AG
1002	PGS-PETROLEUM GEO-SERVICES	1042	QIAGEN NV	1082	REVOLUTION BARS GROUP	1122	SAIPEM SPA	1162	SELFRIDGES PLC
1003	PHAROL SGPS SA	1043	QINETIQ GROUP	1083	REXAM PLC	1123	SAIRGROUP	1163	SELOGER.COM
1004	PHOENIX IT GROUP	1044	QSC AG	1084	REXEL SA	1124	SALAMANDER ENERGY PLC	1164	SELONDA AQUACULTURE SA
1005	PHOENIX SOLAR AG	1045	QUABIT INMOBILIARIA SA	1085	REYAL URBIS SA	1125	SALZGITTER AG	1165	SEMA PLC
1006	PHS GROUP PLC	1046	QUINTAIN ESTATES & DEVELOP	1086	RHEIN BIOTECH NV	1126	SAMAS NV	1166	SENSATA TECHNOLOGES HLDG PLC
1007	PIAGGIO & C SPA	1047	RACAL ELECTRONICS PLC	1087	RHEINMETALL AG	1127	SAMSUNG ELECTRONICS CO LTD	1167	SENVION SA
1008	PIERRE & VACANCES	1048	RAG AG	1088	RHODIA	1128	SANDVIK AB	1168	SEQUANA
1009	PILKINGTON PLC	1049	RAIN INDUSTRIES LTD	1089	RHOEN-KLINIKUM AG	1129	SANOFI	1169	SERCO GROUP PLC
1010	PINEWOOD GROUP PLC	1050	RAISIO PLC	1090	RICHMOND FOODS PLC	1130	SANTANDER UK PLC	1170	SERICA ENERGY PLC
1011	PINKROCCADE NV	1051	RALLYE	1091	RIO TINTO GROUP (GBR)	1131	SAP SE	1171	SERVICE POINT SOLUTIONS SA
1012	PIRELLI & CO	1052	RAMSAY GENERALE DE SANTE SA	1092	RIVERDEEP GROUP PLC	1132	SAPPI LTD	1172	SEVAN MARINE ASA
1013	PIZZAEXPRESS PLC	1053	RANDSTAD NV	1093	RMC GROUP PLC	1133	SARAS RAFFINERIE SARDE SPA	1173	SEVERFIELD PLC
1014	POLYGRAM NV	1054	RANK GROUP PLC	1094	ROBERT WISEMAN DAIRIES PLC	1134	SARDUS AB	1174	SEVERN TRENT PLC
1015	POLYNORM NV	1055	RAUFOSS ASA	1095	ROCHE HOLDING AG	1135	SARTORIUS AG	1175	SGL CARBON SE
1016	POLYNT SPA	1056	RAUMA OY	1096	ROLLS-ROYCE HLDGS PLC	1136	SASA INDUSTRIE SA	1176	SHANGHAI JAHWA UNITED CO LTD
1017	POLYTEC HOLDING AG	1057	RAUTARUUKKI OYJ	1097	ROTH & RAU AG	1137	SAUDI BASIC INDUSTRIES CORP	1177	SHEPHERD NEAME LTD
1018	POSTNL NV	1058	RDF MEDIA GROUP PLC	1098	ROTTNEROS AB	1138	SAURER AG	1178	SHIRE PLC
1019	POUNDLAND GROUP PLC	1059	REACH PLC	1099	ROXAR ASA	1139	SAVENCIA SA	1179	SIDENOR HOLDINGS SA
1020	POWELL DUFFRYN PLC	1060	REALIA BUSINESS SA	1100	ROYAL DOULTON PLC	1140	SBM OFFSHORE NV	1180	SIEMENS AG
1021	POWERGEN PLC	1061	RECOLETOS GRUPO COMUNICACION	1101	ROYAL DUTCH SHELL PLC	1141	SCA-SVENSKA CELLULOSA AB	1181	SIGNET JEWELERS LTD
1022	PRADA SPA	1062	RED ELECTRICA CORP SA	1102	ROYAL IMTECH NV	1142	SCANDIC HOTELS AB	1182	SILTRONIC AG
1023	PRAKTIKER BAU- & HEIMWERKER	1063	REDROW PLC	1103	RPC GROUP PLC	1143	SCANIA AB	1183	SIMCO
1024	PRELIOS SPA	1064	REFRESCO GROUP NV	1104	RTL GROUP	1144	SCAPA GROUP PLC	1184	SIMINN HF
1025	PREMIER FARNELL PLC	1065	REGENCY ENTERTAINMENT S.A	1105	RUBIS & CIE	1145	SCHALTBAU HOLDING AG	1185	SINGULUS TECHNOLOGIES AG
1026	PREMIER FOODS PLC	1066	REGENT INNS PLC	1106	RWE AG	1146	SCHIBSTED ASA	1186	SITRONICS JSC
1027	PREMIER OIL PLC	1067	REITAN NARVESEN ASA	1107	SA D'IETEREN NV	1147	SCHMOLZ & BICKENBACH AG	1187	SKANSKA AB
1028	PREMIER RESEARCH GROUP PLC	1068	RELIGARE ENTERPRISE LTD	1108	SAAB AB	1148	SCHNEIDER ELECTRIC SA	1188	SKF AB
1029	PRIMACOM AG	1069	RELX PLC	1109	SAATCHI & SAATCHI PLC	1149	SCHRODERS PLC	1189	SKY DEUTSCHLAND AG
1030	PRODWARE	1070	REMY COINTREAU	1110	SABMILLER PLC	1150	SCHUITEMA NV	1190	SKY PLC
1031	PROMOTORA DE INFORMACIONES	1071	REN-REDES ENERGETICAS NACIO	1111	SACYR SA	1151	SCHULER AG	1191	SMARTRAC N.V.
1032	PROSAFE SE	1072	RENAULT SA	1112	SAECO INTERNATIONAL GROUP	1152	SCHWARZ PHARMA AG	1192	SMITH & NEPHEW PLC
1033	PROSEGUR (CIA DE SEGURIDAD)	1073	RENEWABLE ENERGY CORP AS	1113	SAF HOLLAND SA	1153	SCORPIO BULKERS	1193	SMITHS GROUP PLC
1034	PROSIEBENSAT.1 MEDIA SE	1074	RENEWABLE ENERGY HLDGS	1114	SAFILO SPA	1154	SCOTTISH & NEWCASTLE PLC	1194	SMOBY SA
1035	PROVIDENCE RESOURCES PLC	1075	RENEWI PLC	1115	SAFRAN SA	1155	SCOTTISH POWER PLC	1195	SMURFIT KAPPA GROUP PLC
1036	PROVIMI	1076	RENOLD PLC	1116	SAFT GROUPE S.A.	1156	SCR-SIBELCO NV	1196	SNIA SPA
1037	PRYSMIAN SPA	1077	RENTOKIL INITIAL PLC	1117	SAGA PETROLEUM A/S	1157	SEARS PLC	1197	SODEXO
1038	PUBLIC POWER CORP SA	1078	REPLY SPA	1118	SAGE GROUP PLC	1158	SEB SA	1198	SOFTWARE AG
1039	PUBLICIS GROUPE SA	1079	REPSOL SA	1119	SAIA-BURGESS ELECTRONICS AG	1159	SECHE ENVIRONNEMENT SA	1199	SOGECABLE SA
1040	PUNCH GRAPHIX PLC	1080	RETAIL DECISIONS PLC	1120	SAINSBURY (J) PLC	1160	SECURITAS AB	1200	SOGEFI SPA

BORROWER NAME							
1201	SOLARWORLD AG	1241	STX EUROPE ASA	1281	TEEKAY PETROJARL ASA	1321	TOUAX SA	1361	USINOR SA
1202	SOLVAY SA	1242	STYLO PLC	1282	TELE COLUMBUS AG	1322	TOUPARGEL GROUPE	1362	UTFORS AB
1203	SONAE.COM SGPS SA	1243	SUBSEA 7 SA	1283	TELE PIZZA SA	1323	TRACTEBEL SA	1363	VALENCIANA DE CEMENTOS SA
1204	SONOVA HOLDING AG	1244	SUEDZUCKER AG	1284	TELE2 AB	1324	TRADER CLASSIFIED MEDIA NV	1364	VALENTINO FASHION GROUP SPA
1205	SONY CORP	1245	SUEZ	1285	TELECITY GROUP	1325	TRADIA CORP	1365	VALEO SA
1206	SOPHOS GROUP PLC	1246	SUEZ SA	1286	TELECOM ITALIA SPA	1326	TRANS-SIBERIAN GOLD LTD	1366	VALIANT PETROLEUM PLC
1207	SOPRA STERIA GROUP SA	1247	SULZER LTD	1287	TELEFONAKTIEBOLAGET LM ERICS	1327	TRANSCOM WORLDWIDE AB	1367	VALLOUREC SA
1208	SORIN SPA	1248	SUNTORY HOLDINGS LTD	1288	TELEFONICA SA	1328	TRANSICIEL SA	1368	VALORA HOLDING AG
1209	SOUTHERN CROSS HEALTHCARE	1249	SUPER DE BOER NV	1289	TELEKOM AUSTRIA AG	1329	TRAVIS PERKINS PLC	1369	VATTENFALL
1210	SOUTHERN ELECTRIC PLC	1250	SUPERDIPLO SA	1290	TELENOR ASA	1330	TRELLEBORG AB	1370	VEDANTA RESOURCES
1211	SOUTHNEWS PLC	1251	SWEDISH MATCH AB	1291	TELENT PLC	1331	TREVISAN COMETAL SPA	1371	VEDIOR NV
1212	SOVEREIGN OILFIELD GP PLC	1252	SWISS INTL AIR LINES LTD	1292	TELEPERFORMANCE	1332	TRIBAL GROUP PLC	1372	VENTURE PRODUCTION PLC
1213	SPEEDY HIRE PLC	1253	SWISSCOM AG	1293	TELIA COMPANY AB	1333	TRIGANO SA	1373	VEOLIA ENVIRONNEMENT
1214	SPERIAN PROTECTION	1254	SWISSLOG HOLDING AG	1294	TEMENOS AG	1334	TT ELECTRONICS PLC	1374	VERBUND AG
1215	SPIE	1255	SYDKRAFT AB	1295	TERNA SPA	1335	TUI AG	1375	VERZATEC SA DE CV
1216	SPIRENT COMMUNICATIONS	1256	SYMRISE AG	1296	TESSENDERLO GROUP NV	1336	TUI TRAVEL PLC	1376	VESTAS WIND SYSTEMS A/S
1217	SPONDA OYJ	1257	SYNGENTA AG	1297	TESTA INMUEBLES EN RENTA SA	1337	TULLOW OIL PLC	1377	VICAT SA
1218	SPORTECH PLC	1258	SYNTHES INC WILMINGTON	1298	THALES	1338	TV LOONLAND AG	1378	VICKERS PLC
1219	SPORTFIVE	1259	T & N PLC	1299	THAMES WATER PLC	1339	TVSL SA	1379	VIFOR PHARMA AG
1220	SPORTINGBET PLC	1260	T & S STORES PLC	1300	THOMAS COOK GROUP PLC	1340	UBI SOFT ENTERTAINMENT SA	1380	VILMORIN & CIE SA
1221	SPORTS DIRECT INTL PLC	1261	TA TRIUMPH-ADLER AG	1301	THOMSON REUTERS PLC	1341	UBM PLC	1381	VINCI SA
1222	SPRING GROUP PLC	1262	TAG HEUER INTERNATIONAL SA	1302	THOMSON TRAVEL GROUP PLC	1342	UCB SA-NV	1382	VIRGIN MOBILE HLDGS (UK) PLC
1223	SSAB CORP	1263	TALARIUS PLC	1303	THULE GROUP AB	1343	ULTRA ELECTRONICS HLDGS PLC	1383	VIRIDIAN GROUP PLC
1224	SSL INTERNATIONAL PLC	1264	TARKETT AG	1304	THUS GROUP PLC	1344	ULTRAFRAME PLC	1384	VISMA ASA
1225	SSP HOLDINGS	1265	TARMAC PLC	1305	THYSSENKRUPP AG	1345	UMICORE SA	1385	VITEC GROUP PLC
1226	STABILUS SA	1266	TARSUS GROUP PLC	1306	TI FLUID SYSTEMS LTD	1346	UNICHEM LABORATORIES LTD	1386	VIVARTE
1227	STACI SA	1267	TATA CHEMICALS LTD	1307	TI GROUP PLC	1347	UNILABS SA	1387	VIVENDI SA
1228	STAGECOACH GROUP PLC	1268	TATA GLOBAL BEVERAGES LTD	1308	TIETO CORP	1348	UNILEVER PLC	1388	VOCENTO
1229	STALLERGENES GREER PLC	1269	TATA MOTORS LTD	1309	TIM HELLAS TELECOMM SA	1349	UNION FENOSA SA	1389	VODAFONE GROUP PLC
1230	STANLEY LEISURE PLC	1270	TATA STEEL LTD	1310	TINOPOLIS PLC	1350	UNIQ PLC	1390	VOLKSWAGEN AG
1231	STATKRAFT SF	1271	TATE & LYLE PLC	1311	TITAN CEMENT CO SA	1351	UNIT 4 NV	1391	VOLUTION HOLDINGS LTD
1232	STE NATIONALE CHEMINS BELGES	1272	TAYLOR & FRANCIS GROUP PLC	1312	TNT EXPRESS NV	1352	UNITE GROUP PLC	1392	VOLVO AB
1233	STEFANEL SPA	1273	TAYLOR NELSON SOFRES PLC	1313	TNU PLC	1353	UNITED INTERNET AG	1393	VON ROLL AG
1234	STENA LINE AB	1274	TAYLOR WIMPEY PLC	1314	TOGNUM AG	1354	UNITED PAN-EUROPE COMMNS NV	1394	VOPAK (KONINKLIJKE) NV
1235	STOLT NIELSEN LTD	1275	TBI PLC	1315	TOM TAILOR HOLDING SE	1355	UNITED UTILITIES GROUP PLC	1395	VP PLC
1236	STORA ENSO OYJ	1276	TDC A/S	1316	TOMTOM NV	1356	UNITOR A/S	1396	VT GROUP PLC
1237	STORK NV	1277	TECHEM AG	1317	TOPPS TILES PLC	1357	UPM-KYMMENE CORP	1397	VTG AG
1238	STREAMLINE HOLDINGS PLC	1278	TECHNICOLOR SA	1318	TOREX PLC	1358	UPONOR OYJ	1398	W.E.T. AUTOMOTIVE SYSTEMS AG
1239	STROEER SE & CO KGAA	1279	TECHNIPFMC PLC	1319	TORM PLC	1359	URBIUM PLC	1399	WACKER CHEMIE AG
1240	STV GROUP PLC	1280	TECHNO FORGE LTD	1320	TOTAL SA	1360	USG PEOPLE NV	1400	WAGON PLC

	BORROWER NAME		
1401	WALLENIUS WILHELMSEN LOGISTI	1441	YALCO-CONSTANTINOU SA
1402	WARDLE STOREYS PLC	1442	YARA INTERNATIONAL ASA
1403	WARTSILA OYJ ABP	1443	YATES GROUP PLC
1404	WASHTEC AG	1444	YTL POWER INTERNATIONAL BHD
1405	WASSALL PLC	1445	ZAPF CREATION AG
1406	WASTE MANAGEMENT INTL PLC	1446	ZODIAC AEROSPACE
1407	WATERFORD FOODS PLC	1447	ZUMTOBEL GROUP AG
1408	WATERFORD WEDGWOOD PLC		
1409	WAVIN NV		
1410	WEIR GROUP PLC		
1411	WELLA AG		
1412	WELLINGTON UNDERWRITING PLC		
1413	WELLSTREAM HOLDINGS PLC		
1414	WEMBLEY PLC		
1415	WERELDHAVE NV		
1416	WESSANEN NV		
1417	WESTBURY PLC		
1418	WETHERSPOON (JD) PLC		
1419	WH SMITH PLC		
1420	WHATMAN PLC		
1421	WHITBREAD PLC		
1422	WIENERBERGER AG		
1423	WILLIAM HILL PLC		
1424	WILMINGTON PLC		
1425	WILSON ASA		
1426	WILSON BOWDEN PLC		
1427	WINCANTON PLC		
1428	WM-DATA AB		
1429	WOLTERS KLUWER NV		
1430	WOOLWORTHS GROUP		
1431	WORKSPACE GROUP PLC		
1432	WPP PLC		
1433	WSP GROUP PLC		
1434	WT FOODS PLC		
1435	WYEVALE GARDEN CENTERS PLC		
1436	XANSA PLC		
1437	XCHANGING PLC		
1438	XPO LOGISTICS EUROPE SA		
1439	XSTRATA AG		
1440	XSTRATA PLC		

APPENDIX B. Lender names of the sample used for interconnectedness construction

	Lender	Country		Lender	Country		Lender	Country
1	Abanca [ex-Caixa Galicia]	Spain	41	Banco Caixa Geral SA [Ex-Banco Simeon SA]	Spain	81	Bank One NA	USA
2	Abbey National Treasury Services Plc	UK	42	Banco CEISS [ex-Caja Espana de Inversiones]	Spain	82	Bank Polska Kasa Opieki SA [Pekao]	Poland
3	ABC International Bank Plc	Germany	43	Banco Comercial Portugues SA [BCP]	Portugal	83	Bankgesellschaft Berlin AG	Germany
4	ABN AMRO Bank NV [RBS]	Netherlands	44	Banco Cooperativo Espanol SA	Spain	84	Bankhaus Loebbecke & Co KG	Germany
5	Abu Dhabi Commercial Bank PJSC [ADCB]	UAE	45	Banco de Credito Local de Espana SA [BCL]	Spain	85	Bankia [ex-Caja de Ahorros de Avila]	Spain
6	Agricultural Bank of China	China	46	Banco de Sabadell SA	Spain	86	Bankia [ex-Caja de Ahorros y Monte de Piedad]	Spain
7	Agricultural Bank of Greece SA [ATE]	Greece	47	Banco de Valencia SA	Spain	87	Bankia [ex-Caja Madrid]	Spain
8	Ahorro Corporacion Financiera SVB SA [ACF]	Spain	48	Banco di Sardegna SpA	Italy	88	Bankinter SA	Spain
9	Akbank Turk AS	Turkey	49	Banco di Sicilia SpA	Italy	89	Banque Cantonale Vaudoise	Switzerland
10	Allgemeine Sparkasse Oberosterreich Bank AG	Austria	50	Banco do Brasil	Brazil	90	Banque Commerciale pour l' Europe du Nord	France
11	Alliance & Leicester Building Society	UK	51	Banco Efisa SA	Portugal	91	Banque de Neuflize SA [Ex-Banque de Neuflize Schlumberger Mallet Demachy]	France
12	Allied Irish Banks Plc [AIB]	Ireland	52	Banco Espanol de Credito SA [Banesto]	Spain	92	Banque et Caisse d'Epargne de L'Etat Luxembourg [BCEE]	Luxembourg
13	Alpha Credit Bank SA	Greece	53	Banco Espirito Santo SA [BES]	Portugal	93	Banque Federative du Credit Mutuel [BFCM]	France
14	ANZ Investment Bank	Australia	54	Banco Grupo Cajatres SA [ex-Caja de Ahorros del Circulo Catolico]	Spain	94	Banque Generale du Luxembourg SA [BGL]	Luxembourg
15	Arab Banking Corp BSC [ABC]	UAE	55	Banco Grupo Cajatres SA [ex-Caja del Circulo Catolico de Obreros de Burgos]	Spain	95	Banque Internationale a Luxembourg SA [BIL]	Luxembourg
16	Arbejdernes Landesbank	Germany	56	Banco Grupo Cajatres SA [ex-Monte de Piedad Caja General de Ahorros de Bada	Spain	96	Banque Marocaine du Commerce Exterieur SA [BMCE]	Morocco
17	Argentaria Group	Spain	57	Banco Guipuzcoano SA	Spain	97	Banque Misr SAE	Egypt
18	Australia & New Zealand Banking Group Ltd [ANZ]	Australia	58	Banco Internacional do Funchal SA [BANIF]	Portugal	98	Banque Saudi Fransi [Al Bank Al Saudi Al Fransi]	France
19	Baden-Wurttemburgische Bank AG [BW-Bank]	Germany	59	Banco Itau SA	Brazil	99	Banque Scalbert DuPont	France
20	Banca Agrileasing SpA	Italy	60	Banco Pastor SA	Spain	100	Barclays Bank Plc	UK
21	Banca Antonveneta SpA [ANTV]	Italy	61	Banco Popular Espanol SA	Spain	101	Barclays Bank SA	UK
22	Banca Carige SpA	Italy	62	Banco Portugues de Investimento SA [BPI]	Portugal	102	BAWAG International Finance Ltd	Austria
23	Banca Cassa di Risparmio di Firenze SpA [Carifirenze]	Italy	63	Banco Urquijo SA	Spain	103	BAWAG PSK [Bank fur Arbeit und Wirtschaft und Osterr'che Postsprkasse AG]	Germany
24	Banca Commerciale Italiana SpA	Italy	64	Banco Zaragozano	Spain	104	Bayerische Landesbank GZ [BayernLB]	Germany
25	Banca di Legano SpA	Italy	65	Bank Austria AG [US]	Austria	105	BBL Finance Ireland	Ireland
26	Banca Italease SpA	Italy	66	Bank fur Tirol und Vorarlberg AG	Germany	106	Bear Stearns & Co	USA
27	Banca Mediocredito SpA	Italy	67	Bank Nederlandse Gemeenten NV [BNG]	Netherlands	107	BEI Holdings Ltd	Germany
28	Banca Monte dei Paschi di Siena SACF	Italy	68	Bank of America	USA	108	BFCE	France
29	Banca Monte dei Paschi di Siena SpA [MPS]	Italy	69	Bank of America International Ltd	USA	109	BG Bank	Denmark
30	Banca Monte Paschi Belgio SA	Italy	70	Bank of Austria	Austria	110	Bilbao Bizkaia Kutxa [BBK]	Spain
31	Banca Nazionale del Lavoro SpA [BNL]	Italy	71	Bank of Bahrain & Kuwait BSC [BBK]	Bahrain	111	BNP Paribas [Ex-Banque Nationale de Paris]	France
32	Banca Popolare dell'Emilia Romagna SCRL [BPER]	Italy	72	Bank of China Ltd	China	112	BNP Paribas [Ex-Banque Paribas]	France
33	Banca Popolare di Milano SCaRL [BPM]	Italy	73	Bank of Ireland Group	Ireland	113	BRE Bank SA [Bank Rozwoju Eksportu SA]	Poland
34	Banca Popolare di Novara SCaRL	Italy	74	Bank of Montreal	Canada	114	BRED Banque Populaire SA	France
35	Banca Sanpaolo di Brescia SpA	Italy	75	Bank of New York	US	115	Bremer Landesbank Kreditanstalt Oldenburg GZ	Germany
36	Bancaja Group	Spain	76	Bank of New York Co Inc [BNY]	US	116	British Arab Commercial Bank Ltd	UK
37	Banco Atlantico SA	Portugal	77	Bank of Nova Scotia	Canada	117	BW Bank Ireland Plc [Dublin]	Ireland
38	Banco Bilbao Vizcaya Argentaria SA [ex-Banca Catalana SA]	Spain	78	Bank of Scotland Plc	Scotland	118	BZW [Barclays de Zoete Wedd]	UK
39	Banco Bilbao Vizcaya Argentaria SA [ex-Banco Bilbao Vizcaya SA]	Spain	79	Bank of Taiwan	Taiwan	119	Caboto Holding SIM SpA	Italy
40	Banco Bradesco SA	Brazil	80	Bank of Tokyo-Mitsubishi Trust Co	Japan	120	Caisse Regionale de Credit Agricole Mutuel de Paris et d'Ile de France	France

	Lender	Country		Lender	Country		Lender	Country
121	Caixa d'Estalvis de Gerona SA	Spain	161	CECA	Spain	201	Danske Bank A/S	Denmark
122	Caixa d'Estalvis de Sabadell	Spain	162	Central European International Bank Ltd [CIB]	Hungary	202	Davidson Kempner Institutional Partners LP	USA
123	Caixa d'Estalvis del Penedes	Spain	163	Centrobanca SpA	Italy	203	DBS Bank Ltd	UK
124	Caixa d'Estalvis i Pensions de Barcelona SA	Spain	164	Ceska Sporitelna as	CR	204	De Nationale Investerings Bank	Netherlands
125	Caixa de Terrassa	Spain	165	Ceskoslovenska Obchodni Banka AS [CSOB]	CR	205	Deka International SA [ex-Deutsche Girozentrale International SA]	Germany
126	Caixa Geral de Depositos SA [CGD]	Portugal	166	Charterhouse Bank Ltd	UK	206	DEPFA Bank Europe Plc	Ireland
127	Caja Castilla la Mancha [CCM]	Spain	167	Chase Manhattan Bank	USA	207	Deutsche Bank AG	Germany
128	Caja de Ahorros de Castilla-La Mancha	Spain	168	Chase Manhattan Corp	USA	208	Deutsche Bank AG Luxembourg	Germany
129	Caja de Ahorros de Galicia	Spain	169	China Construction Bank [CCB]	China	209	Development Bank of Singapore Ltd [DBS]	Singapore
130	Caja de Ahorros de la Inmaculada de Aragon SL	Spain	170	Christiania Bank Og Kreditkasse	Norway	210	DLJ Capital Funding	USA
131	Caja de Ahorros de Murcia	Spain	171	CIBC [Canadian Imperial Bank of Commerce]	Canada	211	DNB ASA [ex-Den Norske Bank]	Norway
132	Caja de Ahorros de Navarra	Spain	172	CIBC CEF	Canada	212	Donaldson Lufkin & Jenrette Inc	USA
133	Caja de Ahorros de Valencia Castellon y Alicante	Spain	173	CIC Lyonnais de Banque	France	213	Dresdner Bank AG	Germany
134	Caja de Ahorros de Vitoria y Alava	Spain	174	CIT Group Inc	USA	214	Dresdner Bank Luxembourg	Luxembourg
135	Caja de Ahorros del Mediterraneo SA [CAM]	Spain	175	CIT Group/Business Credit Inc	USA	215	DZ Bank AG [Ex-DG Bank AG]	Germany
136	Caja de Ahorros Municipal de Burgos	Spain	176	Citibank	USA	216	Efibanca SpA	Italy
137	Caja de Ahorros San Fernando de Sevilla y Jerez	Spain	177	Citibank International Plc	USA	217	Electro Banque	France
138	Caja de Ahorros y Monte de Piedad de Baleares	Spain	178	Citicorp North America Inc	USA	218	Emporiki Bank of Greece SA [Ex-Commercial Bank of Greece]	Greece
139	Caja de Ahorros y Monte de Piedad de Extramadura	Spain	179	COFIRI SpA	Italy	219	Enskilda SA	Sweden
140	Caja de Ahorros y Pensiones	Spain	180	Comerica Bank	USA	220	Erste Bank AG	Austria
141	Caja de Asturias	Spain	181	Commerzbank AG	Germany	221	Erste Bank der oesterreichischen Sparkassen AG	Austria
142	Caja de Avila SA	Spain	182	Commerzbank Corporates & Markets [ex-Dresdner Kleinwort Wasserstein]	Germany	222	European Bank for Reconstruction & Development (EBRD)	UK
143	Caja de Badajoz	Spain	183	Commerzbank International SA	Germany	223	European Capital Ltd	UK
144	Caja de Burgos	Spain	184	Common Bank of Greece	Greece	224	European Investment Bank [EIB]	Luxembourg
145	Caja de Castilla-La Mancha	Spain	185	Commonwealth Bank of Australia	Australia	225	Export Development Canada [EDC]	Canada
146	Caja de Galicia	Spain	186	Confederacion Espanola de Cajas de Ahorros [CECA]	Spain	226	Export Development Corp	Canada
147	Caja de Granada	Spain	187	Credit Agricole Indosuez	France	227	F van Lanschot Bankiers	Netherlands
148	Caja de la Rioja SA	Spain	188	Credit Agricole SA	France	228	Fifth Third Bank	USA
149	Caja de San Fernando	Spain	189	Credit Commercial de France [CCF]	France	229	Finansierungsinstituttet for Industri Og Handvaerk	Germany
150	Caja de Segovia SA	Spain	190	Credit Cooperatif	France	230	First Abu Dhabi Bank [ex-National Bank of Abu Dhabi PJSC [NBAD]]	UAE
151	Caja General de Granada	Spain	191	Credit du Nord	France	231	First Commercial Bank	USA
152	Caja Madrid [Caja de Ahorros y Monte de Piedad de Madrid SA]	Spain	192	Credit Foncier de France	France	232	First National Bank	Africa
153	Caja Rural de Burgos	Spain	193	Credit Industriel de l'Ouest [CIO]	France	233	First Union National Bank	USA
154	Caja Rural de Navarra	Spain	194	Credit Industriel et Commercial de Paris	France	234	Fleet Bank	USA
155	Caja Rural de Soria	Spain	195	Credit Lyonnais Bank Nederland NV	Netherlands	235	Fokus Bank ASA	Norway
156	Caja Vital Kuxta	Spain	196	Credit Suisse AG	Switzerland	236	Fortis Bank Nederland (Holding) NV [ex-Fortis Finance NV]	Netherlands
157	CajaSur [Caja de Ahorros y Monte de Piedad de Cordoba SA]	Spain	197	Credit Suisse First Boston	Switzerland	237	Frankfurter Sparkasse	Germany
158	Carlyle Group	USA	198	Creditanstalt	Austria	238	Friesland Bank Securities NV	Netherlands
159	Cassa di Risparmio di Bologna SpA [Carisbo]	Italy	199	Credito Bergamasco SpA	Italy	239	Fuji Bank Ltd	Japan
160	Catolico de Obreros de Burgos	Italy	200	Dai-Ichi Kangyo Bank Ltd	Japan	240	General Electric Capital Corp	USA

	Lender	Country		Lender	Country		Lender	Country
241	General Electric Co	USA	281	Investkredit Bank AG	Austria	321	Lloyds Bank Plc	UK
242	General Electric Finance Capital LTD	USA	282	Irish Bank Resolution Corp Ltd [ex-Anglo Irish Bank Corp Plc]	Ireland	322	Lyonnaise de Banque	France
243	Generale Bank SA	Belgium	283	Irish Intercontinental Bank	Ireland	323	Macquarie Bank Ltd	Australia
244	Genossenschaftliche Zentralbank AG	Germany	284	Islandsbanki HF [Ex-Islandsbanki-FBA]	Iceland	324	Malayan Banking Bhd	Malaysia
245	Goldman Sachs & Co	USA	285	Israel Discount Bank of New York Inc [IDBNY]	USA	325	Mapfre SA	Spain
246	Goldman Sachs Credit Partners LP	USA	286	JP Morgan & Co	USA	326	MCC Financial Corp	USA
247	Governor & Co of the Bank of Ireland	Ireland	287	JP Morgan Securities Inc	USA	327	MCC SpA [Ex-Mediocredito Centrale]	Italy
248	Groupe Caisse d'Epargne	France	288	Jyske Bank	Denmark	328	MCC SpA [Ex-Mediocredito di Roma]	Italy
249	GS Mezzanine Partners LP	USA	289	Kantonalbank of Zurich	Switzerland	329	Mediobanca SpA	Italy
250	Gulf Bank of Kuwait KSC	Kuwait	290	Kaupthing Bunadarbanki HF [Ex-Bunadarbanki Islands HF]	Iceland	330	Mediocredito Dell'Umbria SpA	Italy
251	Gulf International Bank BSC [GIB]	SA	291	Keybank NA	USA	331	Mediocredito Italiano SpA	Italy
252	Hamburger Sparkasse AG	Germany	292	KfW International Finance Inc	Germany	332	Mediocredito Trentino-Alto Adige SpA	Italy
253	Handelsbank National Westminster	UK	293	KfW IPEX-Bank GmbH [Ex-KfW]	Germany	333	Mees Pierson	Netherlands
254	Handelsbanken Markets	Sweden	294	KfW IPEX-Bank GmbH [Ex-Kreditanstalt fur Wiederaufbau AG]	Germany	334	Merita Bank Ltd	Finland
255	Hellenic Bank Ltd	Greece	295	Komercni Banka as	CR	335	Merrill Lynch & Co Inc	USA
256	Heller Financial Inc	USA	296	Kreissparkasse Koln	Germany	336	Merrill Lynch Capital Corp	USA
257	Highland Capital Corp	USA	297	La Caixa [La Caja de Ahorros I Pensions de Barcelona]	Spain	337	Merrill Lynch Capital Markets	USA
258	Hollandsche Bank-Unie BV	Netherlands	298	La Compagnie Financiere Edmond de Rothschild Banque SA	France	338	Merrill Lynch International Bank Ltd	USA
259	HSBC Banking Group	UK	299	Land Bank of Taiwan	Taiwan	339	MetLife Capital Credit Corp	USA
260	HSH Nordbank AG [Ex-Hamburgische Landesbank GZ]	Germany	300	Landesbank Berlin AG [LBB]	Germany	340	Midland Bank Plc	UK
261	Hungarian Foreign Trade Bank Ltd [Magyar Kulkereskedelmi Bank Rt] [MKB]	Hungary	301	Landesbank Hessen-Thuringen GZ [ex-Hessische Landesbank GZ]	Germany	341	Mitsubishi Bank Ltd	Japan
262	Ibercaja	Spain	302	Landesbank Hessen-Thuringen GZ [ex-Hessische Landesbank]	Germany	342	MML Pension Insurance Co	Netherlands
263	Ibercaja [Caja de Ahorros de Zaragoza Aragon y Rioja]	Spain	303	Landesbank Hessen-Thuringen GZ [Helaba]	Germany	343	Monte de Piedad Caja de Ahorros de Ronda Cadiz	Spain
264	ICO [Instituto de Credito Oficial]	USA	304	Landesbank Kiel	Germany	344	Montepio Geral SA	Portugal
265	ICO Inc	USA	305	Landesbank Rheinland-Pfalz GZ	Germany	345	Morgan Guaranty Trust	USA
266	IFE	Puerto Rico	306	Landesbank Saar GZ	Germany	346	Morgan Stanley & Co International	USA
267	IKB Deutsche Industrie Bank AG	Germany	307	Landesbank Sachsen GZ	Germany	347	Morgan Stanley Dean Witter & Co	USA
268	IMI Capital Markets	Italy	308	Landesbank Schleswig-Holstein GZ	Germany	348	Morgan Stanley Senior Funding Inc	USA
269	Industrial & Commercial Bank of China	China	309	Landsbanki Islands hf [National Bank of Iceland Ltd]	Iceland	349	MPS Group Inc	USA
270	Industrial & Commercial Bank of China Ltd [ICBC]	China	310	Landwirtschaftliche Rentenbank	Germany	350	National Australia Bank Ltd [NAB]	Australia
271	Industrial Bank of Japan Ltd	Japan	311	LaSalle National Bank	Netherlands	351	National Bank of Egypt SAE [NBE]	Egypt
272	ING Bank	Netherlands	312	LB Saar	Germany	352	National Bank of Greece SA	Greece
273	ING Barings	Netherlands	313	Le Credit Lyonnais SA [LCL]	France	353	National Investment Bank of the Netherlands	Netherlands
274	ING BHF-Bank AG [ex-BHF-Bank AG]	Netherlands	314	Lehman Brothers Inc	USA	354	National Westminster Bank Plc	UK
275	Institut Catala del Sol [Catalan Land Institute] [Incasol]	Spain	315	Lehman Commercial Paper Inc	USA	355	Nationwide Building Society	UK
276	Instituto Catalan de Finanzas [ICF]	Spain	316	Liberbank SA [ex-Caja de Ahorros de Asturias]	Spain	356	Natixis SA [Ex-Natexis Banques Populaires]	France
277	Instituto de Credito Oficial (US)	Spain	317	Liberbank SA [ex-Caja de Ahorros y Monte de Piedad de Extremadura]	Spain	357	NatWest Capital Markets	UK
278	Interbanca SpA	Italy	318	Liberbank SA [ex-Caja de Cantabria]	Spain	358	NBI Inc	Canada
279	Intermediate Capital Group [ICG]	UK	319	Liberbank SA [ex-Cajastur]	Spain	359	New York Life Insurance & Annuity Corp	USA
280	Investec Group Ltd	UK	320	Lloyds Bank Capital Markets	UK	360	Nomura Bank International Plc	UK

	Lender	Country		Lender	Country		Lender	Country
361	Nomura International Plc	UK	401	Saudi Hollandi Bank	SA	441	Wells Fargo & Co	USA
362	Norddeutsche Landesbank GZ [NordLB]	Germany	402	Singer & Friedlander Ltd [SF]	UK	442	Wells Fargo Bank	USA
363	Nordic Investment Bank	Finland	403	Skandinaviska Enskilda Banken AB [France]	France	443	Westdeutsche Genossenschafts-Zentralbank [Dusseldorf]	Germany
364	NordLB Group	Finland	404	Skandinaviska Enskilda Banken AB [Sweden]	Sweden	444	Westdeutsche Genossenschafts-Zentralbank eG [WGZ-Bank]	Germany
365	Norinchukin Bank	Japan	405	Societe Bordelaise de CIC	France	445	Westdeutsche Landesbank GZ	Germany
366	Nova Ljubljanska Banka dd [NLB]	Slovenia	406	Societe Generale SA	France	446	Westpac Banking Corp	USA
367	Nykredit Bank AS	Denmark	407	Societe Nanceienne Varin Bernier [SNVB]	France	447	Westpac Banking Corp	Australia
368	Oesterreichische Volksbanken AG [OeVAG]	Austria	408	Societe Nationale de Credit et d'investissement	Luxembourg	448	Wilmington Trust Co	USA
369	OP Financial Group [ex-Pohjola Bank Plc [Ex-OKO Bank Plc]]	Finland	409	Sparebanken	Norway	449	Yapi ve Kredi Bankasi AS [YKB]	Turkey
370	Oversea-Chinese Banking Corp Ltd [OCBC]	Singapore	410	Sparebanken Rogaland	Norway	450	Zurich Insurance Group AG	Switzerland
371	Piraeus Bank SA	Greece	411	Standard Bank Plc [Ex-Standard Bank London Ltd]	UK			
372	PNC Bank	USA	412	Standard Chartered Bank Plc [SCB]	UK			
373	Popular Investments	USA	413	State Bank of India	India			
374	Portigon AG [ex-WestLB AG]	Germany	414	Sumitomo Bank	Japan			
375	Postbanken	Norway	415	Sumitomo Trust & Banking Co Ltd	Japan			
376	Qatar National Bank SAQ [QNB]	Qatar	416	SunTrust Bank	USA			
377	Rabobank	Netherlands	417	Svensk Exportkredit AB (publ) [SEK] [Swedish Export Credit Corp]	Sweden			
378	Raiffeisen Bank Rt [Hungary]	Hungary	418	Svenska Handelsbanken AB (publ)	Sweden			
379	Riyad Bank [RB]	SA	419	Svenska Handelsbanken AB (publ) [SHBA]	Sweden			
380	Rothschild Inc	UK	420	Svenska International Plc	Sweden			
381	Royal Bank of Canada	Canada	421	Swedbank AB [Ex-ForeningsSparbanken-Swedbank Markets]	Sweden			
382	Royal Bank of Canada Europe Ltd	Canada	422	Swiss Reinsurance Co [Swiss Re]	Switzerland			
383	Royal Bank of Scotland Plc [RBS]	Scotland	423	Sydbank	Denmark			
384	Saar Bank	Netherlands	424	Tokai Bank Ltd	Japan			
385	Sabadell Multibanca	Spain	425	Toronto Dominion Bank	Canada			
386	SACE SpA [Servizi Assicurativi del Commercio Estero]	Italy	426	Turkiye Halk Bankasi AS	Turkey			
387	Sachsen LB	Germany	427	UBAE Arab Italian Bank	Italy			
388	Sal Oppenheim jr & Cie KGaA	Germany	428	Ulster Investment Bank Ltd	Ireland			
389	Salomon Brothers	USA	429	Unibank A/S	Denmark			
390	Salomon Brothers International	USA	430	Unicaja	Spain			
391	Salomon Smith Barney	USA	431	UniCredit Romania SA	Romania			
392	Sanpaolo Banca dell'Adriatico SpA [Ex-Banca Popolare dell' Adriatico]	Italy	432	Union Bank NA	USA			
393	Sanpaolo Banco di Napoli SpA [Ex-Banco di Napoli]	Italy	433	Union Bank of Norway	Norway			
394	Sanpaolo IMI SpA	Italy	434	United Overseas Bank	China			
395	Santander Central Hispano SA [ex-Banco Central Hispanoamericano SA [BCH]]	Spain	435	US Bank International	USA			
396	Santander Central Hispano SA [ex-Banco Central SA]	Spain	436	US Bank NA	USA			
397	Santander Central Hispano SA [ex-Banco Santander SA]	Spain	437	Vereins-und Westbank AG	Germany			
398	Sanwa Bank Ltd	Japan	438	Vereins-und Westbank International SA	Luxembourg			
399	Sanwa International Finance	Japan	439	Via Banque	France			
400	Saudi British Bank JSC [SABB]	SA	440	Wachovia Bank	USA			

APPENDIX C. Matched lead arranger names with SRISK measure bank names

	Lender	Country		Lender	Country
1	Agricultural Bank of Greece SA [ATE]	Greece	31	Credit Suisse AG	Switzerland
2	Akbank Turk AS	Turkey	32	DNB ASA [ex-Den Norske Bank]	Norway
3	Allied Irish Banks Plc [AIB]	Ireland	33	Danske Bank A/S	Denmark
4	Australia & New Zealand Banking Group Ltd [ANZ]	Australia	34	Deutsche Bank AG	Germany
5	BNP Paribas [Ex-Banque Nationale de Paris]	France	35	F van Lanschot Bankiers	Netherlands
6	Banca Carige SpA	Italy	36	First Abu Dhabi Bank [ex-National Bank of Abu Dhabi PJSC [NBAD]]	UAE
7	Banca Italease SpA	Italy	37	HSBC Banking Group	UK
8	Banca Monte dei Paschi di Siena SpA [MPS]	Italy	38	ING Bank	Netherlands
9	Banca Popolare dell'Emilia Romagna SCRL [BPER]	Italy	39	Intermediate Capital Group [ICG]	UK
10	Banca Popolare di Milano SCaRL [BPM]	Italy	40	Investec Group Ltd	UK
11	Banco Bilbao Vizcaya Argentaria SA [ex-Banco Bilbao Vizcaya SA]	Spain	41	Lloyds Bank Plc	UK
12	Banco Bradesco SA	Brazil	42	Malayan Banking Bhd	Malaysia
13	Banco Comercial Portugues SA [BCP]	Portugal	43	Mapfre SA	Spain
14	Banco Espanol de Credito SA [Banesto]	Spain	44	Mediobanca SpA	Italy
15	Banco Espirito Santo SA [BES]	Portugal	45	National Australia Bank Ltd [NAB]	Australia
16	Banco Internacional do Funchal SA [BANIF]	Portugal	46	National Bank of Greece SA	Greece
17	Banco Popular Espanol SA	Spain	47	Oversea-Chinese Banking Corp Ltd [OCBC]	Singapore
18	Banco de Sabadell SA [Spain]	Spain	48	Piraeus Bank SA	Greece
19	Banco de Valencia SA	Spain	49	Royal Bank of Canada	Canada
20	Banco di Sardegna SpA	Italy	50	Santander Central Hispano SA [ex-Banco Santander SA]	Spain
21	Bank Polska Kasa Opieki SA [Pekao]	Poland	51	Skandinaviska Enskilda Banken AB [Sweden]	Sweden
22	Bank of Ireland Group	Ireland	52	Societe Generale SA	France
23	Bank of Montreal	Canada	53	Standard Chartered Bank Plc [SCB]	UK
24	Bank of Nova Scotia	Canada	54	SunTrust Bank	USA
25	Bankinter SA	Spain	55	Svenska Handelsbanken AB (publ) [SHBA]	Sweden
26	Barclays Bank Plc	UK	56	Swedbank AB [Ex-ForeningsSparbanken-Swedbank Markets]	Sweden
27	CIBC [Canadian Imperial Bank of Commerce]	Canada	57	Wells Fargo & Co	United States
28	Commerzbank AG	Germany			
29	Commonwealth Bank of Australia	Australia			
30	Credit Agricole SA	France			

APPENDIX D. Matched lead arranger names with CoVaR measure bank names

	Lender	Country
1	Bank of America	United States
2	Bank of New York Co Inc [BNY]	United States
3	Chase Manhattan Bank	United States
4	Deutsche Bank AG	Germany
5	Goldman Sachs & Co	United States
6	JP Morgan & Co	United States
7	Morgan Stanley & Co International	United States
8	Morgan Stanley Dean Witter & Co	United States
9	PNC Bank	United States
10	Salomon Brothers International	United States
11	Wells Fargo & Co	United States

APPENDIX E. Names of Western Europe countries used for Granger causality test

Western Europe Countries:

1 Belgium
2 Denmark
3 Finland
4 France
5 Germany
6 Iceland
7 Netherlands
8 Norway
9 Sweden
10 Switzerland
11 UK