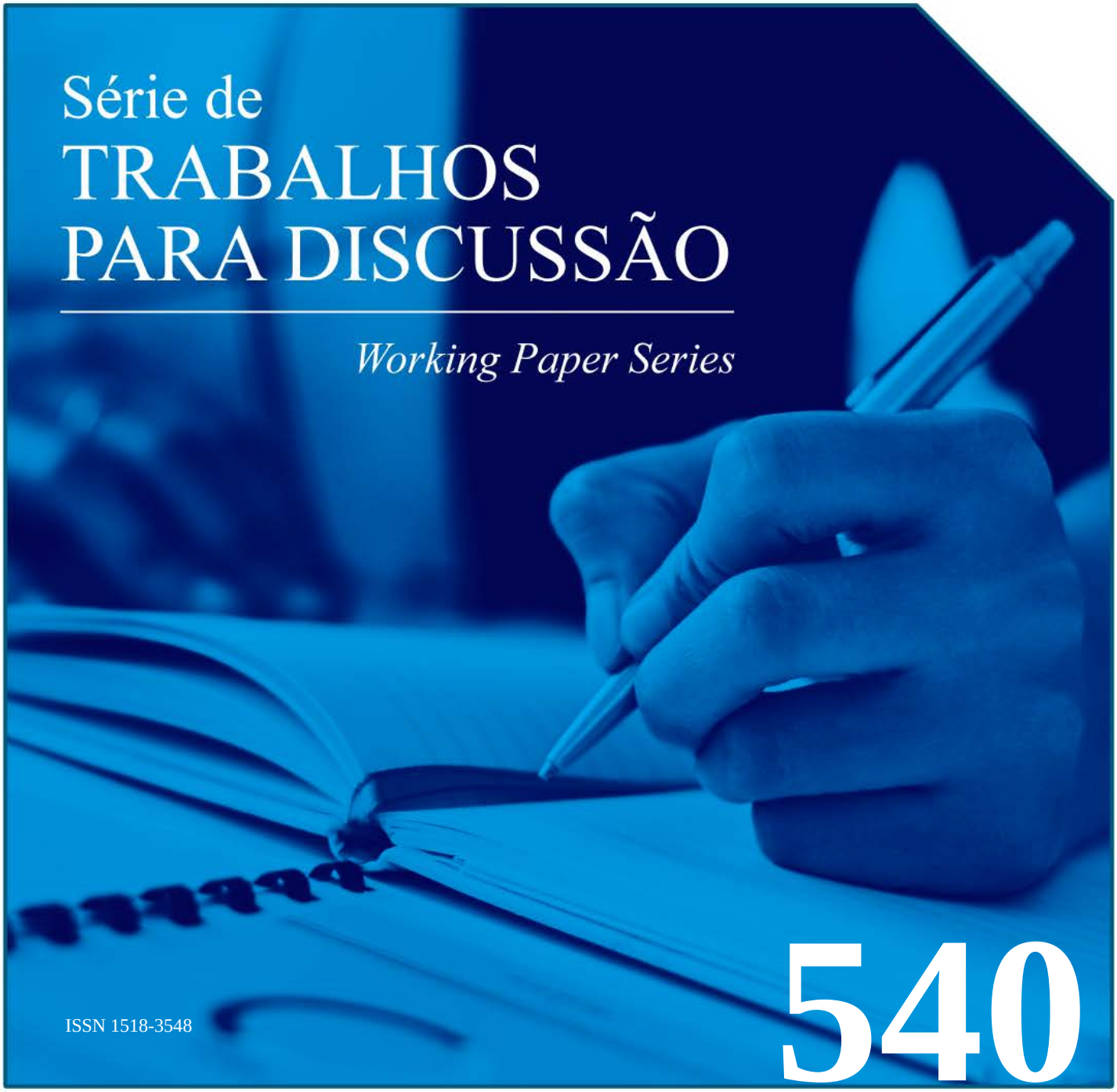

NOVEMBER 2020

Regulatory Banking Leverage: what do you know?

Douglas da Rosa München, Herbert Kimura

BANCO CENTRAL DO BRASIL

ISSN 1518-3548
CGC 00.038.166/0001-05

Working Paper Series	Brasília	no. 540	November	2020	p. 1-89

Working Paper Series

Edited by the Research Department (Depep) – E-mail: workingpaper@bcb.gov.br

Editor: Francisco Marcos Rodrigues Figueiredo

Co-editor: José Valentim Machado Vicente

Head of the Research Department: André Minella

Deputy Governor for Economic Policy: Fabio Kanczuk

The Banco Central do Brasil Working Papers are evaluated in double blind referee process.

Citizen Service Division

Banco Central do Brasil

Deati/Diate

SBS – Quadra 3 – Bloco B – Edifício-Sede – 2º subsolo

70074-900 Brasília – DF – Brazil

Toll Free: 0800 9792345

Fax: +55 (61) 3414-2553

Internet: http//www.bcb.gov.br/?CONTACTUS

Sumário Não Técnico

A excessiva alavancagem das instituições financeiras é apontada como um fator relevante na explicação da última crise financeira global. A crise do final dos anos 2000 evidenciou o impacto extremo que o setor bancário pode ter sobre a economia em situações de turbulência. A inovação no setor bancário e a engenharia financeira levaram ao desenvolvimento de novos produtos bancários, trazendo novas formas de risco e maiores desafios para a regulação bancária. A forma tradicional de intermediação bancária entre poupadores e devedores tornou-se mais complexa, tornando os bancos mais expostos e mais dispostos a correr riscos. Consequentemente, a mensuração inadequada dessas novas formas de intermediação financeira aumentou a chamada alavancagem dos bancos.

O objetivo do presente estudo é realizar uma revisão bibliográfica dos principais estudos sobre a alavancagem bancária no contexto da regulação prudencial de capital. As revisões de literatura constituem estudos relevantes que solidificam pesquisas sobre um tema específico. O levantamento sistemático e a análise dos principais artigos relacionados ao Índice de Alavancagem das instituições bancárias permitem a consolidação do conhecimento e a identificação de possibilidades de pesquisa neste tema. Esta revisão tem como objetivo verificar como o Índice de Alavancagem está sendo estudado na literatura e relacioná-lo com estudos de desempenho bancário e ambiente econômico. Uma amostra de 160 artigos de importantes periódicos das áreas de finanças e economia é utilizada para subsidiar a revisão bibliográfica. Em particular, é utilizado um método bibliométrico com duas análises: A primeira - uma análise da literatura da amostra de artigos - utiliza uma técnica padronizada de classificação e codificação dos estudos pesquisados. O segundo - uma análise de rede de pesquisa - usa rede de co-citações e rede de co-palavras.

Os resultados da análise da literatura indicaram *estabilidade financeira* como um importante objeto de estudo associado à alavancagem, além do *risco de inadimplência*. Constatou-se que o principal veículo de publicação é o *Journal of Banking and Finance*. Além disso, percebeu-se uma lacuna no estudo do tema em países emergentes. Os resul-

tados da análise da rede de pesquisa indicaram artigos influentes com uma forte rede de citações em *clusters* relacionados ao tema alavancagem e indicaram termos-chave para pesquisas e estudos futuros sobre o tema alavancagem bancária.

Por fim, como o objeto de estudo *estabilidade financeira* foi o mais encontrado na pesquisa realizada, deve-se destacar que a regulação microprudencial e macroprudencial não só atuam de forma independente, mas também existe tensão entre as duas formas de regulação. Assim, pode ser considerado importante não apenas se ater a estudos de natureza macroprudencial (como ocorreu preponderantemente na literatura no período posterior à crise financeira do final dos anos 2000), mas também considerar outros objetos mais vinculados à abordagem microprudencial.

Non-Technical Summary

The excessive leverage of financial institutions is indicated as being a relevant factor in explaining the last global financial crisis. The late 2000s' crisis highlighted the extreme impact that the banking sector can have on the economy in turbulent situations. Innovation in the banking sector and financial engineering led to the development of new bank products, bringing new forms of risk and greater challenges for banking regulation. The traditional form of banking intermediation between savers and borrowers has become more complex, making banks more exposed to and more willing to take risks. Consequently, the inappropriate measurement of these new forms of financial intermediation increased the so-called leverage of the banks.

The objective of the present study is to conduct a bibliographical review of the main studies concerning the leverage of banks in the context of the prudential regulation of capital. Literature reviews constitute relevant studies that solidify research on a specific theme. The systematic survey and analysis of the main articles related to the Leverage Ratio of banking institutions enables the consolidation of knowledge and identification of research possibilities in this topic. This review aims at verifying how the Leverage Ratio is being studied in the literature and to connecting it with studies of bank performance and economic environment. A sample of 160 articles from major journals in the areas of finance and economics are used to support the bibliographical review. In particular, it is used a bibliometric method with two analyses: The first – a literature analysis of the sample of articles – uses a standardized technique of classifying and codifying the studies researched. The second – a research network analysis – uses co-citations network and co-words network.

The results of the literature analysis indicated *financial stability* as an important object of study associated with leverage, in addition to *default risk* object. It was found the main publication vehicle is the Journal of Banking and Finance. Furthermore, a gap could be seen in the study of the topic in emerging countries. The results of the research

network analysis indicated influential articles with a strong network of citations in clusters related to the topic of leverage and indicated key terms for future research and studies on the subject of banking leverage.

Finally, because the *financial stability* object of study was the one most found in the research conducted, it should be highlighted microprudential and macroprudential regulations not only act independently, but there is also tension between the two forms of regulation. Thus, it may be considered important not only to stick to studies of a macroprudential nature (as occurred preponderantly in the literature in the period after the late 2000s' financial crisis) but also to consider other objects more linked to microprudential approach.

Regulatory Banking Leverage: What Do You Know?

Douglas da Rosa München*

Herbert Kimura**

Abstract

The substantial leverage of financial institutions is indicated as a factor that is relevant for explaining the latest global financial crisis. However, the concept of leverage is not new. The connections of these objects of study with the theme of banking leverage are listed in this present work. Through a sample of 160 articles from major journals in the areas of finance and economics, the present study is a bibliographic review to support studies on bank performance and the economies of countries. In particular, this paper seeks to contribute with a systematic survey of the characteristics of the articles related to the theme of banking leverage, using science mapping with bibliometric method. The results indicated gaps for future research involving, for example, the need for further studies related to emerging countries and indicated influential articles with a strong network of citations in clusters related to the topic of leverage.

Keywords: Leverage; Review; Banks; Science Mapping; Bibliometric.
JEL Classification: G20, G21, G28.

*Central Bank of Brazil. e-mail: douglasmunchen@gmail.com

**University of Brasília. e-mail: herbert.kimura@gmail.com

1 Introduction

The excessive leverage of financial institutions is indicated as being a relevant factor in explaining the last global financial crisis (Miele and Sales, 2011, p. 293). Effects of the banking industry on the economy are broadly studied in the literature (e.g., Iacovone et al., 2019; Tongurai and Vithessonthi, 2018; Wang et al., 2019). However, the 2007's crisis highlighted the extreme impact that the banking sector can have on the economy in turbulent situations. Innovation in the banking sector and financial engineering led to the development of new products for the financial market; however, this also brought new forms of risk and greater challenges for regulating them.

Thus, the traditional form of banking intermediation between savers and borrowers has become more complex, making banks more exposed to and willing to take risks. However, given the financial innovations, the risks assumed were little known. Consequently, the inappropriate measurement of these new forms of financial intermediation increased the so-called leverage of the banks.

Studies published in the finance and economics literature support the adoption – via banking regulations – of mechanisms to limit the high level of leverage of such institutions. However, it is worth noting that the use of the leverage indicator is not new for certain countries (e.g., USA and Canada) that had already been using it in supervisory activity before Basel 3 (Miele and Sales, 2011, p. 293). Canadian banks are a good case study in this regard, as they have been subject to a regulatory leverage indicator since the early 1980s (Crawford et al., 2009).

Papanikolaou and Wolff (2014, p. 3) argued that, in general, financial leverage is part of the underlying characteristic of banks. Traditionally, leverage came from formal debts; however, according to the authors, in the years before the crisis of 2007, banks were transferring part of their leverage off the balance sheets, due to the emergence of the use of financial engineering techniques that masked the real leverage of these institutions.

According to Papanikolaou and Wolff (2014, p. 3), when the financial crisis of 2007 emerged, banks had to scrap their positions, expanding the process of depreciating asset prices. Thus, according to the authors, this procyclical process was most relevant for large and systemically important institutions that were engaged in off-balance sheet operations.

Given the importance attributed to banking leverage in recent years, especially after the 2007 crisis, it is important to highlight how this issue is discussed in the literature, especially in the form of capital regulation. Many important works have been and are being conducted in relation to banking leverage – particularly with great predominance of studies after the 2007 crisis, when the number of publications started to grow significantly.

The studies by Gjerde and Semmen (1995), Evanoff and Wall (2001), Saunders and Wilson (2001), Morgan (2002), Gueyie and Lai (2003) and Blum (2008) showed the importance of banking leverage before the financial crisis started in 2007, especially regarding the *moral hazard* object of study and also *asymmetric information*, *capital markets* and *business model* subjects. After the crisis, studies sought to relate leveraging to the following topics: *business cycles* (Aymanns et al., 2016a; Aymanns and Farmer, 2015; Brei and Gambacorta, 2016); *monetary policy* (Angeloni and Faia, 2013); *systemic risk* (Aymanns et al., 2016a; Aymanns and Farmer, 2015; López-Espinosa et al., 2012; Papanikolaou and Wolff, 2014; Tasca et al., 2014); and *financial stability* (Kiema and Jokivuolle, 2014; Papanikolaou and Wolff, 2014).

The objective of the present study is to conduct a bibliographical review of the main studies concerning the leverage of banks in the context of the prudential regulation of capital. In particular, it is used a bibliographical review with bibliometric method, which enables quantitative reviews and standardized summaries of academic research and establishes guidelines for reliable and valid reviews (Wolf, 1986, p. 10).

The bibliometric method with two analyses is used. The first – a literature analysis of the sample of articles – uses a standardized technique of classifying and codifying the studies researched. The second – a research network analysis – uses a network of

co-citations and co-words.

For Small (1973, p. 265), co-citation analysis and the identification of clusters of co-cited papers highlight a new way of studying specialties in science. According to Aria and Cuccurullo (2017, p. 961), co-word analysis facilitates the understanding of the cognitive structure by mapping and creating clusters of the terms extracted from the keywords, titles, or abstracts. A co-citation study analyses the references cited through the articles of the sample while the co-word analysis is based on the keywords of the articles of the sample itself.

A sample of 160 articles from major journals in the areas of finance and economics are used to support the bibliographical review, according to methodology from Junior and Filho (2010, p.14-15), Seuring (2013, p. 1513), Jabbour (2013, p. 144-145), and Silva et al. (2017, p. 92-93) for literature analysis and the workflow suggested by Zupic and Čater (2015) for research network analysis.

It is important to highlight that literature reviews, although not numerous in the field of finance, constitute relevant studies that solidify research on a specific theme. For instance, Harris and Raviv (1991) review the literature on capital structure, whereas Shleifer and Vishny (1997) develop a survey on corporate governance, Sundaresan (2000) review and assess continous-time methods in finance, and Danielsson et al. (2005) survey regulation of hedge funds. More recently, literature reviews on macroprudential policy (Kahou and Lehar, 2017), systemic risk (Silva et al., 2017), islamic banking (Hassan and Aliyu, 2018) and the securitization impact on financial stability (Deku et al., 2019).

From this perspective, the systematic survey and analysis of the main articles related to the Leverage Ratio of the banking institutions enables the consolidation of knowledge and identification of research possibilities in this topic. This review aims at verifying how the Leverage Ratio is being studied in the literature and connecting it with the studies of bank performance and the economies of countries. Additionally, gaps to be explored in future studies are suggested.

The justification for the analysis of the banking segment is due to the importance of checking the degree of leverage of the banks, given that a situation of financial imbalance in these entities, and the consequent alteration of the capital structure, can lead to high costs for the economy and for society. Additionally, it is relevant for experts in the area (central banks, financial markets participants, academics, etc.) to verify which objects of study are associated with banking leverage.

Thus, this paper presents the following contributions to the literature on finance and economics:

(i) compilation of the studies published so far regarding the aforementioned constraint on capital within the banking system, collaborating in the understanding and classification of studies on the leverage ratio in finance and economics; and

(ii) establishing a literary basis for the identification of opportunities to continue studies or explore new perspectives on the subject presented.

It is worth noting the study of banking leverage and the suggestion to conduct a literature review on the topic become relevant because of the last global financial crisis, which caused a breakdown of global financial institutions and economic restrictions for many countries.

The results of the literature analysis indicated *financial stability* as an important object of study associated with leverage, in addition to the *default risk* object. Yet, it was found the main publication vehicle is the Journal of Banking and Finance. Furthermore, a gap could be seen in the study of the topic in emerging countries, as well as a gap in the interaction of studies of a macroprudential nature in conjunction with microprudential ones.

The results for the co-citation network analysis indicate five main clusters regarding the study of leverage. The topic of study concerning those clusters and important works to be considered are: i. determinants of banking capital structure (Gropp and Heider,

2010); ii. *moral hazard*, *default risk* and *contagion* (Allen and Gale, 2000; Calomiris and Kahn, 1991; Keeley, 1990); iii. monitoring and *business model* of banking institutions, and the most recent publications addressing *liquidity*, *credit bubbles*, and *systemic risk* (Brunnermeier, 2009; Demsetz and Strahan, 1997; DeYoung and Roland, 2001; Diamond, 1984; Wagner, 2010); iv. *credit cycles*, *liquidity* and the relationship with leverage (Adrian and Shin, 2010; Brunnermeier and Pedersen, 2009; Kiyotaki and Moore, 1997) and v. risk and banking capital (Blum, 1999; Calem and Rob, 1999; Jarrow, 2013; Shrieves and Dahl, 1992).

Regarding the results of co-word network analysis, the key terms *banking*, *capital*, *regulation*, *Basel* and their variations, in addition to the keywords *systemic risk*, *financial crisis*, and *liquidity* were the most often found, in line with that advocated by the BIS (2010).

Yet, the co-word network analysis and their cognitive structure encompass six clusters with the following main keywords and example of articles: *systemic risk* (Patro et al., 2013; Vallascas and Keasey, 2012); *moral hazard* (Chaigneau, 2013; Gueyie and Lai, 2003; Lee, 2009b; Schenck and Thornton, 2016); *liquidity* (Hugonnier and Morellec, 2017; Ratnovski, 2013; Sorokina et al., 2017); *contagion* (Acharya and Thakor, 2016; Elyasiani et al., 2015; Roukny et al., 2016); *financial stability* (Aymanns et al., 2016b; Calmès and Théoret, 2013; Ellis et al., 2014; Valencia, 2014); and *private equity* (Arayssi, 2016; Heed, 2010).

The remainder of the paper is organized as follows: the applied literature analysis and the research network method is described in section 2; section 3 presents a brief conceptual foundation of regulatory banking leverage, with a brief report of prudential regulation and leverage, the method for measuring banking leverage in the new Basel Accord, and the approaches to banking leverage in the literature; the results of the literature analysis research are discussed in section 4; the results of the research network analysis are stated in section 5; and, finally, section 6 is dedicated to the final considerations.

2 Bibliometric Method

For the definition of the group of articles that represent banking leverage in the context of the regulatory and risk exposure environment, this literature review uses literature analysis, which is a standardized technique of classifying and codifying the studies researched, and also research network analysis, which enable quantitative reviews and standardized summaries of academic research. For more detailed description of those two analyses see Junior and Filho (2010, p. 14-15), Seuring (2013, p. 1513), Jabbour (2013, p. 144-145), and Silva et al. (2017, p. 92-93) for literature analysis and the workflow suggested by Zupic and Čater (2015) for research network analysis.

The *Scopus* database was used, together with the search for the words *leverag* and basel or regulat* and bank* or financial institution* and risk**.

Association of Business Schools (ABS) in the areas of Finance and Economics, Econometrics, and Statistics was adopted to restrict the evaluation to important journals in the area of finance and economics. Furthermore, all the selected articles were written in the English language.

In the first evaluation, on August 17, 2017, 133 articles were found using the previously defined filters. On November 6, 2017, a new round of research was conducted with the same criteria, and no additional articles were found. On June 21, 2018, 155 articles were found – 22 articles in addition to those previously found. The following were not analyzed for selection of the sample's final set: one article that had been duplicated in the database, one article that did not conform to the subject being studied (an article from the electric sector), and one article that was not available for download. A latest new round of research was conducted on January 10, 2019, and 8 articles more were found. Thus, the final sample consisted of 160 articles.

2.1 Literature Analysis

The literature analysis presented in this work uses a standardized technique of classifying and codifying the studies researched. This process of classifying and codifying follows the method of Silva et al. (2017, p. 94), who conducted a bibliometric review related to the topic of *systemic risk*.

Tables 1 and 2 illustrate the main features of the articles published on the topic, including, for example, the following: the specific study object and the type of focus institutions of the related articles; the types of studies done (theoretical or empirical); the type of approach (quantitative or qualitative); the method used; the type of data analyzed; and, in the case of quantitative studies, the scope (one country or more than one country), the context (developed or emerging countries), the time period studied, and if they offer new perspectives or are consistent with previously published studies.

Regarding Table 1, Numeration C1 - objects of study, those themes are based on Silva et al. (2017, p. 94), in the study of the literature and in the author's evaluation, encompassing topics that are related to banking leverage.

Additionally, in relation to the objects of Table 1, a microprudential or macroprudential nature was assigned to those objects, in accordance with Vinais (2013) and Borio (2003) and based on the banking regulation policy in practice since the last financial crisis. This classification is important to compare the nature of studied objects in the literature (macro or microprudential) with that required by BIS (2010).

According to Galati and Moessner (2011), prior to the financial crisis of 2007, macroeconomic policies – especially monetary policy – aimed for the stability of prices and products and were treated in a way not associated with the so-called microprudential policies, which basically individually analyse the minimum limits and provisions of financial institutions. After the financial crisis of 2007, it was necessary to analyse the macroeconomic policies that incorporate the behaviour of the financial system, which began being done through the implementation of macroprudential policies. According to

this denomination, a macroprudential policy is that which, above all, aims for financial and systemic stability.

By contrast, microprudential policies are focused on individual stability (Caruana, 2010). According to Acharya and Thakor (2016, p. 4), because both forms of regulation ultimately are aimed at improving financial system's stability, microprudential and macroprudential regulation not only relate to each other, but there is, in fact, tension between them. For more information on macroprudential policies and their differences from microprudential policies, see for instance Galati and Moessner (2011).

It is important to highlight that the macroprudential regulation is crucial from a *financial stability* and a *systemic risk* perspectives (Bruno et al., 2017; Cerutti et al., 2017; de Haan et al., 2017; Karmakar, 2016). A broad stream of literature discusses macroprudential regulation related not only to leverage but also to stress testing (Buncic and Melecky, 2013), monetary transmission mechanisms (Agénor and da Silva, 2014), credit spreads (Tayler and Zilberman, 2016), risk communication and visualization (Sarlin, 2016)

Thus, for the purpose of this present study, the study objects of the *business cycles* (which has a strong connection to monetary policy), *systemic risk*, and *financial stability* are more linked to the macroprudential approach. By contrast, the other objects of study are more related to the individual stability of institutions, besides not being only related to microprudential approach – *asymmetric information*, *moral hazard*, *bank runs*, *business model*, *capital markets*, and *default risk / distress risk*.

It should be noted each article may have one or more objects of study and can address both the macroprudential and microprudential object level. This classification aims at facilitating the understanding of what types of risk the studies on the banking leverage topic are dealing with, in accordance with Table 1 of the proposed coding scheme.

Additionally, the articles may contain other objects of study not listed in Table 1 because the study seeks to list objects of studies related to regulatory banking leverage.

Thus, other objects of study connected to leverage are classified as *others*.

Regarding the focus of the studies, also in Table 1 of the coding scheme, the expectation with respect to the results is that the *banks* element be the main result found in the articles surveyed, given that the prudential regulation of banking leverage – disclosed by the Basel Committee – has this type of institution as the main focus.

Classification and coding used for the analysis of the articles		
Numeration	**Title**	**Description**
C1	Object of study	
		A - Asymmetric information
		B - Moral hazard
		C - Bank runs
		D - Business model
		E - Capital markets
		F - Default risk / Distress risk
		G - Business cycles
		H - Systemic risk
		I - Financial stability
		J - Others
C2	Focus	
		A - Financial institutions in general
		B - Banks
		C - Stock market
		D - Insurance companies
		E - Investment funds
		F - Mortgage / real estate market
		G - General market (non-financial)
		H - Countries / government securities
		I - Other segments

Table 1: *Object and focus of the study.*

With the codification proposed in Table 2, the idea was to understand how the topic of leverage is being studied, that is, which type of study was done (theoretical or empirical), which type of approach (quantitative or qualitative) and method were used, and, if the study was empirical, what types of data were analyzed (market, financial statements,

etc.), what was the scope and context of the articles, how many periods were studied in the articles of the sample, and what types of results were found. It should be noted that if the study used only simulated data or mathematical models, it is classified as theoretical. In relation to the C6 classification (Data types analyzed) of Table 2, it should be highlighted that the option *various* differs from the term *others* proposed in Silva et al. (2017, p. 94). In Table 2, *various* means that a given article uses more than one data source.

Additionally, in Table 2, the leverage metric used in the articles studied (classification C7) is discussed. Two leverage metrics are mentioned in this study. Metric *A* represents the total assets of the banks over equity (or the inverse of this ratio) or the total debt over total assets. In other words, the first metric is an indicator that demonstrates the equity position. Metric *B*, which is the indicator required by Basel III, comprises the ratio between Tier 1 Capital and Total Exposure. This second metric basically represents an indicator that comprises the quality equity of the banks over the total assets plus items not accounted for in the assets, which are considered to be *off-balance sheet* items. This indicator is presented in more detail in section 3.2.

Considering the characteristics of the leverage, the expectation regarding the evaluation of this metric is that most of the articles are situated in item *A*, given that metric *B* was required by the Basel committee in 2013; therefore, only the studies conducted most recently were suitable to perform at least one proxy of this new indicator.

Numeration	**Title**	**Description**
C3	Type of study	A- Theoretical
		B-Empirical
		C- Both
C4	Type of approach	A- Quantitative
		B- Qualitative
		C- Quantitative and qualitative
		D- Review/Research

Continued on next page

– continued from previous page

Numeration	Title	Description
		E- Not applicable
C5	Methods used	A- Econometric / Statistical / Multivariate analysis
		B- Computational / Simulation
		C- Mathematical modelling
		D- Not applicable
C6	Types of data analyzed	A- From the market
		B- From balance sheets
		C- Macroeconomic
		D- From regulators, IMF, and other entities
		E - Various
		F- Not applicable
C7	Metrics for leverage	A- Total assets / Net equity
		B- Level 1 capital / Total exposure
		C- Not applicable
C8	Scope	A- One country
		B- More than one country
		C- Region/Block
		D- Global
		E- Not specified / Not applicable
C9	Context	A- Developed countries
		B- Emerging countries
		C- Both
		D- Not applicable
C10	Periods studied	A- Up to 2 years
		B- From 2 to 5 years
		C- From 5 to 10 years

Continued on next page

– continued from previous page

Numeration	Title	Description
		D- More than 10 years
		E- Not applicable
C11	Results	A- New perspectives
		B- Consistent with studies previously
		published in the literature

Table 2: *Type of study, approach, methods used, type of data, metrics for leverage, scope, context, period, and results.*

Regarding the Scope item, the objective was to answer the following questions: Where is the focus of the articles? Does the study focus on a country or a region? Does the article have a global scope? Considering the context, one can also see the focus countries of the studies in Table 2 and whether they are developed or emerging or both. This Table also codifies the period of time studied in the articles. For the articles that do not use empirical data and, therefore, are only theoretical, the term *not applicable* is adopted for the period of time studied. In relation to the Results item found in the articles of the sample (classification C11), two options were adopted in relation to the results analyzed, as follows: if they have new perspectives, taking into account the authors' own mention; or if the studies are consistent with previous publications.

Table 3 shows the results of the classifying and codifying of the studies researched, according to the main features of the articles listed in Tables 1 and 2.

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Papanikolaou and Wolff (2014).	1G,1H,1I	2B	3B	4A	5A	6E	7B	8A	9A	10D	11A
Dermine (2015).	1A,1C,1F	2B	3A	4A	5C	6F	7A	8E	9D	10E	11A
Aymanns and Farmer (2015).	1G,1H	2A	3A	4A	5B	6F	7A	8E	9D	10E	11B
Aymanns et al. (2016a).	1D,1F,1G,1H,1I	2B	3A	4A	5B	6F	7A	8E	9D	10E	11B
Angeloni and Faia (2013).	1C,1G,1J	2B	3A	4C	5A,5C	6E	7A	8E	9D	10E	11B
Demirguc-Kunt et al. (2013).	1E,1I	2B	3B	4A	5A	6E	7B	8B	9A	10B	11B
Vallascas and Keasey (2012).	1D.1F.1H	2B	3B	4A	5A	6E	7B	8C	9A	10D	11A
Kiema and Jokivuolle (2014).	1F,1I	2B	3A	4A	5B,5C	6F	7B	8E	9D	10E	11B
Cathcart et al. (2015).	1F,1I	2B	3C	4A	5A,5C	6D	7A	8A	9A	10B	11A
Blum (2008).	1A,1B,1D,1H,1J	2B	3A	4A	5C	6F	7A	8E	9D	10E	11A
Kalemli-Ozcan et al. (2012).	1D,1G	2B,2G	3B	4A	5A	6E	7B	8D	9C	10C	11A
Chen and Mazumdar (1994).	1B,1J	2B	3B	4A	5C	6F	7A	8A	9A	10E	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Morgan (2002).	1A,1J	2B,2D	3B	4A	5A	6D	7A	8A	9A	10C	11B
Beltratti and Stulz (2012).	1H,1I,1J	2B	3B	4A	5A	6E	7A	8D	9C	10B	11A
Carey et al. (1998).	1D	2B	3B	4A	5A	6E	7C	8A	9A	10C	11A
Hughes et al. (1999).	1D	2B	3B	4A	5A	6E	7C	8A	9A	10A	11B
Evanoff and Wall (2001).	1E	2B	3B	4A	5A	6E	7A	8A	9A	10D	11A
López-Espinosa et al. (2012).	1H,1I,1J	2B	3B	4A	5A	6E	7A	8B	9C	10C	11A
John et al. (2010).	1J	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Saunders and Wilson (2001).	1E,1G	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Poghosyan and Čihak (2011).	1F,1H,1I,1J	2B	3B	4A	5A	6E	7A	8C	9A	10D	11A
Episcopos (2008).	1B,1F	2B	3B	4A	5A	6E	7B	8A	9A	10B	11A
McAleer (2009).	1J	2B	3B	4A	5A	6E	7C	8B	9A	10D	11B
Riccetti et al. (2013).	1F,1G,1H,1I,1J	2G	3A	4A	5B	6F	7C	8E	9D	10E	11B
DeAngelo and Stulz (2015).	1F	2B	3A	4A	5B	6F	7A	8E	9D	10E	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Clarke (2010).	1F,1J	2A	3A	4B	5D	6D	7C	8C	9A	10E	11B
Gueyie and Lai (2003).	1B	2A	3B	4A	5A	6E	7A	8A	9A	10D	11B
Guidara et al. (2013).	1G,1I	2B	3B	4A	5A	6E	7A	8A	9A	10D	11A
Patro et al. (2013).	1E,1F,1H,1I	2B,2G	3B	4A	5A	6A	7C	8A	9A	10A	11B
Kane (2012).	1I	2A	3A	4B	5C	6F	7C	8A	9A	10E	11B
Braun and Raddatz (2010).	1J	2B	3B	4A	5A	6E	7A	8D	9C	10D	11B
Poledna et al. (2014).	1F,1G,1H	2A	3A	4A	5B	6F	7A	8E	9D	10E	11B
Weiß et al. (2014).	1H,1I	2B	3B	4A	5A	6E	7A	8D	9C	10D	11A
Kishan and Opiela (2012).	1I,1J	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Carbo-Valverde et al. (2008).	1D	2B	3B	4A	5A	6E	7A	8C	9A	10D	11B
Calomiris and Nissim (2014).	1E,1I	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Gjerde and Semmen (1995).	1B	2B	3A	4A	5B	6F	7A	8E	9D	10E	11B
Black et al. (2016).	1F,1H,1I,1J	2B	3B	4A	5A	6E	7A	8C	9A	10D	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Lee and Chih (2013).	1F	2B	3B	4A	5A	6B	7A	8A	9B	10C	11A
Triantis (2000).	1J	2G	3A	4B	5D	6F	7C	8A	9A	10E	11A
Mingo (1976).	1D	2B	3B	4A	5A	6B	7A,7B	8A	9A	10A	11A
Vazquez and Federico (2015).	1F,1I	2B	3B	4A	5A	6E	7A	8B	9A	10C	11B
Chan-Lau et al. (2015).	1E,1I	2B	3B	4A	5A	6E	7A	8B	9A	10B	11B
Prasch (2012).	1I	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Mazumder and Ahmad (2010).	1E,1I	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Carson and Hoyt (2000).	1F,1J	2D	3B	4A	5A	6E	7C	8C	9A	10D	11B
Allen et al. (1996).	1B,1F,1J	2B	3C	4A	5A	6E	7A	8A	9A	10B	11A
Plantin (2015).	1A,1B,1D	2B	3A	4A	5C	6F	7A	8E	9D	10E	11B
Gabbi et al. (2015).	1G,1H,1I	2B	3A	4A	5B	6F	7A	8E	9D	10E	11A
Ratnovski (2013).	1J	2B	3A	4A	5C	6F	7C	8E	9D	10E	11A
Inderst and Mueller (2008).	1B,1F	2A	3A	4A	5C	6F	7A	8E	9D	10E	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Tasca et al. (2014).	1D,1F,1H	2B	3A	4A	5B	6F	7A	8E	9D	10E	11A
Geanakoplos (2014).	1G,1I	2A	3A	4B	5D	6F	7C	8C	9A	10E	11B
Calmès and Théoret (2013).	1G,1I	2B	3B	4A	5A	6E	7B	8A	9A	10D	11B
Hagen and Fender (1998).	1J	2A	3A	4B	5D	6F	7C	8E	9D	10E	11B
Krug et al. (2015).	1H.1I	2B	3A	4A	5B	6F	7A	8E	9D	10E	11B
Mullineux (2014).	1B,1I,1J	2B	3A	4B	5D	6F	7C	8B	9A	10E	11B
Ellis et al. (2014).	1,H,1I,1J	2B	3A	4B	5D	6F	7C	8E	9D	10E	11B
Pennathur et al. (2014).	1E,1I	2A	3B	4A	5A	6E	7A	8A	9A	10A	11A
Cabral (2013).	1I	2B	3A	4C	5B	6F	7C	8A	9A	10E	11A
Chernykh and Cole (2015).	1F,1I	2B	3B	4A	5A	6E	7A	8A	9A	10C	11A
Lee and Lin (2012).	1F	2G	3B	4A	5A	6E	7C	8A	9A	10C	11B
Nieto and Garcia (2012).	1I,1J	2B	3A	4B	5D	6F	7C	8C	9A	10E	11B
Acharya and Thakor (2016).	1H,1J	2B	3A	4A	5C	6F	7C	8E	9D	10E	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Mohsni and Otchere (2015).	1I,1J	2B	3B	4A	5A	6E	7A	8A	9A	10C	11A
Valencia (2014).	1I,1J	2B	3A	4A	5B	6F	7A	8E	9D	10E	11B
Bernardo and Welch (2013).	1I,1J	2A	3A	4A	5B,5C	6F	7C	8E	9D	10E	11B
Harding et al. (2013).	1B,1F	2B	3A	4A	5B,5C	6F	7A	8E	9D	10E	11B
Blundell-Wignall et al. (2012).	1D,1H1I	2B	3A	4C	5D	6D	7C	8C	9A	10E	11B
Miele and Sales (2011).	1I	2B	3A	4C	5D	6D	7C	8D	9C	10E	11B
Heed (2010).	1D,1H,1I	2A	3A	4B	5D	6F	7C	8B	9A	10E	11B
Bernard et al. (2005).	1B	2B	3A	4A	5B,5C	6F	7C	8A	9A	10E	11A
Wang et al. (2014).	1H	2A	3B	4A	5A	6E	7A	8A	9B	10C	11A
Koch (2014).	1D,1E1G.1I	2B	3B	4A	5A	6E	7A	8A	9A	10C	11A
Schmaltz et al. (2014).	1D	2B	3B	4A	5B	6B	7B	8A	9A	10A	11A
Agur (2013).	1A,1I	2B	3A	4A	5C	6F	7C	8B	9A	10E	11A
Glasser (2013).	1I	2A	3A	4B	5D	6F	7C	8A	9A	10E	11B
Mullineux (2011).	1B,1I,1J	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Handorf (2011).	1D,1E	2B	3B	4A	5A	6E	7A	8A	9A	10A	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Hugonnier and Morellec (2017).	1F	2B	3A	4A	5B,5C	6E	7A	8A	9A	10	11B
Osborne et al. (2017).	1G,1I	2B	3B	4A	5A	6E	7A,7B	8A	9A	10D	11A
Arayssi (2016).	1A,1D,1H,1J	2B	3A	4A	5C	6F	7A	8E	9D	10E	11A
Hasan et al. (2016).	1B,1D,1F,1I	2B	3B	4A	5A	6E	7A	8D	9C	10D	11A
Kuzubaş et al. (2016).	1D,1H	2B	3C	4A	5A,5B	6B	7A	8A	9A	10A	11A
Bengtsson (2016).	1D,1G,1H	2E	3A	4B	5D	6F	7C	8E	9D	10E	11A
Admati (2016).	1F,1H,1I	2B	3A	4B	5D	6F	7C	8E	9D	10E	11B
Benhabib et al. (2016).	1B,1C,1G,1I	2B	3A	4A	5B,5C	6F	7C	8E	9D	10E	11B
Kupiec and Wallison (2015).	1F,1H,1I	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Elyasiani et al. (2015).	1E,1H,1I	2B,2D	3B	4A	5A	6E	7A	8B	9A	10C	11A
Fidrmuc et al. (2015).	1D,1F	2A	3B	4A	5A	6B	7A	8A	9A	10B	11B
Dubecq et al. (2015).	1A, 1J	2B	3A	4A	5C	6F	7C	8A	9A	10E	11A
Thimann (2015).	1H	2B,2D	3A	4B	5D	6F	7C	8C	9A	10E	11B
Derviz (2014).	1F,1H,1I	2B	3A	4A	5B,5C	6F	7C	8E	9E	10E	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Pakravan (2014).	1H,1I	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Borri et al. (2014).	1H,1I	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Wilmarth (2014).	1D,1J	2B	3A	4B	5D	6F	7C	8E	9D	10E	11B
Cole and Cadogan (2014).	1F,1J	2G	3A	4A	5C	6F	7C	8E	9D	10E	11A
Eberlein et al. (2013).	1E,1G	2B	3B	4A	5A,5C	6A	7C	8A	9A	10D	11A
di Iasio (2013).	1F,1G,1I	2B	3A	4A	5C	6F	7C	8E	9D	10E	11A
Jarrow (2013).	1F,1G,1H,1I	2B	3A	4A	5C	6F	7C	8E	9D	10E	11B
Yang et al. (2012).	1B,1E,1F	2D	3B	4A	5B,5C	6A	7C	8A	9B	10C	11B
Moosa and Silvapulle (2012).	1I,1J	2B	3A	4B	5D	6F	7C	8D	9C	10E	11B
Muradoglu (2010).	1I,1J	2B	3A	4B	5D	6F	7C	8A	9A	10E	11A
Covi (2017).	1F,1I,1J	2B	3C	4C	5A	6A	7A,7B	8C	9A	10C	11B
Haritchabalet et al. (2017).	1A,1H,1J	2B	3A	4A	5C	6F	7C	8D	9C	10E	11B
Miu and Ozdemir (2017).	1F,1G	2B	3C	4A	5A,5C	6E	7C	8E	9D	10D	11A
Sorokina et al. (2017).	1D,1G	2B	3B	4A	5A	6E	7A	8A	9A	10D	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Nesbitt (2017).	1D,1F	2G	3B	4A	5A	6D	7C	8A	9A	10D	11B
Krstevska et al. (2017).	1D	2B	3B	4A	5A	6E	7A	8A	9B	10D	11B
Falagiarda and Saia (2017).	1F,1G,1H,1I,1J	2B	3C	4A	5B,5C	6F	7C	8E	9D	10E	11A
Chen et al. (2017).	1D,1J	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Entrop et al. (2017).	1J	2B	3B	4A	5A	6E	7A	8A	9A	10D	11A
Dandapani et al. (2017).	1D,1I	2B	3B	4A	5A	6E	7A,7B	8A	9A	10B	11A
Barucci et al. (2016).	1F	2B	3B	4A	5A	6E	7B	8C	9A	10A	11B
Wu and Zhao (2016).	1A	2B	3A	4A	5C	6F	7C	8E	9D	10E	11B
Dressler and Tauer (2016).	1D,1F	2A	3B	4A	5A	6E	7A	8A	9A	10C	11A
Klimenko and Moreno-Bromberg (2016).	1D,1J	2B	3A	4A	5B,5C	6F	7A	8E	9D	10E	11A
Schenck and Thornton (2016).	1B,1E,1I	2B	3C	4A	5A,5B	6E	7A	8A	9A	10D	11A
Walther (2016).	1F,1H,1J	2B	3A	4A	5C	6F	7C	8E	9D	10E	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Lengwiler and Maringer (2015).	1F,1H,1I	2A	3B	4A	5B	6F	7C	8E	9D	10E	11B
Kanas (2014).	1F	2B	3B	4A	5A	6D	7A,7B	8A	9A	10D	11A
Kellermann and Schlag (2013).	1I	2B	3C	4A	5A,5C	6B	7B	8A	9A	10B	11A
Bergevin et al. (2013).	1G,1H,1I	2B	3B	4A	5A	6A	7A,7B	8A	9A	10D	11A
Zamora-Mesinas et al. (2011).	1D,1I	2B	3B	4A	5B	6F	7C	8E	9D	10E	11B
Lee (2009a).	1J	2B	3B	4A	5A	6D	7A	8A	9B	10D	11B
Lee (2009b).	1B	2B	3B	4A	5A	6D	7A	8A	9B	10D	11B
Gavalas (2015).	1I,1J	2B	3B	4A	5A	6A	7A	8C	9A	10C	11B
Paris (2000).	1E	2B	3A	4A	5C	6F	7C	8E	9D	10E	11A
Chaigneau (2013).	1J	2B	3A	4A	5C	6F	7C	8E	9D	10E	11B
Imbierowicz et al. (2018).	1G,1H	2B	3B	4A	5A	6D	7A,7B	8A	9A	10C	11B
Ghosh and Chatterjee (2018).	1D,1I,1J	2B	3B	4A	5A	6D	7A	8A	9B	10D	11B
Hossain et al. (2017).	1G,1I	2B	3B	4A	5A	6E	7A,7B	8C	9B	10C	11A
Kim et al. (2018).	1F,1I	2A	3B	4A	5A	6E	7C	8A	9A	10B	11B
Allahrakha et al. (2018).	1J	2A	3B	4A	5A	6D	7B	8A	9A	10B	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Barth and Seckinger (2018).	1B,1D,1J	2B	3A	4A	5C	6F	7C	8E	9D	10E	11A
Luciano and Wihlborg (2018).	1D,1F,1H	2B	3A	4A	5B,5C	6F	7C	8E	9D	10E	11B
Dreassi et al. (2017).	1D,1F,1H	2B,2D	3B	4A	5A	6A	7A,7B	8C	9A	10C	11A
Benbouzid et al. (2017a).	1F,1I	2B	3B	4A	5A	6A	7A	8B	9C	10C	11B
Mendonça and Silva (2017).	1H	2B	3B	4A	5A	6E	7A	8A	9B	10B	11B
Benbouzid et al. (2017b).	1F,1I	2B	3B	4A	5A	6E	7A	8B	9C	10C	11B
Cartwright and Sarraf (2005).	1F,1J	2B	3A	4B	5D	6F	7C	8E	9D	10E	11E
Lechner and Gatzert (2017).	1J	2G	3B	4A	5A	6E	7A	8A	9A	10B	11B
Herring (2018).	1J	2B	3A	4B	5D	6F	7C	8A	9A	10E	11B
Roukny et al. (2016).	1F.1H	2B	3A	4A	5C	6F	7C	8E	9D	10E	11A
Holland (2010).	1D,1I,1J	2B	3A	4B	5D	6F	7C	8A	9A	10E	11A
Goddard et al. (2009).	1I	2B	3A	4B	5D	6F	7C	8C	9A	10A	11B

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Greenwood et al. (2017).	1I	2B	3C	4C	5C	6D	7B	8A	9A	10E	11A
Sarin and Summers (2016).	1E,1I	2B	3C	4C	5A	6A	7A	8B	9C	10D	11B
Morris and Shin (2008).	1I	2B	3C	4C	5A	6B	7A	8A	9A	10D	11A
Leonard and Biswas (1998).	1B	2B	3B	4A	5A	6B	7A	8A	9A	10C	11A
Baker (2016).	1E	2A,2G	3C	4C	5A	6A	7A	8A	9A	10D	11B
Chen and Skoglund. (2014).	1J	2B	3A	4A	5B, 5C	6F	7C	8E	9D	10E	11A
Gong et al. (2018).	1D	2B	3B	4A	5A	6E	7A	8A	9A	10D	11A
Dewenter et al. (2018).	1B	2B	3B	4A	5A	6E	7A	8B	9A	10C	11B
Chami et al. (2018).	1B, 1I	2B	3C	4C	5A	6E	7A,7B	8A	9A	10A	11B
Barucci et al. (2018).	1H	2B	3B	4A	5A	6D	7B	8C	9A	10A	11B
Milonas (2018).	1J	2B	3B	4A	5A	6E	7A	8A	9A	10D	11B
Bharati and Jia (2018).	1J	2B	3B	4A	5A	6A	7A	8A	9A	10D	11B
Gornall and Strebulaev (2018).	1B,1J	2B,2G	3C	4A	5B	6D	7A	8E	9D	10E	11A

Continued on next page.

– continued from previous page

Article	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Adrian and Boyarchenko (2018).	1H, 1J	2B	3A	4A	5B,5C	6F	7C	8E	9D	10E	11A

Table 3: *Classification and coding of the articles of the sample.*

2.2 Research Network Analysis

According to Wolf (1986, p. 10), the procedures used in science mapping with bibliometric methods enable quantitative reviews and standardized summaries of academic research, which aim at establishing guidelines for reliable and valid reviews.

Citation analysis has become an important indicator for assessing the impact of scholarly works (Garfield, 1983, p. 355). From bibliometric methods, one can identify the most influential articles on a topic and obtain the links between articles that explore a certain topic.

The results of bibliometric methods are useful not only to measure the popularity and influence of articles but also to identify key authors and their publications. According to van Raan (2003, p. 20-21), bibliometric methods are based on the premise that authors publish their most important results in cutting-edge journals, and the application of citation analysis is, in many situations, a strong indicator of scientific performance.

Among the various types of bibliometric methods, the research network analysis is an important method for extracting relevant information about a particular topic. There are various forms of network evaluation involving different objects of study discussed in the literature on a particular topic. For Small (1973, p. 265), co-citation analysis and the identification of clusters of co-cited papers highlight a new way of studying specialties

in science. Morris et al. (2003, p. 413) established that the analysis of research fronts is done based on a large number of articles that reference fundamental articles, regardless of the time of the research.

The concept of research network analysis has received attention lately due to the development of new forms of scientific collaboration provided by recent technological innovation. For the elaboration of research network analysis, Zupic and Čater (2015, p. 436) proposed a flow of intellectual mapping composed of five stages, as follows: elaboration of the study, data collection, data analysis, data visualization, and interpretation.

In the Elaboration of the Study stage, the research question and the bibliometric methods to answer the proposed question are defined.

According to Zupic and Čater (2015, p. 440), one of the main decisions made in scientific mapping is to limit the study scope. In an attempt to address this issue, the authors suggested the two following options: carefully selecting the keywords searched and limiting the scope to articles published in one or a small number of journals.

According to Aria and Cuccurullo (2017, p. 960), Data Collection is divided into three sub-stages. The first sub-stage involves obtaining the data. There are various online bibliographic databases, such as Web of Science, Scopus, Google Scholar, and Science Direct; however, they do not cover scientific fields and journals in the same way. Thus, each researcher must identify the most suitable database for their research. According toAria and Cuccurullo (2017, p. 961), the second sub-stage involves loading and converting the data into a format that is friendly to the bibliometric tools being used. The final sub-stage is data cleaning, in which the quality of the results depends on the quality of the data. Various reprocessing methods can be used such as, for instance, detection of duplicate elements and misspellings. According to the authors, although most databases are reliable, cited references may contain multiple versions of the same publication and different spellings of an author's name. Additionally, cited journals may appear in many different ways and books may have different editions.

The Data Analysis phase begins with pre-processing, in which, to achieve better results, the data must be *clean* (Zupic and Čater, 2015, p. 442). This phase encompasses the descriptive analysis and identification of networks. According to Aria and Cuccurullo (2017), different approaches have been developed to identify networks using different units of analysis, as shown in Table 4.

Taxonomy of the bibliometric technique	Unit of analysis used	Type of relationship
Bibliographic coupling	Author	Common references in the authors' works
	Document	Common references in the documents
	Journal	Common references in the papers of the journals
Co-citation	Author	Co-cited authors
	Reference	Co-cited references
	Journal	Co-cited journals
Co-author	Author	Co-occurrence of authors in the author's list of a document
	Country per affiliation	Co-occurrence of countries in the address list of a document
	Institution per affiliation	Co-occurrence of institutions in the address list of a document
Co-word	Keyword, or term extracted from the title, abstract, or body of the document	Co-occurrence of terms in a document

Table 4: *Usual bibliometric techniques according to the unit of analysis.*

Source: Aria and Cuccurullo (2017)

According to Aria and Cuccurullo (2017, p. 961), the most common form of

data analysis is citation analysis, which uses citation counting as a measure of similarity between documents, authors, and journals. Citation analysis can be divided into bibliographic coupling and co-citation. Bibliographic coupling was proposed by Kessler (1963), who verified that the greater the similarity between the content of the articles studied, the greater the similarity of the reference literature. According to Aria and Cuccurullo (2017, p. 968) the general formula can be obtained as follows:

$$B_{coup} = AA^t \tag{1}$$

in which A is a document $\times$ cited reference matrix. Each element b_{ij} indicates how many bibliographic couplings connect documents i and j. The intensity of the bibliographic coupling between two articles i and j is defined by the number of references in common.

The co-citation technique – proposed by Small (1973) – aims at analyzing the basic articles and pioneers in a specific field of scientific research. According to Aria and Cuccurullo (2017, p. 961), bibliographic coupling is based on the documents searched and is used to map current research fronts. A co-citation study analyzes the documents cited through the documents searched. According to the authors, a co-citation between two articles occurs when both are cited in a third article. A co-citation network can be obtained by general formula 1; however, in this case, element B_{ij} indicates how many co-citations exist between documents i and j.

According to Zupic and Čater (2015, p. 446), another taxonomy of the bibliometric technique, i.e., the co-author analysis, is used to identify the structure of scientific networks established in the collaborations of authors and their affiliations. In turn, co-word analysis is based on the most important words in the documents. According to Aria and Cuccurullo (2017, p. 961), co-word analysis facilitates the understanding of the cognitive structure by mapping and creating clusters of the terms extracted from the keywords, ti-

tles, or abstracts. A co-word network can be obtained by the general formula described in Equation 1, in which A is a document x word matrix.

According to Aria and Cuccurullo (2017, p. 961), once data analysis is constructed and the network of connections is established, a normalization process (e.g., Jaccard coefficient or Pearson correlation) can be performed. Additionally, the use of a data reduction technique is appropriate for identifying niches, such as the use of clustering algorithms.

For Zupic and Čater (2015, p. 446), the Data Visualization phase is the first stage of mapping a scientific field. According to the authors, network analysis results in visualizations of scientific fields in which the *nodes* show the units of analysis (documents, authors, etc.) and the *edges* signify the similarity between the connections.

Finally, the Interpretation of the Data – the last stage of the flow of intellectual mapping proposed by Zupic and Čater (2015) – has as a premise the need for the author to expand upon the theme to better interpret the results.

Thus, in the present article, the data collection for the network analysis followed the proposition in section 2.2, via the Scopus database.

For the data analysis in this article, two taxonomies of bibliometric techniques were used. The first is the co-citation by author taxonomy, which has the objective of analyzing the basic articles on the topic of banking leverage, in accordance with Small (1973). Zamore et al. (2018) used the co-citation technique for bibliographic review and credit risk agenda. Second, the co-word by keyword taxonomy was used (see Table 4) to understand the cognitive structure of leverage, in accordance with Aria and Cuccurullo (2017, p. 961). The Bibliometrix package of the R software — developed by Aria and Cuccurullo (2017) and which supports a bibliometric analysis process compatible with that proposed by Zupic and Čater (2015) – was used as an automated tool for the analysis. Thus, the knowledge base as well as possible inflections in the field of scientific research were explored. In the case of banking leverage, these estimates are important for evaluating the intellectual structure of the literature on the topic.

For visualization and interpretation of the results found, the VosViewer software – which is useful for graphically constructing bibliometric maps – was used (van Eck and Waltman, 2010). It uses the Visualization of Similarities (VOS) mapping technique to generate views based on the distances from bibliometric networks. For the formation of clusters in the VosViewer program, the Pajek package was used (Mrvar and Batagelj, 2016).

3 A Brief Conceptual Foundation of Regulatory Banking Leverage

3.1 Brief Report on Prudential Banking Regulation and Leverage

Capital limits were originally dealt with in the first Basel Accord, *Basel I*, released in 1988. A new capital accord, known as *Basel II*, was published in 2004. A broad stream of literature on the the first Basel accords, taking into account financial stability, banking policy and impacts on the industry and economy, is extensively discussed (Andersen, 2011; Ayadi et al., 2016; Aymanns et al., 2016a; Barakova and Palvia, 2014; Demirguc-Kunt and Detragiache, 2011; Hakenes and Schnabel, 2011; Herring, 2004; Rossignolo et al., 2012; Schmaltz et al., 2014). For more information on the *Basel I* and *Basel II*, Balin (2008) performed a descriptive analysis of both accords.

With the advent of the subprime market crisis in 2007, the Financial Stability Board (*FSB*) and the *G20* proposed a set of measures aimed at protecting the banking system against financial crises. These negotiations contributed greatly to the broader reform that culminated in the most recent capital accord named *Basel III* BIS (2010), which involves greater concern for the quality of the banks' capital, among other measures. In this new context, where *liquidity* plays a major role in financial crisis, various studies discusses different facets of *Basel III* (Dermine, 2015; Fidrmuc and Lind, 2018; Hessou and Lai, 2017; Hong et al., 2014; King, 2013; Petrella and Resti, 2017; Rubio and Carrasco-Gallego,

2016). Herring (2018) discusses the growing complexity in financial regulation, including an analysis of *Basel III*.

Most countries have gone through a process of disintermediation, that is, a large part of financial intermediation is taking the form of negotiable securities, rather than loans and bank deposits (Hausler, 2002). Due to regulatory incentives and capital requirements, as well as the possibility of greater returns to shareholders and greater competitiveness, banks have moved financial risks, especially default risk, from their balance sheets into the securities market.

One of the topics in this new accord relates to the excessive leverage of financial institutions. According to Demirguc-Kunt et al. (2013), many banks were apparently in compliance with the minimum regulatory capital both before and after the crisis; however, they did not actually have enough capital to absorb the unexpected losses.

Thus, the *Basel III* recommendations require that the Leverage Ratio and risk-based capital requirements function together (Brei and Gambacorta, 2016, p. 360). According to the authors, on the one hand, it is important to have risk-sensitive capital requirements because the charges for capital are higher for exposure to low probability of payment, and lower when the probability of payment of an asset is higher.

On the other hand, given that any estimate of the probability of loss depends on the assumptions of the underlying model, which may be wrong and lead to the sub-estimation of the associated risks, it is important to have a Leverage Ratio restriction that is independent of such risk assessments (Miele and Sales, 2011, p.293).

In particular, risk-based capital requirements refer to the banking institutions' potential loss, while the Leverage Ratio indicates the maximum loss that can be covered by the capital (Brei and Gambacorta, 2016, p. 360).

For this reason, BIS (2010) recommended the establishment of new operational limits to be followed by financial institutions, which meant additional requirements for

global banks. BIS (2014) made official the introduction of the new Leverage Ratio (LR) indicator.

3.2 Measuring Regulatory Banking Leverage

BIS (2014) established a supplementary instrument to the capital requirements based on risk weighting by adopting a leverage cap in conjunction with the recently revised operational capital limits in BIS (2010). According to the agency, the LR leads to greater resilience for the banks and the financial system because such a restriction acts as a second layer of protection against possible errors in the measurement of the risks of financial intermediation operations. Additionally, imposing limits on banks' leveraging can reduce possible excess credit supply, thus reducing potential cyclical effects on the banks' capital requirements. The guideline of the said agency is that the leverage measure adopted by the national jurisdictions be simple, transparent, and easy to determine.

According to (Gabbi et al., 2015, p. 118), one of the impacts of this new approach is that it broadens the definition of what constitutes leverage of a banking institution. Thus, it should lead to banks acting noticeably to increase their capital or to reduce their intermediation activity.

The Leverage Ratio (LR) is defined as the fraction of Tier 1 and Total Exposure, where Tier 1 corresponds to the sum of the Core Capital and the Additional Tier 1 Capital, whose portions are explicitly defined in the BIS (2010) document. In turn, according to BIS (2014), *total exposure* means the exposures recorded in the balance sheet added to the following items with specific treatment: exposure to derivatives, exposure to transferable securities, and items not recorded on the balance sheet.

3.3 Connection of Regulatory Banking Leverage with Objects of Study from the Literature on Finance and Economics

Main object of associated study	Examples of important studies
Moral hazard	Gjerde and Semmen (1995).
	Gueyie and Lai (2003).
Asymmetric information	Morgan (2002).
	Blum (2008).
Business model	Carey et al. (1998).
	Holland (2010).
Default risk	Episcopos (2008) .
	Poghosyan and Čihak (2011).
	Lee and Chih (2013).
Business cycles	Kalemli-Ozcan et al. (2012).
	Guidara et al. (2013).
	Poledna et al. (2014).
Capital markets	Saunders and Wilson (2001).
	Evanoff and Wall (2001).
	Beltratti and Stulz (2012).
	Demirguc-Kunt et al. (2013).
	Calomiris and Nissim (2014).
Systemic risk	López-Espinosa et al. (2012).
	Vallascas and Keasey (2012).
	Patro et al. (2013).
	Weiß et al. (2014).
	Black et al. (2016).
Financial stability	Morris and Shin (2008).
	Goddard et al. (2009).
	Clarke (2010).
	Kane (2012).
	Vazquez and Federico (2015).

Continued on the next page.

Main object of associated study	Examples of important studies
Others	Hughes et al. (1999).
	McAleer (2009).
	John et al. (2010).
	Braun and Raddatz (2010).
	Kishan and Opiela (2012).
	Angeloni and Faia (2013).
	Riccetti et al. (2013).

Table 5: *Objects of study and respective studies.*

This section shows the connection of regulatory banking leverage with objects of study from the literature on finance and economics. In order to do that, Table 5 shows the studies with more than 15 citations on the date of the last round of research conducted and the main object associated with each study, contemplating the 160 articles of the final sample.

Studies addressing **asymmetric information** and **moral hazard** were carried out before the late 2000's financial crisis. Gjerde and Semmen (1995) analyzed the effectiveness of risk-based capital indicators when bank deposits are fully insured, and the results showed that, when diverted from the optimal weightings of risk, a combination of leverage restriction and a risk-based capital indicator appears to be a more suitable approach.

In the case of official deposit insurance in Canada, (Gueyie and Lai, 2003, p. 249) found no evidence of moral hazard in the banking industry after the introduction of deposit insurance in this country. The authors found that the total capital risk, market risk, and implied volatility of bank assets increased. However, these conditions are necessary, but not sufficient, to complete the change in behavior of banks in the midst of the implementation of deposit insurance.

Blum (2008, p. 1700) found that without capital regulation, banks have an incentive to inefficiently incur high risks, both in the presence of deposit insurance not properly

priced and in externalities that result in banking collapses. However, as risk is not directly observable, due to privacy and unobserved information from the banks, capital requirements cannot precisely control the level of risk to which banks are exposed.

Morgan (2002, p. 874) associated asymmetric information in relation to the opacity of the information available from banks, indicating the disagreement in certain evaluations of the American rating agencies and emphasizing that the uncertainty about banks comes from their assets, loans, and securities in particular, which are risks that are difficult to observe and change. In addition to the uncertainty about their assets, the leverage of banks can also result in problems of agency.

Regarding the **Business model** object of study and its relationship with leverage, Carey et al. (1998) highlighted the specialization in the North American corporate credit market by comparing corporate lending by banks and other financial institutions. The results showed that financial institutions tend to lend to riskier companies, particularly those that are more leveraged.

Holland (2010) reviewed the literature on business models and compared the cases of bankrupt and non-bankrupt banks and found evidence that the lack of basic knowledge about the risks and values of the banking business by managers and the administration of the institutions in the failed banks had an effect on the recent banking crisis.

Additionally, in the context of the likelihood of a banking collapse (**default risk**), the relationship between this issue and prudential regulation of capital was seen in the work of Episcopos (2008). The author used barrier options to study contingency claims. According to the author, barrier options are similar to the standardized options for buying and selling stocks; however, they start or stop when the value of the underlying asset reaches a predetermined level before the date for exercising the option. The regulator or the administrator of the bank deposit insurance has an option over the assets of the banks, which can be counterbalanced with the expectation of coverage costs (Episcopos, 2008, p. 1677). The results found showed that regulatory barriers are priced into the stock market

and are inversely proportional to the leverage indicator.

Poghosyan and Čihak (2011, p. 163) analyzed the determinants of problematic banking situations in Europe, and the results showed that leverage is an important determinant of the risk situations of banks as well as the asset quality and profitability profile. Additionally, Lee and Chih (2013) examine whether Chinese banks have met standard regulations and analyze how previous regulations have impacted bank risk.

It should be noted that, besides the determinants of the performance profile of the banks already cited (e.g., profitability, quality, size, and growth of assets), institutions are affected by the economic context they are subjected to – these external determinants are analyzed in important studies related to the leverage of banking institutions.

Regarding the **business cycles** object of study, in a work conducted with data before and after the 2007 crisis, Kalemli-Ozcan et al. (2012) found evidence of the pro-cyclicity of leverage for large commercial banks and investment banks in the United States. The study also covered emerging market countries, and the results showed that *tighter* banking regulations may have contributed to less deleveraging during the crisis of 2007. According to these authors, excessive risk-taking before the crisis was related to the quality, not quantity, of the assets.

In this context, bank capital buffers could be useful to manage systemic risk in different economic cycles. For instance, Valencia and BolaÃ±os (2018) analyze capital buffers and cyclical patterns around the world, whereas Guidara et al. (2013, p. 3374) study countercyclical effects between the capital buffer of six large Canadian banks and the business cycles. The authors observe a larger capital buffer in economic expansions than in recessions, which can be explained – among others results – by the Canadian experience of implementing both the risk-based capital requirement and the non-risk-based capital requirement (Leverage Ratio).

Poledna et al. (2014) considered the leverage cycle to be a process that is dependent on investor heterogeneity. The authors used three regulatory credit policies, as follows:

the case of non-regulation, the Basel II accord, and a hypothetical alternative using options to hedge risk operations. When compared to the unregulated case, both the Basel II accord and the perfect hedge policy reduce the risk of default when the leverage is low, but increase the risk when the leverage is high. This is because both regulatory policies increase the level of buying and selling of assets necessary to achieve deleveraging, which may destabilize the market (Poledna et al., 2014, p. 199).

The relationship between **capital markets** and leverage was considered in important studies conducted by Beltratti and Stulz (2012); Calomiris and Nissim (2014); Demirguc-Kunt et al. (2013); Evanoff and Wall (2001); Saunders and Wilson (2001), which compared the behaviour of instruments issued by banks (stocks or subordinated debt) and the level of capital held by these institutions, especially in crisis situations.

Saunders and Wilson (2001, p. 185) mention self-regulatory incentives generated by valuable bank charters to constrain their risk taking and present evidence that charter value itself may emerge from high-risk intermediation. During economic expansions, bank charter values rise to reflect growth opportunities and banks gain easier access to equity capital sources. However, the relationship may invert during economic contractions, demonstrating that the charter value and bank leverage relationship is sensitive to market conditions.

Evanoff and Wall (2001, p. 121) performed an empirical analysis of the effectiveness of some capital ratios as well as subordinated debt spreads to predict the economic conditions of banks. The results showed that some capital ratios have no predictive power. However, the leverage ratio performs much like the sound predictive power of the spreads of subordinated debts. Beltratti and Stulz (2012, p. 1) used the significant variations in the share returns of major world banks during the period from July 2007 to December 2008 to evaluate the poor performance of these banks' shares during this period. Among other results, they found that the banks with better performance had lower leverage and lower returns just before the crisis.

Demirguc-Kunt et al. (2013, p. 1147) studied the situations in which the best capitalized banks obtained higher stock returns during the financial crisis. The authors distinguished various types of capital ratios, as follows: risk-based capital ratio, leverage indicator, level 1 and level 2 capital ratios, and the tangible capital ratio. Among the results found, before the crisis, the difference between capital ratios did not have much impact on stock returns. During the crisis, a stronger capital position was associated with better stock market performance, especially for large banks. The strongest capital position was notably better when using the leverage indicator rather than the risk-based capital indicator.

Calomiris and Nissim (2014) studied changes in the market indicators of US banks during the financial crisis, and the results showed that the declines in intangible assets coupled with unrecognized contingent liabilities may explain the extent and persistence of the decline of market indicators and indicators of equity value.

In the context of the financial crisis of 2007, the subject of **systemic risk** became very important, especially after the aid given to the financial institutions that were systematically important at that time, which caused an increased expenditure of public resources — especially in developed countries —to avoid the collapse of large institutions and the consequent spread to the entire financial system.

To reduce the possibility of a banking collapse, Vallascas and Keasey (2012) suggest the adoption of a ceiling in the absolute size of a bank, which would be an effective measure for systemic risk and a complement for the measures of liquidity and leverage. The authors also suggested adopting portions of non-interest revenue (service revenue) and the growth of assets, which are important indicators in regulatory actions disclosed by the Basel Committee.

Using the CoVaR approach to identify the determining factors of systemic risk, López-Espinosa et al. (2012, p. 3150) did not find strong evidence that either size or leverage contributes to increasing systemic risk in the context of internationally active

banks. Patro et al. (2013) presented a systemic risk indicator based on the correlation of the return on stocks of financial institutions. They indicated that the increase in systemic risk is highly influenced by the increase in the correlation between the idiosyncratic risks of the banks, which tend to predict or coincide with important economic events such as the crisis of 2007.

Similarly, Weiß et al. (2014, p. 78) found no empirical evidence that bank size, leverage, non-interest revenue, or bank asset quality are persevering determinants of systemic risk in financial crises. The results show that global systemic risk is predominantly guided by the characteristics of the regulatory regime.

Black et al. (2016, p. 107) calculated a distress insurance premium to determine the systemic risk of European banks. This measure includes characteristics of the banks, such as size, likelihood of default, and correlation. The results showed that the risk of default on sovereign securities has a strong influence on systemic risk and that the specific indicators of the banks (e.g., leverage) predict the systemic risk a year ahead.

In the context of the financial crisis of 2007, to verify the **financial system stability**, Morris and Shin (2008, p. 229) presented the idea of a leverage constraint, not from the traditional viewpoint of a buffer against the loss of assets, but as a result of the stabilization of the institutions' liabilities in a highly connected financial system.

Vazquez and Federico (2015, p. 1) analyze the evolution of banks' financing structures in the course of the global financial crisis, as well as the implications for financial stability. According to the authors, the emphasis of *Basel III* should be on the leverage of the banks, particularly for systematically important institutions

Goddard et al. (2009) analyzed the government measures taken in western Europe to address problem banks during the crisis, and, under the new regulatory framework, banks in the region should be less leveraged. Clarke (2010) determined that the recent financial crisis called for a detailed analysis of how some financial institutions had taken such high risks and how risk management, governance, and the ethical environment allowed such

risky situations for the institutions.

Kane (2012) studied the tax benefits received by financial institutions in the safety net contracts in the United States and concluded that a key factor in achieving robust financial reform is to develop an effective statistical metric for measuring the ex-ante value of the support given, both in aggregate form and by individual institution.

Furthermore, the relationship between leverage and others banking issues can be found in important studies. Hughes et al. (1999, p. 292) studied the **banking consolidation and mergers** of US banks and found evidence that the economic benefits of the consolidation are greater for those banks engaged in inter-state expansion and, in particular, that which diversifies the macroeconomic risks of the banks.

McAleer (2009, p. 831) studied the monitoring of **market risk** from the perspective of the Basel II accord and found evidence that it encourages excessive risk-taking, due to the high costs of accurate measures and risk projections.

Studies like the one by John et al. (2010, p. 383) examine **CEO compensation** and the existence of two types of problems of agency, as follows: the classic owner-manager agency problem and the problem of the change in risk between shareholders and creditors. The results show that the sensitivity regarding the payment for CEO performance decreases with the increase in the leverage indicator.

Braun and Raddatz (2010, p. 234) analyzed when **former politicians** become directors of banks, and they found that, at a micro level, banks that are politically connected are larger and more profitable than other banks, despite being less leveraged.

Kishan and Opiela (2012, p. 573) analyze a **monetary policy** channel through the risk pricing of bank debt in the market for jumbo certificates of deposit and the results show that contractionary policy boosts the sensitivity of jumbo-CD spreads to leverage and asset risk for small banks, and to leverage for large banks. Angeloni and Faia (2013, p. 311) studied the connection between monetary policy and capital regulation, and the

results showed that a monetary expansion and a positive productivity shock increase the risk and leverage of the banks. According to the authors, risk-based capital requirements amplify the economic cycle. Thus, within simple prudential rules, the best combination includes anti-cyclical capital ratios and a response to monetary policy for asset prices or for leveraging of the banks.

Using the **classic capital structure classification** between pecking order theory and trade-off theory, Riccetti et al. (2013) used the dynamic trade-off theory to model the leverage and financial structure of firms and the possible impact, in the case of default, on the financial and equity situation of banks, as well as the impact on the stability of the financial system, also covering the systemic risk and monetary policy of central banks. Among other things, the results showed that if the leverage increases, the economy becomes riskier, with a higher pro-cyclical leverage having a destabilizing effect that could weaken the effect of the monetary policy.

4 Results of Literature Analysis

Given the set of articles in the sample, it was found that the main publication vehicle is the Journal of Banking and Finance, with 22 articles in the sample, representing 14% of the total. The sample was also found to have a large dispersion of publication vehicles – 40 journals had only 1 publication, which represents 25% of the total.

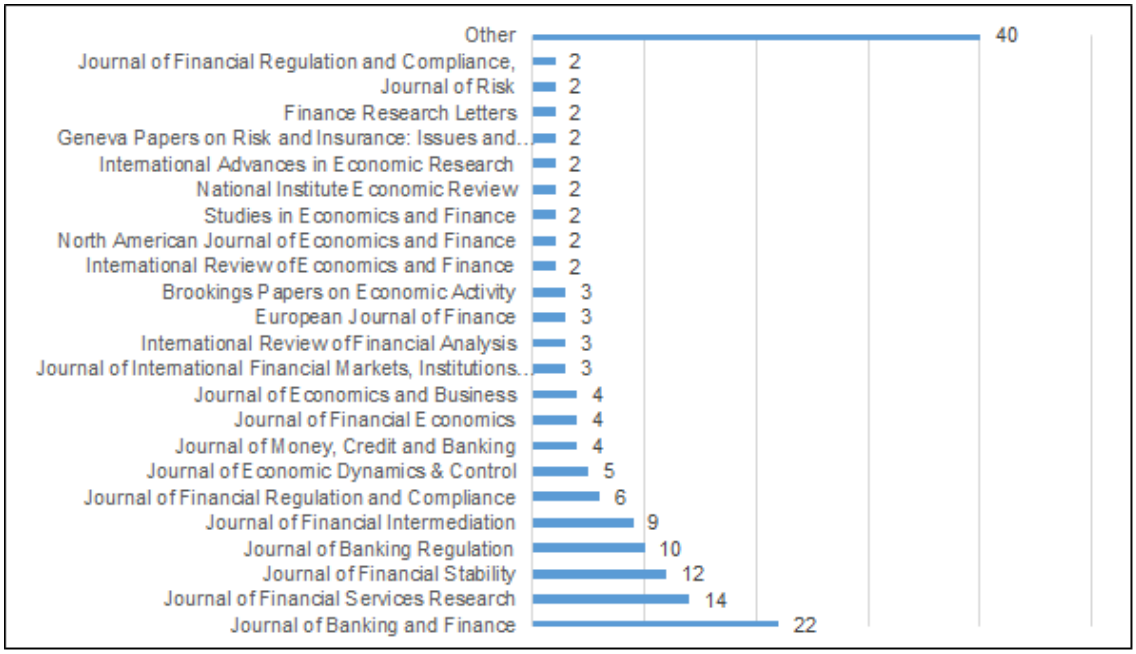

Figure 1: *Number of articles per journal.*

In relation to the year of publication, production increased after the financial crisis of 2007 – 86% of the sample's articles were published within this period.

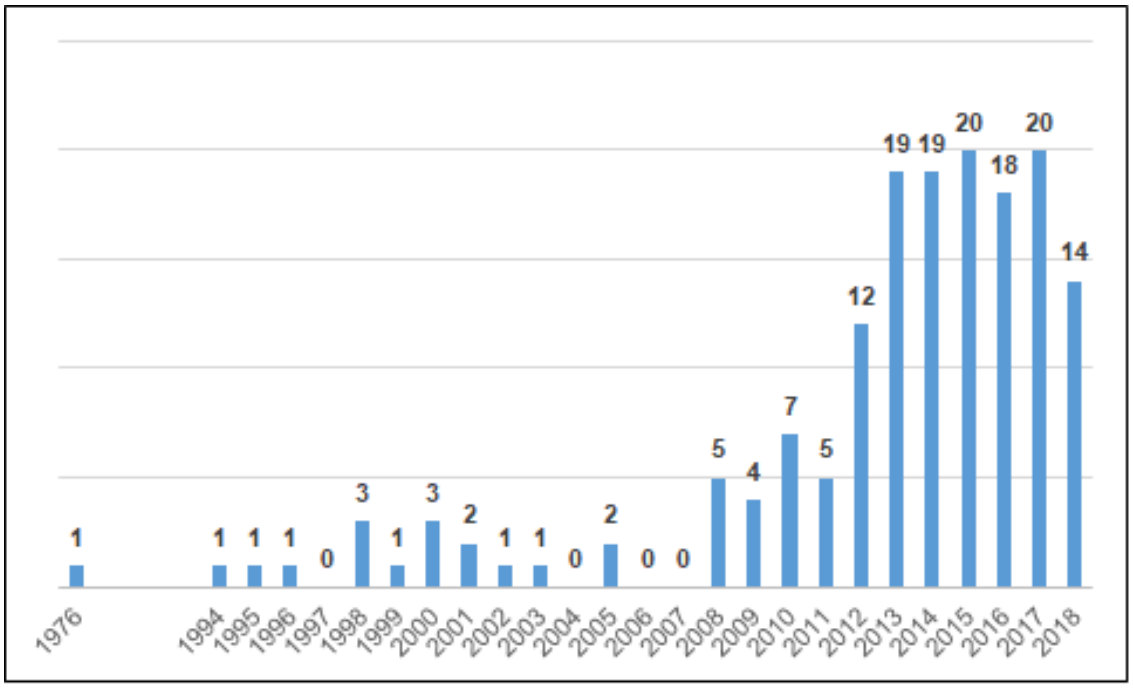

Figure 2: *Number of articles per year.*

The results found in relation to the components of Tables 1 and 2 presented in the

methodology and respective coding are shown in what follows below. Table 6 uses the coding scheme proposed in Table 1 to address the connections of the objects of study. We can see from that, considering the *default risk* / *distress risk* an object with microprudential approach, it was the most frequent (48 articles or 30% of the sample) in this type of approach. Given that the *default risk* to which banks are subjected represents the greatest risk incurred by them, this result is somewhat expected, in accordance with the works of Poghosyan and Čihak (2011), Episcopos (2008), and DeAngelo and Stulz (2015), who discussed the quality of the assets, regulatory limits, and debt issuance, respectively, as well as possible impacts on the *default risk* of banking institutions.

Additionally, from the microprudential point of view, 22 articles in total were classified within the *moral hazard* object of study. For example, *moral hazard* with *default risk* and also *corporate governance* were discussed in the works of Allen et al. (1996); Episcopos (2008); Harding et al. (2013); Inderst and Mueller (2008), and Mullineux (2011, 2014). The *business model* object of study is more strongly associated either with *systemic risk* (11 times), in works such as Blum (2008); Vallascas and Keasey (2012), or with *default risk* (9 times), in works such as Aymanns et al. (2016a); Tasca et al. (2014).

Considering the *capital markets* object of study, which was found in 17 articles, it was associated with *financial stability* in 10 of the sample articles, in works such as Calomiris and Nissim (2014); Chan-Lau et al. (2015); Demirguc-Kunt et al. (2013), which assessed the behavior of the stock value of the financial institutions before and during the last major financial depression.

Seven of the nine articles of *asymmetric information* object was found in the period after 2007 crisis, in works such as Dermine (2015); Plantin (2015), who studied imperfect information regarding banks' assets. It was also verified that only three articles had *bank runs* as the object of study (Angeloni and Faia, 2013; Benhabib et al., 2016; Dermine, 2015), which can be regarded as an opportunity for future studies, given that the *bank runs* – according to Diamond and Dybvig (1983) – is a common feature during a crisis.

The *financial stability* object of study was found to have the highest number of articles – 73 or 46% of the sample. This object is predominant in articles appearing after the financial crisis of 2007. It is interesting to note that in a joint analysis with other objects, the *financial stability* object was found in 24 articles in conjunction with the *systemic risk* object and in 21 articles in conjunction with the *default risk* object – see Table 6. It can be said that this relationship is important, given that after the financial crisis of 2007, the concern with *financial stability* was discussed, mainly due to the *contagion* and consequent spread of *systemic risk* among large international banks, for example, in the studies of Beltratti and Stulz (2012) and López-Espinosa et al. (2012), which indicated that long-term debt deficits are a determining factor for the spread of *systemic risk* and the consequent fragile *financial stability* of large world banks. Furthermore, the discussion of *financial stability* with *default risk* was addressed in the studies of Vazquez and Federico (2015) and Chernykh and Cole (2015), which dealt with the connection between *default risk* and *financial stability*.

Also from the macroprudential view, the *business cycles* object of study was found a higher number of times with the objects of study *financial stability* (15 times) and *systemic risk* (11 times), which indicates the strong connection between the objects of study of this same approach. Except for the study of Saunders and Wilson (2001), for the other articles in the sample, the *business cycles* object of study became the target of study after the financial crisis of 2007, which indicates the concern of experts about placing the connection of the leverage with the real economy.

	Asymm. infor.	Moral hazard	Bank runs	Business model	Cap. markets	Default risk	Business cycles	Syst. risk	Financ. Stab.	Others
Asymm. infor.	9									
Moral hazard	2	22								
Bank runs	1	1	3							
Business model	3	4	0	34						
Capital markets	0	2	0	2	17					
Default risk	1	6	1	9	2	48				
Business cycles	0	1	2	5	3	7	25			
Systemic risk	3	1	0	11	2	18	11	44		
Financ. Stab.	1	6	1	8	10	21	15	24	73	
Others	5	6	1	7	0	11	3	13	17	48

Table 6: *Connection between the objects of study.*

The objects of study classified in the *others* item – not directly explained in Table 1 – and their respective number of citations were as follows: *corporate governance* (twelve times); *liquidity* (eleven times); *monetary policy* (eight times); *agency theory* (seven times); *market discipline* and *monitoring or supervision* (six times each); *market risk* (four times); *banking resolution* and *trade-off theory* (twice each); and *regulation*, *economic policy*, *safety nets*, and *behavioral economics* (once each). The object most cited in the *others* category – *corporate governance* – is in line with the procedures promulgated by the Basel committee for good supervisory and regulatory practices, known

as pillars two and three.

Also in relation to the results from Table 1 of the proposed coding scheme, with regard to the focus of the study, most of the articles in the sample have *banks* as the focus of the study (125 of the 160 articles in the sample). Given that regulatory banking leverage has the banks as its main object, the result found was expected.

Regarding Table 2, which addresses how banking leverage is being studied in the literature, the results of each item are shown in Table 7 and Figures 3, 4, and 5. The categories of Theoretical and Empirical study types had 44% and 48% of the articles from the sample, respectively. The remainder (8%) used these categories together. Regarding the type of approach (Table 2 - C4), approximately 78% of the articles used a quantitative approach, with the following fitting into this category: empirical studies (Table 7 coding 3B and 3C, representing 48% and 9% of the sample, respectively), theorists of mathematical methods (Table 7 coding 5C, representing 14%), and theorists of simulation methods (Table 7 coding 5B, representing 9%). Therefore, there is a possibility for future studies with a qualitative approach, as this approach represented only 16% of the sample. Regarding the methods used, 48% were of the Econometric / Statistical / Multivariate analysis type.

Classification	Number of articles	Proportion
3A - Theoretical	70	44%
3B - Empirical	76	48%
3C - Both	14	9%
5A - Econometric...	77	48%
5B - Computational...	15	9%
5C - Modelling...	22	14%
5D - Not applicable	26	16%
5A e 5B	2	1%
5A e 5C	5	3%
5B e 5C	13	8%
7A - Total assets/ Equity	73	46%
7B - Tier 1 capital / Total exposure	13	8%
7A e 7B	10	6%
7C - Not applicable	64	40%
8A - One country	75	47%
8B - More than one country	13	8%
8C - Region / bloc	17	11%
8D - Global	8	5%
8E - Not specified / Not applicable	47	29%
10A - Up to 2 years	11	7%
10B - From 2 to 5 years	13	8%
10C - From 5 to 10 years	23	14%
10D - More than 10 years	39	24%
10E - Not applicable	74	46%
11A - New perspectives	69	43%
11B - Consistent with previous studies	91	57%

Table 7: *Number of articles in accordance with the classification.*

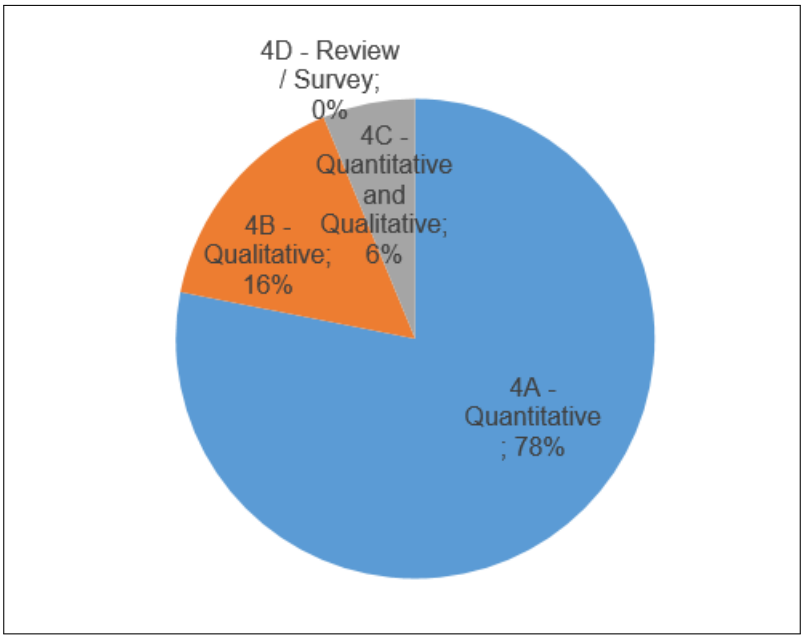

Figure 3: *Type of approach.*

Also in relation to Table 2 of the coding scheme, most of the analyzed data are from various sources (36%), as seen in Figure 4. This result is feasible since, in empirical studies of financial system analysis, it is more likely that data are collected from various sources than just one location. Additionally, there are studies using a single data source. In the sample of articles, these studies employed market, balance sheet and regulator data. In relation to the results for the metrics used, according to Table 7, 46% of the articles in the sample used the traditional accounting metric (classification 7A), which considers the assets and equity of the institutions, or variants very close to this metric. This result was expected because the regulatory leverage metric stipulated by the Basel committee was disclosed only in the year 2014.

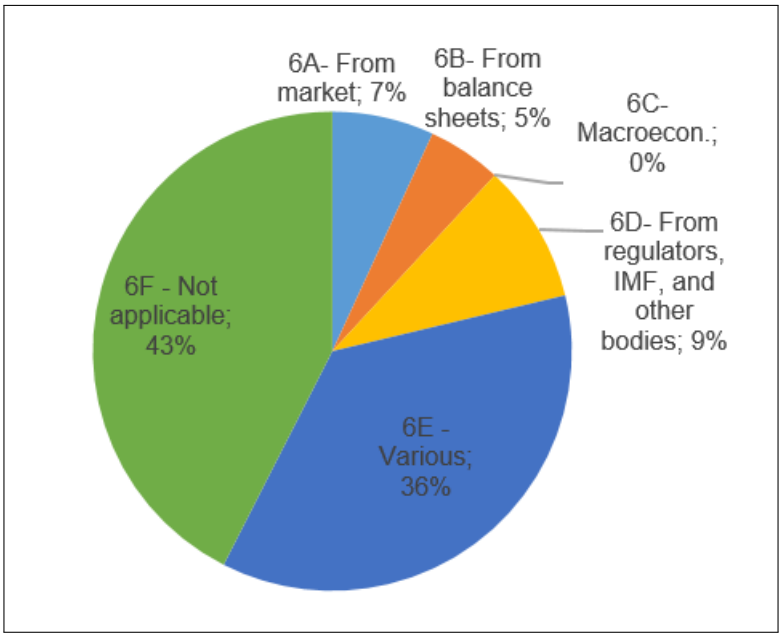

Figure 4: *Type of data.*

The results associated with Table 2 - C9 of the coding scheme indicated a gap for studies that address the topic of leverage in emerging countries – see Figure 5. Only 6% of the articles in the sample have emerging countries as the context – 58% of the studies performed were related to developed countries. In relation to the scope applied, according to Table 7, approximately 47% of the studies apply to only one country – for example, the studies addressing the financial crisis that began in 2007 and related to the behaviour of American banks (Cathcart et al., 2015; Papanikolaou and Wolff, 2014) and Canadian banks Guidara et al. (2013).

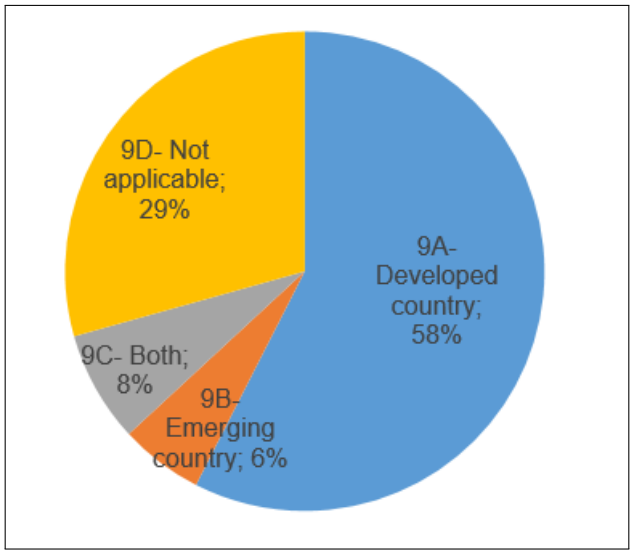

Figure 5: *Context.*

Regarding the C10 coding from Table 2, the empirical articles with study periods longer than 10 years have the highest proportion in the sample, representing 24% of the total number of articles researched, according to Table 7 item 10D, which indicates a trend of longer-term empirical studies when addressing the topic of banking leverage. Studies with a macroprudential approach are predominant when a longer period of time is considered, for example, the studies by Papanikolaou and Wolff (2014), Poghosyan and Čihak (2011), Guidara et al. (2013), Weiß et al. (2014), Kishan and Opiela (2012), Calomiris and Nissim (2014), Black et al. (2016), and Calmès and Théoret (2013).

Regarding the *results* item of the coding scheme in Table 2 item C11, Table 7 item 11B shows that 57% of the articles surveyed are consistent with results previously presented in the literature and Table 7 item 11A shows that approximately 43% present new perspectives in relation to previous results in the literature, which shows that the subject of banking leverage provides a significant share of new approaches and an addition to existing theory. For example, the study by Papanikolaou and Wolff (2014) paid particular attention to the deleveraging process of banking institutions after the 2007 crisis, and the study of Dermine (2015) revealed new ideas by studying the leverage limit as an argument to reduce the risk of *bank runs*, given the *asymmetric information* about the values

of bank assets.

5 Results of the Research Network Analysis

In order to extract relevant information about the topic of regulatory banking leverage, this section shows the results of research network analysis. In the use of bibliometric techniques for the sample, the *Bibliometrix* library of the R statistical analysis software was used, in accordance with Aria and Cuccurullo (2017). The kamada-kawai layout (Kamada and Kawai, 1989) was used together with the VosViewer software (van Eck and Waltman, 2010) to visualize and construct the graph in pajek format, which aimed at treating a large network of connections in multiple small networks.

For the co-citation analysis, the main 60 references cited were selected to perform a content analysis of these articles. References related to the normative publications of regulatory agencies were excluded to restrict the sample to only include articles. For the co-word analysis, using the keywords mentioned by the authors in the Scopus database, 40 main keyword connections were selected in the sample of articles. The next sections show the results of co-citation and co-word analysis.

5.1 Co-citation Analysis

Aiming at reinforcing the results presented in the bibliometric review, the technique of analysis through co-citation networks was also used for the 160 articles of the sample. According to Small (2004), this technique measures the frequency with which two articles are cited simultaneously in a third article. The *nodes* show the units of analysis (the references of the articles in the sample) and the *edges* signify the similarity between the connections (co-citations).

The size of the circles is linked to the number of times the article participated in a co-citation, which demonstrates the strength of the links or the connectivity of the work.

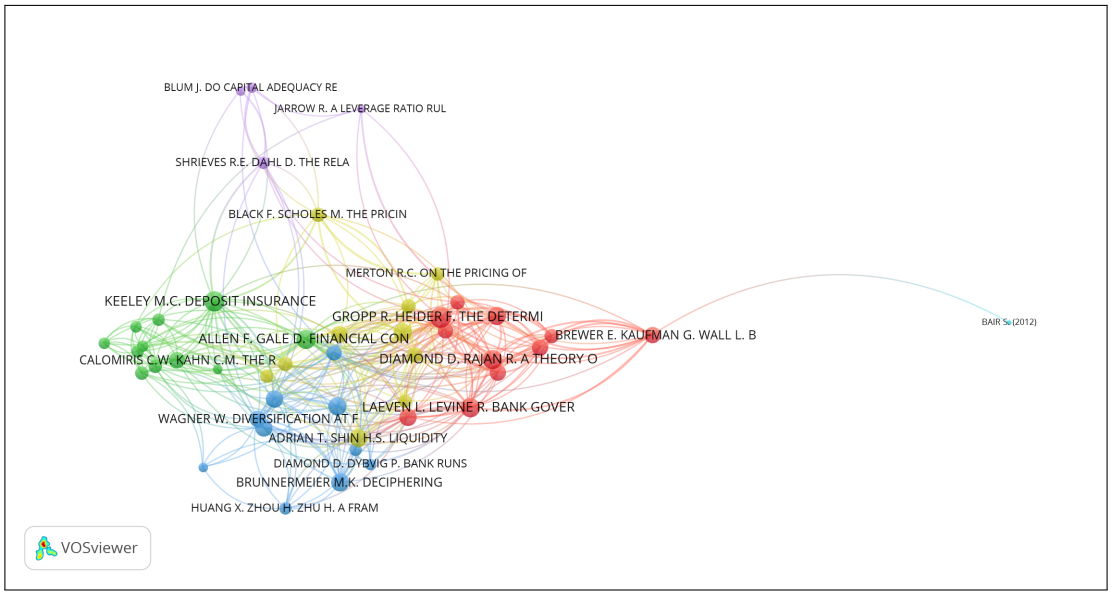

Figure 6: *Network of co-citations.*

Figure 6 is the result of the co-citation network of the articles used in the bibliometric review, and the creation of the five main clusters can be seen in it.

The clusters formation follows the pajek format (Mrvar and Batagelj, 2016), a data reduction technique appropriate to identify niches and treat a large network of connections in multiple small networks. The formation of clusters is based on the largest number of links (co-citations) among the works cited.

The purple cluster includes the works of Blum (1999); Calem and Rob (1999); Jarrow (2013); Shrieves and Dahl (1992), who addressed the link between risk and banking capital.

In the yellow cluster, the works of Adrian and Shin (2010); Brunnermeier and Pedersen (2009); Kiyotaki and Moore (1997) are the ones with the greatest link strength (above 20) – they dealt with *credit cycles*, *liquidity* and the relationship with leverage. In the blue cluster, the authors Brunnermeier (2009); Demsetz and Strahan (1997); DeYoung and Roland (2001); Diamond (1984); Wagner (2010) also had link strengths above 20, and they addressed the theory of financial intermediation, more specifically, the monitoring and business model of banking institutions, with the risk incurred by these institutions.

The most recent publications in this cluster also address *liquidity*, *credit bubbles*, and *systemic risk*.

The green cluster includes the authors Allen and Gale (2000); Calomiris and Kahn (1991); Keeley (1990), who had the greatest link strength (also above 20) and essentially addressed *moral hazard*, *default risk*, and *contagion* in the financial system. The red cluster has as its exponent the study of Gropp and Heider (2010), which analyzed the determinants of the banking capital structure, considering elements of the classical theory of finance in the activity of financial intermediation.

Thus, by analyzing the network of co-citations and the construction of clusters, it can be seen that the bibliometric review uses both recent citations regarding the financial crisis of 2007 and classic financial theory citations.

5.2 Co-word Analysis

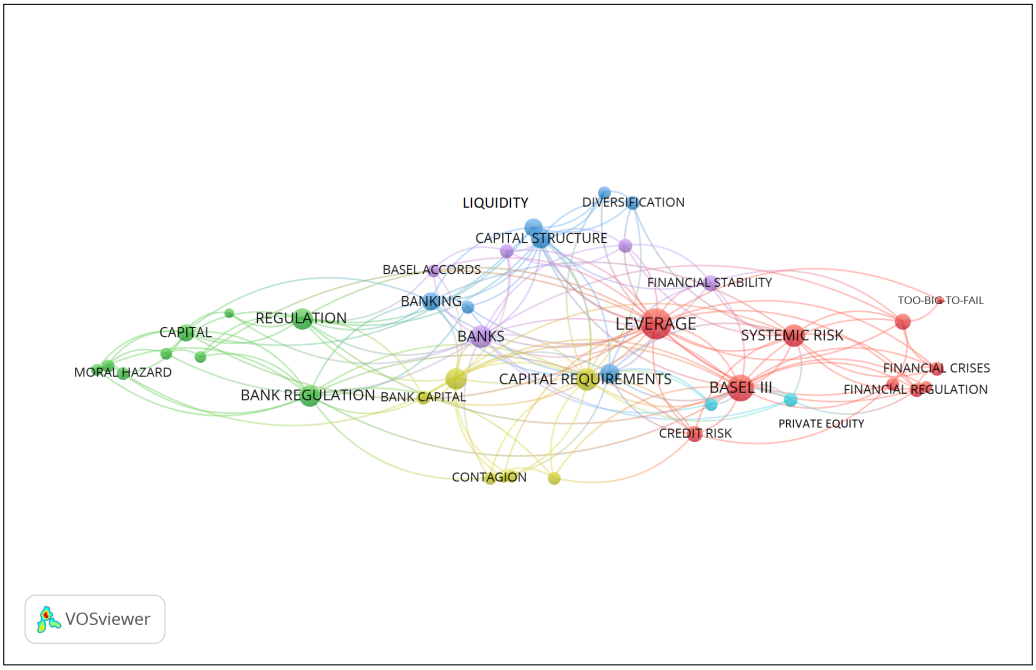

Figure 7: *Co-word network.*

Co-word analysis facilitates the understanding of the cognitive structure by mapping and creating clusters of the terms extracted from the keywords.

The *nodes* show the units of analysis (keywords) and the *edges* signify the co-occurrence of terms between documents. As in the co-citation network, the clusters formation follows the pajek format (Mrvar and Batagelj, 2016), based on the largest number of links (co-words) among the articles in the sample.

Having applied the methodology described in the section 2.2, it could be seen in Figure 7 that the keywords bank, capital, regulation, and Basel, and their variations, permeate the six clusters found, which was expected because they are basic words for the study of leverage, and, according to Galati and Moessner (2011), the main target of the Basel 3 proposals was the banking sector. Thus, the finding of these key terms in the articles of the sample is consistent with the concerns of the banking sector's regulating agencies.

In addition to these key terms, the most found words and their corresponding number of links are as follows: *systemic risk* (14), *financial crisis* (13), and *liquidity* (10).

In the red cluster, the evaluation of leverage in the macroprudential context is highlighted, which is mainly associated with the *systemic risk* object of study. This association can be found in the studies by Vallascas and Keasey (2012) and Patro et al. (2013). This cluster shows the concern of the articles studied regarding the financial policies adopted by countries and regulatory bodies due to the last financial crisis, which is the focus of the Basel 3 accord (BIS, 2010). In the green cluster, the regulation of capital structure and risk is represented by the study of objects related to *moral hazard*, deposit insurance (Gueyie and Lai, 2003; Lee, 2009b; Schenck and Thornton, 2016) and CEO compensation (Chaigneau, 2013). In the blue cluster, keywords that represent *liquidity* and variations of the term banking are found, which are associated with capital structure. The studies of Ratnovski (2013) and Hugonnier and Morellec (2017) are examples of articles in this cluster that are in line with the concerns of the regulatory agencies about the ability of financial institutions to honour their deposits and funding, both in the short and long term, as advocated by BIS (2010). Also the term diversification appears in this cluster associ-

ating the ability of banks to combine leverage, *liquidity* and loan portfolio diversification (Sorokina et al., 2017).

In relation to the yellow cluster, leverage is associated mainly with the *contagion* between financial instituions in studies such as those by Elyasiani et al. (2015), Lengwiler and Maringer (2015), Roukny et al. (2016) and Dreassi et al. (2017). These works support the notion that both depositors and market participants play an important role in *financial stability*, as well as taking into account the importance of market discipline (Acharya and Thakor, 2016).

In the purple cluster, the Basel accords and capital regulation are associated with the activity of financial intermediation and *financial stability*, in accordance with the following topics and studys: *business cycles* (Calmès and Théoret, 2013), monetary policy (Valencia, 2014) and *systemic risk*, encompassing the Value-at-Risk management by banks and the leverage cycle in the period of the financial crisis and the period leading up to it (Aymanns et al., 2016b), and the relation of *corporate governance* and *systemic risk* (Ellis et al., 2014). Finally, the light blue cluster covers mainly the keyword *private equity*, which can be seen in the works of Heed (2010) and Arayssi (2016), which address the effect that private investment has on bank capital requirements.

6 Final considerations

In this present study, significant results that relate the topic of regulatory banking leverage to important objects of study from the finance and economics literature were found (e.g., *financial stability*, *default risk*, and *systemic risk*), in accordance with the bibliometric review conducted considering important journals in the areas of finance and economics.

Considering the bibliometric method used, this work has its limitations. By changing some criteria, some articles could be included or excluded from the sample. From the literature analysis perspective, the categories of object of study could also be modified

depending on the researcher's approach and interest. Nonetheless, the structure of this bibliometric revision brought important results as well as possibilities for future studies.

It was found that the main publication vehicle is the Journal of Banking and Finance, representing 14% of the sample. Yet, 46% of the articles of the sample had *financial stability* as their object of study. It is interesting to note that all the articles for this object of study were published after the financial crisis of 2007. Before this crisis, important studies mainly considered the *moral hazard* object of study. These studies were related to the use of deposit insurance by the financial institutions.

It should be emphasized that, considering a microprudential view, the *default risk* object of study was the object most cited, which is an important and also expected result, given that *default risk* is one of the greatest risks that financial institutions are exposed to. A gap in the study of banking leverage in emerging countries was identified, as studies of this context represented only 6% of the sample of articles studied.

Given the research network analysis, it could be seen that the articles by Gropp and Heider (2010) and Keeley (1990) were the most relevant in co-citation network, which makes them a reference for research on the topic of banking leverage, varying in accordance with the specific cluster to be studied.

The results in the co-word network analysis indicated potential terms in future research and studies on the subject of banking leverage. Beside the key terms *banking, capital, regulation, and Basel* and their variations, the keywords *systemic risk*, *financial crisis*, and *liquidity* were the most founded. Yet, the co-word network analysis and their cognitive structure encompass six clusters and the main keywords: *systemic risk*, *moral hazard*, *liquidity*, *contagion*, *financial stability* and *private equity*, which indicates the strength of the macroprudential approach in the studies related to banking leverage, in line with that advocated by BIS (2010).

Finally, because the *financial stability* object of the studies was the one most found in the research conducted, it should be highlighted – in accordance with Acharya and

Thakor (2016) – that microprudential and macroprudential regulations not only act independently, but there is also tension between the two forms of regulation. Thus, it may be considered important not only to stick to studies of a macroprudential nature (as occurred preponderantly in the literature in the period after the financial crisis of 2007), but also to consider other objects more linked to microprudential approach besides *default risk*, which was present in the sample of articles studied. For example, one can consider the *bank runs* object of study and their relationship with macroprudential issues, which this work establishes as a suggestion for future studies.

References

Acharya, V. and Thakor, A. (2016). The dark side of liquidity creation: Leverage and systemic risk. *Journal of Financial Intermediation*, 28:4–21.

Admati, A. (2016). The Missed Opportunity and Challenge of Capital Regulation. *National Institute Economic Review*, 235(1):R4–R14.

Adrian, T. and Boyarchenko, N. (2018). Liquidity policies and systemic risk. *Journal of Financial Intermediation*, 35:45–60.

Adrian, T. and Shin, H. S. (2010). Liquidity and leverage. *Journal of Financial Intermediation*, 19(3):418–437.

Agur, I. (2013). Multiple bank regulators and risk taking. *Journal of Financial Stability*, 9(3):259–268.

Agénor, P.-R. and da Silva, L. A. P. (2014). Macroprudential regulation and the monetary transmission mechanism. *Journal of Financial Stability*, 13:44–63.

Allahrakha, M., Cetina, J., and Munyan, B. (2018). Do higher capital standards always reduce bank risk? The impact of the Basel leverage ratio on the U.S. triparty repo market. *Journal of Financial Intermediation*, 34:3–16.

Allen, F. and Gale, D. (2000). Financial Contagion. *Journal of Political Economy*, 108(1):1–33.

Allen, L., Jagtiani, J., and Landskroner, Y. (1996). Interest rate risk subsidization in international capital standards. *Journal of Economics and Business*, 48(3):251–267.

Andersen, H. (2011). Procyclical implications of basel ii: Can the cyclicality of capital requirements be contained? *Journal of Financial Stability*, 7(3):138–154.

Angeloni, I. and Faia, E. (2013). Capital regulation and monetary policy with fragile banks. *Journal of Monetary Economics*, 60(3):311–324.

Arayssi, M. (2016). The effect of private investments on banks' capital requirements. *The European Journal of Finance*, 22(15):1580–1595.

Aria, M. and Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4):959–975.

Ayadi, R., Naceur, S. B., Casu, B., and Quinn, B. (2016). Does basel compliance matter for bank performance? *Journal of Financial Stability*, 23:15–32.

Aymanns, C., Caccioli, F., Farmer, J., and Tan, V. W. C. (2016a). Taming the Basel leverage cycle. *Journal of Financial Stability*, 27:263–277.

Aymanns, C., Caccioli, F., Farmer, J., and Tan, V. W. C. (2016b). Taming the Basel leverage cycle. *Journal of Financial Stability*, 27:263–277.

Aymanns, C. and Farmer, J. D. (2015). The dynamics of the leverage cycle. *Journal of Economic Dynamics and Control*, 50:155–179.

Baker, M. (2016). Risk neglect in equity markets. *Journal of Portfolio Management*, 42(3):12–25.

Balin, B. (2008). Basel i, basel ii, and emerging markets: A nontechnical analysis. *SSRN Electronic Journal*.

Barakova, I. and Palvia, A. (2014). Do banks' internal basel risk estimates reflect risk? *Journal of Financial Stability*, 13:167–179.

Barth, A. and Seckinger, C. (2018). Capital regulation with heterogeneous banks – Unintended consequences of a too strict leverage ratio. *Journal of Banking and Finance*, 88:455–465.

Barucci, E., Baviera, R., and Milani, C. (2016). Is the Comprehensive Assessment able to capture banks' risks? *Finance Research Letters*, 19:98–104.

Barucci, E., Baviera, R., and Milani, C. (2018). The comprehensive assessment: What lessons can be learned? *European Journal of Finance*, 24(15):1253–1271.

Beltratti, A. and Stulz, R. M. (2012). The Credit Crisis Around the Globe: Why Did Some Banks Perform Better? *Journal of Financial Economics*, 105(1):1–17.

Benbouzid, N., Leonida, L., and Mallick, S. K. (2017a). The non-monotonic impact of bank size on their default swap spreads: Cross-country evidence. *International Review of Financial Analysis*, 55:226–240.

Benbouzid, N., Mallick, S., and Sousa, R. (2017b). An international forensic perspective of the determinants of bank CDS spreads. *Journal of Financial Stability*, 33:60–70.

Bengtsson, E. (2016). Investment funds, shadow banking and systemic risk. *Journal of Financial Regulation and Compliance*, 24(1):60–73.

Benhabib, J., Miao, J., and Wang, P. (2016). Chaotic banking crises and regulations. *Economic Theory*, 61(2):393–422.

Bergevin, P., Calmès, C., and Théoret, R. (2013). Time-Varying Leverage and Basel III: A Look at Canadian Evidence. *International Advances in Economic Research*, 19(3):233–247.

Bernard, C., Courtois, O. L., and Quittard-Pinon, F. (2005). A Study of Mutual Insurance for Bank Deposits. *The Geneva Risk and Insurance Review*, 30(2):129–146.

Bernardo, A. E. and Welch, I. (2013). Leverage and Preemptive Selling of Financial Institutions. *Journal of Financial Intermediation*, 22(2):123–151.

Bharati, R. and Jia, J. (2018). Do bank ceos really increase risk in vega? evidence from a dynamic panel gmm specification. *Journal of Economics and Business*, 99:39–53.

BIS, B. C. B. S. (2010). Basel iii: A global regulatory framework for more resilient banks and banking systems. *BIS document*.

BIS, B. C. B. S. (2014). Basel iii leverage ratio framework and disclosure requirements. *BIS document*.

Black, L., Correa, R., Huang, X., and Zhou, H. (2016). The systemic risk of European banks during the financial and sovereign debt crises. *Journal of Banking and Finance*, 63(1):107–125.

Blum, J. (1999). Do capital adequacy requirements reduce risks in banking? *Journal of Banking and Finance*, 23(5):755–771.

Blum, J. (2008). Why basel II may need a leverage ratio restriction. *Journal of Banking and Finance*, 32(8):1699–1707.

Blundell-Wignall, A., Atkinson, P. E., and Roulet, C. (2012). The Business Models of Large Interconnected Banks and the Lessons of the Financial Crisis. *National Institute Economic Review*, 221(1):R31–R43.

Borio, C. (2003). Towards a macroprudential framework for financial supervision and regulation? *BIS Working Papers*, (128).

Borri, N., Caccavaio, M., Giorgio, G. D., and Sorrentino, A. M. (2014). Systemic risk in the italian banking industry. *Economic Notes*, 43(1):21–38.

Braun, M. and Raddatz, C. (2010). Banking on politics: When former high-ranking politicians become bank directors. *World Bank Economic Review*, 24(2):234–279.

Brei, M. and Gambacorta, L. (2016). Are bank capital ratios pro-cyclical? New evidence and perspectives. *Economic Policy*, 31(86):357–403.

Brunnermeier, M. and Pedersen, L. (2009). Market Liquidity and Funding Liquidity. *Review of Financial Studies*, 22(6):2201–2238.

Brunnermeier, M. K. (2009). Deciphering the Liquidity and Credit Crunch 2007-2008. *Journal of Economic Perspectives*, 23(1):77–100.

Bruno, V., Shim, I., and Shin, H. S. (2017). Comparative assessment of macroprudential policies. *Macroprudential Regulation: from Theory to Implementation*, 28:183–202.

Buncic, D. and Melecky, M. (2013). Macroprudential stress testing of credit risk: A practical approach for policy makers. *Journal of Financial Stability*, 9(3):347–370.

Cabral, R. (2013). A Perspective on the Symptoms and Causes of the Financial Crisis. *Journal of Banking and Finance*, 37(1):103–117.

Calem, P. and Rob, R. (1999). The Impact of Capital-Based Regulation on Bank Risk-Taking. *Journal of Financial Intermediation*, 8(4):317–352.

Calmès, C. and Théoret, R. (2013). Market-oriented banking, financial stability and macro-prudential indicators of leverage. *Journal of International Financial Markets, Institutions and Money*, 27(1):13–34.

Calomiris, C. W. and Kahn, C. M. (1991). The Role of Demandable Debt in Structuring Optimal Banking Arrangements. *American Economic Review*, 81(3):497–513.

Calomiris, C. W. and Nissim, D. (2014). Crisis-related shifts in the market valuation of banking activities. *Journal of Financial Intermediation*, 23(3):400–435.

Carbo-Valverde, S., Kane, E. J., and Rodriguez-Fernandez, F. (2008). Evidence of differences in the effectiveness of safety-net management in european union countries. *Journal of Financial Services Research*, 34(2-3):151–176.

Carey, M., Post, M., and Sharpe, S. A. (1998). Does corporate lending by banks and finance companies differ? evidence on specialization in private debt contracting. *The Journal of Finance*, 53(3):845–878.

Carson, J. and Hoyt, R. (2000). Evaluating the risk of life insurer insolvency: Implications from the us for the european union. *Journal of Multinational Financial Management*, 10(3-4):297–314.

Cartwright, P. and Sarraf, H. (2005). Leveraging regulatory investments with portfolio risk-based pricing. *Journal of Financial Regulation and Compliance*, 13(3):215–223.

Caruana, J. (2010). Macroprudential policy: Working towards a new consensus. *Bank for International Settlements*. Remarks at the high-level meeting on "The Emerging Framework for Financial Regulation and Monetary Policy" jointly organised by the BIS's Financial Stability Institute and the IMF Institute, Washington D.C. [Accessed: 2018 02 14].

Cathcart, L., El-Jahel, L., and Jabbour, R. (2015). Can regulators allow banks to set their own capital ratios? *Journal of Banking and Finance*, 53:112–123.

Cerutti, E., Claessens, S., and Laeven, L. (2017). The use and effectiveness of macroprudential policies: New evidence. *Macroprudential Regulation: from Theory to Implementation*, 28:203–224.

Chaigneau, P. (2013). Risk-shifting and the regulation of bank CEOs' compensation. *Journal of Financial Stability*, 9(4):778–789.

Chami, R., Cosimano, T., Kopp, E., and Rochon, C. (2018). Back to the future: the nature of regulatory capital requirements. *Journal of Banking Regulation*, 19(4):327–336.

Chan-Lau, J., Liu, E., and Schmittmann, J. (2015). Equity returns in the banking sector in the wake of the Great Recession and the European sovereign debt crisis. *Journal of Financial Stability*, 16:164–172.

Chen, A. and Mazumdar, S. C. (1994). Impact of regulatory interactions on bank capital structure. *Journal of Financial Services Research*, 8(4):283–300.

Chen, C., Huang, Y., and Zhang, T. (2017). Non-interest Income, Trading, and Bank Risk. *Journal of Financial Services Research*, 51(1):19–53.

Chen, W. and Skoglund., J. (2014). Optimal hedging of funding liquidity risk. *The Journal of Risk*, 16(3):85–111.

Chernykh, L. and Cole, R. (2015). How should we measure bank capital adequacy for triggering Prompt Corrective Action? A (simple) proposal. *Journal of Financial Stability*, 20:131–143.

Clarke, T. (2010). Recurring crises in Anglo-American corporate governance. *Contributions to Political Economy*, 29(1):9–32.

Cole, J. A. and Cadogan, G. (2014). Bankruptcy risk induced by career concerns of regulators. *Finance Research Letters*, 11(3):259–271.

Covi, G. (2017). The emerging regulatory landscape: A new normal: Breaking the link between banks and sovereigns. *Journal of Banking Regulation*, 18(3):233–255.

Crawford, A., Graham, C., and Bordeleau, E. (2009). Regulatory constraints on bank leverage: issues and lessons from the canadian experience. *Bank of Canada discussion paper*, 15.

Dandapani, K., Lawrence, E., and Patterson, F. (2017). The effect of holding company affiliation on bank risk and the 2008 financial crisis. *Studies in Economics and Finance*, 34(1):105–121.

Danielsson, J., Taylor, A., and Zigrand, J.-P. (2005). Highwaymen or heroes: Should hedge funds be regulated? a survey. *Journal of Financial Stability*, (4):522–543.

de Haan, J., Nijskens, R., and Wagn, W. (2017). Macroprudential regulation: From theory to implementation. *Macroprudential Regulation: from Theory to Implementation*, 28:182.

DeAngelo, H. and Stulz, R. (2015). Liquid-claim production, risk management, and bank capital structure: Why high leverage is optimal for banks. *Journal of Financial Economics*, 116(2):219–236.

Deku, S. Y., Kara, A., and Zhou, Y. (2019). Securitization, bank behaviour and financial

stability: A systematic review of the recent empirical literature. *International Review of Financial Analysis*, 61(C):245–254.

Demirguc-Kunt, A. and Detragiache, E. (2011). Basel core principles and bank soundness: Does compliance matter? *Journal of Financial Stability*, 7(4):179–190.

Demirguc-Kunt, A., Detragiache, E., and Merrouche, O. (2013). Bank capital: Lessons from the financial crisis. *Journal of Money, Credit and Banking*, 45(6):1147–1164.

Demsetz, R. S. and Strahan, P. E. (1997). Diversification, Size, and Risk at Bank Holding Companies. *Journal of Money, Credit and Banking*, 29(3):300–313.

Dermine, J. (2015). Basel III leverage ratio requirement and the probability of bank runs. *Journal of Banking and Finance*, 53:266–277.

Derviz, A. (2014). Collateral composition, diversification risk, and systemically important merchant banks. *Journal of Financial Stability*, 14:23–34.

Dewenter, K., Hess, A., and Brogaard, J. (2018). Institutions and deposit insurance: Empirical evidence. *Journal of Financial Services Research*, 54(3):269–292.

DeYoung, R. and Roland, K. P. (2001). Product Mix and Earnings Volatility at Commercial Banks: Evidence from a Degree of Total Leverage Model. *Journal of Financial Intermediation*, 10(1):54–84.

di Iasio, G. (2013). Incentives and financial crises: Microfounded macroprudential regulation. *Journal of Financial Intermediation*, 22(4):627–638.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring. *The Review of Economic Studies*, 51(3):393–414.

Diamond, D. W. and Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, 91(3):401–419.

Dreassi, A., Miani, S., Paltrinieri, A., and Sclip, A. (2017). Bank-Insurance Risk Spillovers: Evidence from Europe. *Geneva Papers on Risk and Insurance: Issues and Practice*, 43(1):72–96.

Dressler, J. and Tauer, L. (2016). Estimating expected and unexpected losses for agricultural mortgage portfolios. *American Journal of Agricultural Economics*, 98(5):1470–1485.

Dubecq, S., Mojon, B., and Ragot, X. (2015). Risk shifting with fuzzy capital constraints. *International Journal of Central Banking*, 11(1):71–101.

Eberlein, E., Madan, D., and Schoutens, W. (2013). Modeling risk weighted assets and the risk sensitivity of related capital requirements. *The Journal of Risk*, 16(2):3–23.

Ellis, L., Haldane, A., and Moshirian, F. (2014). Systemic risk, governance and global financial stability. *Journal of Banking and Finance*, 45(1):175–181.

Elyasiani, E., Kalotychou, E., Staikouras, S., and Zhao, G. (2015). Return and Volatility Spillover among Banks and Insurers: Evidence from Pre-Crisis and Crisis Periods. *Journal of Financial Services Research*, 48(1):21–52.

Entrop, O., von la Hausse, L., and Wilkens, M. (2017). Looking beyond banks' average interest rate risk: Determinants of high exposures. *The Quarterly Review of Economics and Finance*, 63:204–218.

Episcopos, A. (2008). Bank capital regulation in a barrier option framework. *Journal of Banking and Finance*, 32(8):1677–1686.

Evanoff, D. D. and Wall, L. D. (2001). Sub-debt yield spreads as bank risk measures. *Journal of Financial Services Research*, 20(2-3):121–145.

Falagiarda, M. and Saia, A. (2017). Credit, Endogenous Collateral and Risky Assets: A DSGE Model. *International Review of Economics and Finance*, 49:125–148.

Fidrmuc, J. and Lind, R. (2018). Macroeconomic impact of Basel III: Evidence from a meta-analysis. *Journal of Banking & Finance*.

Fidrmuc, J., Schreiber, P., and Siddiqui, M. (2015). The Transmission of Bank Funding to Corporate Loans: Deleveraging in Germany. *Open Economies Review*, 26(3):581–597.

Gabbi, G., Iori, G., Jafarey, S., and Porter, J. (2015). Financial regulations and bank credit to the real economy. *Journal of Economic Dynamics and Control*, 50:117–143.

Galati, G. and Moessner, R. (2011). Macroprudential policy – a literature review. *BIS Working Papers*, (337).

Garfield, E. (1983). How to use citation analysis for faculty evaluations, and when is it relevant? part 1. *Current Contents*, 44:354–362.

Gavalas, D. (2015). How do banks perform under Basel III? Tracing lending rates and loan quantity. *Journal of Economics and Business*, 81:21–37.

Geanakoplos, J. (2014). Leverage, Default, and Forgiveness: Lessons from the American and European Crises. *Journal of Macroeconomics*, 39(PB):313–333.

Ghosh, S. and Chatterjee, G. (2018). Capital structure, ownership and crisis: how different are banks? *Journal of Financial Regulation and Compliance*, 26(2):300–330.

Gjerde, Ø. and Semmen, K. (1995). Risk-based capital requirements and bank portfolio risk. *Journal of Banking and Finance*, 19(7):1159–1173.

Glasser, T. D. (2013). Leveraging data for financial stability monitoring. *Journal of Banking Regulation*, 14(3-4):195–208.

Goddard, J., Molyneux, P., and Wilson, J. (2009). The financial crisis in Europe: Evolution, policy responses and lessons for the future. *Journal of Financial Regulation and Compliance*, 17(4):362–380.

Gong, D., Huizinga, H., and Laeven, L. (2018). Nonconsolidated affiliates, bank capitalization, and risk taking. *Journal of Banking and Finance*, 97:109–129.

Gornall, W. and Strebulaev, I. (2018). Financing as a supply chain: The capital structure of banks and borrowers. *Journal of Financial Economics*, 129(3):510–530.

Greenwood, R., Stein, J. C., Hanson, S. G., and Sunderam, A. (2017). Strengthening and streamlining bank capital regulation. *Brookings Papers on Economic Activity*, 2017(Fall):479–565.

Gropp, R. and Heider, F. (2010). The Determinants of Bank Capital Structure. *Review of Finance*, 14(4):587–622.

Gueyie, J.-P. and Lai, V. S. (2003). Bank moral hazard and the introduction of official deposit insurance in canada. *International Review of Economics and Finance*, 12(2):247–273.

Guidara, A., Lai, V. S., Soumaré, I., and Tchana, F. T. (2013). Banks' capital buffer, risk and performance in the canadian banking system: Impact of business cycles and regulatory changes. *Journal of Banking and Finance*, 37(9):3373–3387.

Hagen, J. V. and Fender, I. (1998). Central Bank Policy in a More Perfect Financial System. *Open Economies Review*, 9(1):493–531.

Hakenes, H. and Schnabel, I. (2011). Bank size and risk-taking under basel II. *Journal of Banking & Finance*, 35(6):1436–1449.

Handorf, W. C. (2011). Capital management and bank value. *Journal of Banking Regulation*, 12(4):331–341.

Harding, J. P., Liang, X., and Ross, S. L. (2013). Bank capital requirements, capital structure and regulation. *Journal of Financial Services Research*, 43(2):127–148.

Haritchabalet, C., Lepetit, L., Spinassou, K., and Strobel, F. (2017). Bank capital regulation: Are local or central regulators better? *Journal of International Financial Markets, Institutions and Money*, 49:103–114.

Harris, M. and Raviv, A. (1991). The theory of capital structure. *The Journal of Finance*, 46(1):297–355.

Hasan, I., Liu, L., and G. Zhang, G. (2016). The Determinants of Global Bank Credit-Default-Swap Spreads. *Journal of Financial Services Research*, 50(3):275–309.

Hassan, M. K. and Aliyu, S. (2018). A contemporary survey of islamic banking literature. *Journal of Financial Stability*, 34:12–43.

Hausler, G. (2002). The globalization of finance. *International Monetary Fund, Finance and Development*, 39(1).

Heed, A. (2010). Regulation of private equity. *Journal of Banking Regulation*, 12(1):24–47.

Herring, R. (2004). The subordinated debt alternative to basel ii. *Journal of Financial Stability*, 1(2):137–155.

Herring, R. (2018). The Evolving Complexity of Capital Regulation. *Journal of Financial Services Research*, 53(2-3):183–205.

Hessou, H. and Lai, V. S. (2017). Basel iii capital buffer requirements and credit union prudential regulation: Canadian evidence. *Journal of Financial Stability*, 30:92–110.

Holland, J. (2010). Banks, knowledge and crisis: A case of knowledge and learning failure. *Journal of Financial Regulation and Compliance*, 18(2):87–105.

Hong, H., Huang, J.-Z., and Wu, D. (2014). The information content of basel iii liquidity risk measures. *Journal of Financial Stability*, 15:941–111.

Hossain, M., Khan, M., and Sadique, M. (2017). Basel III and perceived resilience of banks in the BRICS economies. *Applied Economics*, 50(19):2133–2146.

Hughes, J. P., Lang, W. W., Mester, L. J., and Moon, C.-G. (1999). The dollars and sense of bank consolidation. *Journal of Banking and Finance*, 23(2):291–324.

Hugonnier, J. and Morellec, E. (2017). Bank capital, liquid reserves, and insolvency risk. *Journal of Financial Economics*, 125(2):266 – 285.

Iacovone, L., Ferro, E., Pereira-López, M., and Zavacka, V. (2019). Banking crises and exports: Lessons from the past. *Journal of Development Economics*, 138:192–204.

Imbierowicz, B., Kragh, J., and Rangvid, J. (2018). Time-Varying Capital Requirements and Disclosure Rules: Effects on Capitalization and Lending Decisions. *Journal of Money, Credit and Banking*, 50(4):573–602.

Inderst, R. and Mueller, H. M. (2008). Bank capital structure and credit decisions. *Journal of Financial Intermediation*, 17(3):295–314.

Jabbour, C. J. C. (2013). Environmental training in organisations: From a literature review to a framework for future research. *Resources, Conservation and Recycling*, 74:144 – 155.

Jarrow, R. A. (2013). Capital Adequacy Rules, Catastrophic Firm Failure, and Systemic Risk. *Review of Derivatives Research*, 16(3):219–231.

John, K., Mehran, H., and Qian, Y. (2010). Outside monitoring and ceo compensation in the banking industry. *Journal of Corporate Finance*, 16(4):383–399.

Junior, M. L. and Filho, M. G. (2010). Variations of the kanban system: Literature review and classification. *International Journal of Production Economics*, 125(1):13 – 21.

Kahou, M. E. and Lehar, A. (2017). Macroprudential policy: A review. *Regulatory Corner*, 29:92–105.

Kalemli-Ozcan, S., Sorensen, B., and Yesiltas, S. (2012). Leverage across firms, banks, and countries. *Journal of International Economics*, 88(2):284–298.

Kamada, T. and Kawai, S. (1989). An algorithm for drawing general undirected graphs. *Information Processing Letters*, 31(1):7–15.

Kanas, A. (2014). The impact of prompt corrective action on the default risk of the U.S. commercial banking sector. *Review of Quantitative Finance and Accounting*, 43(2):393–404.

Kane, E. J. (2012). Missing elements in us financial reform: A kübler-ross interpretation of the inadequacy of the dodd-frank act. *Journal of Banking and Finance*, 36(3):654–661.

Karmakar, S. (2016). Macroprudential regulation and macroeconomic activity. *Risk, Financial Stability and Banking*, 25:166–178.

Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. *The American Economic Review*, 80(5):1183–1200.

Kellermann, K. and Schlag, C. (2013). Occupy risk weighting: how the minimum leverage ratio dominates capital requirements: A Swiss example. *Journal of Financial Regulation and Compliance*, 21(4):353–372.

Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *Journal of the Association for Information Science and Technology*, 14(1):10 – 25.

Kiema, I. and Jokivuolle, E. (2014). Does a leverage ratio requirement increase bank stability? *Journal of Banking and Finance*, 39(1):240–254.

Kim, S., Plosser, M. C., and Santos, J. A. C. (2018). Macroprudential policy and the revolving door of risk: Lessons from leveraged lending guidance. *Journal of Financial Intermediation*, 34:17–31.

King, M. R. (2013). The basel III net stable funding ratio and bank net interest margins. *Journal of Banking & Finance*, 37(11):4144–4156.

Kishan, R. P. and Opiela, T. P. (2012). Monetary policy, bank lending, and the risk-pricing channel. *Journal of Money, Credit and Banking*, 44(4):573–602.

Kiyotaki, N. and Moore, J. (1997). Credit Cycles. *Journal of Political Economy*, 105(2):211–248.

Klimenko, N. and Moreno-Bromberg, S. (2016). The shadow costs of repos and bank liability structure. *Journal of Economic Dynamics and Control*, 65:1–29.

Koch, C. T. (2014). Risky Adjustments or Adjustments to Risks: Decomposing Bank Leverage. *Journal of Banking and Finance*, 45(1):242–254.

Krstevska, A., Nenovski, T., and Kostovska, K. P. (2017). Testing the Modigliani and Miller Theory in Practice: Evidence from the Macedonian Banking System. *Eastern European Economics*, 55(3):277–289.

Krug, S., Lengnick, M., and Wohltmann, H.-W. (2015). The impact of Basel III on financial (in)stability: an agent-based credit network approach. *Quantitative Finance*, 15(12):1917–1932.

Kupiec, P. and Wallison, P. (2015). Can the "Single Point of Entry" strategy be used to recapitalize a systemically important failing bank? *Journal of Financial Stability*, 20:184–197.

Kuzubaş, T., Saltoğlu, B., and Sever, C. (2016). Systemic risk and heterogeneous leverage in banking networks. *Physica A: Statistical Mechanics and its Applications*, 462:358–375.

Lechner, P. and Gatzert, N. (2017). Determinants and value of enterprise risk management: empirical evidence from Germany. *European Journal of Finance*, 24(10):867–887.

Lee, S. (2009a). Firm size, corporate leverage and corporate dividend: Evidence from Korean banking industry. *Corporate Ownership and Control*, 6(4 C CONT. 2):317–322.

Lee, S. (2009b). Regulatory reforms and moral hazard in korean banking. *Investment Management and Financial Innovations*, 6(2):15–21.

Lee, S.-C. and Lin, E. (2012). Book-to-market equity, operating risk, and asset correlations: Implications for basel capital requirement. *Journal of International Financial Markets, Institutions and Money*, 22(4):973–989.

Lee, T.-H. and Chih, S.-H. (2013). Does financial regulation affect the profit efficiency and risk of banks? Evidence from China's commercial banks. *The North American Journal of Economics and Finance*, 26:705–724.

Lengwiler, Y. and Maringer, D. (2015). Regulation and contagion of banks. *Journal of Banking Regulation*, 16(1):64–71.

Leonard, P. and Biswas, R. (1998). The Impact of Regulatory Changes on the Risk-Taking Behavior of State Chartered Savings Banks. *Journal of Financial Services Research*, 13(1):37–39.

López-Espinosa, G., Moreno, A., Rubia, A., and Valderrama, L. (2012). Short-term wholesale funding and systemic risk: A global covar approach. *Journal of Banking and Finance*, 36(12):3150–3162.

Luciano, E. and Wihlborg, C. (2018). Financial synergies and systemic risk in the organization of bank affiliates. *Journal of Banking and Finance*, 88:208–224.

Mazumder, M. I. and Ahmad, N. (2010). Greed, financial innovation or laxity of regulation?: A close look into the 2007-2009 financial crisis and stock market volatility. *Studies in Economics and Finance*, 27(2):110–134.

McAleer, M. (2009). The ten commandments for optimizing value-at-risk and daily capital charges. *Journal of Economic Surveys*, 23(5):831–849.

Mendonça, H. F. d. and Silva, R. B. D. (2017). Effect of banking and macroeconomic variables on systemic risk: An application of delta COVAR for an emerging economy. *North American Journal of Economics and Finance*, 43:141–157.

Miele, M. G. and Sales, E. (2011). The financial crisis and regulation reform. *Journal of Banking Regulation*, 12(4):277–307.

Milonas, K. (2018). Bank taxes, leverage, and risk. *Journal of Financial Services Research*, 54(2):145–177.

Mingo, J. J. (1976). Managerial motives, market structures and the performance of holding company banks. *Economic Inquiry*, 14(3):411–424.

Miu, P. and Ozdemir, B. (2017). Adapting the Basel II advanced internal– ratings–based models for international financial reporting standard 9. *Journal of Credit Risk*, 13(2):53–83.

Mohsni, S. and Otchere, I. (2015). Financial crisis, liquidity infusion and risk-taking: The case of Canadian banks. *Journal of Banking Regulation*, 16(2):146–167.

Moosa, I. and Silvapulle, P. (2012). An empirical analysis of the operational losses of australian banks. *Accounting and Finance*, 52(1):165–185.

Morgan, D. P. (2002). Rating banks: Risk and uncertainty in an opaque industry. *American Economic Review*, 92(4):874–888.

Morris, S. and Shin, H. (2008). Financial regulation in a system context. *Brookings Papers on Economic Activity*, (2):229–261.

Morris, S., Yen, G., Wu, Z., and Asnake, B. (2003). Time Line Visualization of Research Fronts. *Journal of the American Society for Information Science and Technology*, 54(5):413 – 422.

Mrvar, A. and Batagelj, V. (2016). Analysis and visualization of large networks with program package Pajek. *Complex Adaptive Systems Modeling*, 4(1):6.

Mullineux, A. (2011). The Public Duties and Social Responsibilities of Big British Banks. *International Advances in Economic Research*, 17(4):436–450.

Mullineux, A. (2014). Banking for the public good. *International Review of Financial Analysis*, 36:87–94.

Muradoglu, Y. G. (2010). The banking and financial crisis in the UK: what is real and what is behavioural? *Qualitative Research in Financial Markets*, 2(1):6–15.

Nesbitt, S. L. (2017). The investment opportunity in U.S. middle market direct lending. *Journal of Alternative Investments*, 20(1):92–99.

Nieto, M. J. and Garcia, G. G. (2012). The insufficiency of traditional safety nets: what bank resolution fund for europe? *Journal of Financial Regulation and Compliance*, 20(2):116–146.

Osborne, M., Fuertes, A.-M., and Milne, A. (2017). In good times and in bad: Bank capital ratios and lending rates. *International Review of Financial Analysis*, 51:102–112.

Pakravan, K. (2014). Bank capital: the case against Basel. *Journal of Financial Regulation and Compliance*, 22(3):208–218.

Papanikolaou, N. I. and Wolff, C. C. (2014). The role of on- and off-balance-sheet leverage of banks in the late 2000s crisis. *Journal of Financial Stability*, 14:3–22.

Paris, F. M. (2000). A theoretical analysis of alternative approaches to financial regulation. *European Financial Management*, 6(1):19–40.

Patro, D. K., Qi, M., and Sun, X. (2013). A simple indicator of systemic risk. *Journal of Financial Stability*, 9(1):105–116.

Pennathur, A., Smith, D., and Subrahmanyam, V. (2014). The stock market impact of government interventions on financial services industry groups: Evidence from the 2007-2009 crisis. *Journal of Economics and Business*, 71:22–44.

Petrella, G. and Resti, A. (2017). What drives the liquidity of sovereign bonds when markets are under stress? an assessment of the new basel 3 rules on bank liquid assets. *Banking, Financial Markets, Risk and Financial Vulnerability*, 33:297–310.

Plantin, G. (2015). Shadow banking and bank capital regulation. *Review of Financial Studies*, 28(1):146–175.

Poghosyan, T. and Čihak, M. (2011). Determinants of bank distress in europe: Evidence from a new data set. *Journal of Financial Services Research*, 40(3):163–184.

Poledna, S., Thurner, S., Farmer, J. D., and Geanakoplos, J. (2014). Leverage-induced systemic risk under basle ii and other credit risk policies. *Journal of Banking and Finance*, 42(1):199–212.

Prasch, R. E. (2012). The Dodd-Frank Act: Financial Reform or Business as Usual? *Journal of Economic Issues*, 46(2):549–556.

Ratnovski, L. (2013). Liquidity and Transparency in Bank Risk Management. *Journal of Financial Intermediation*, 22(3):422–439.

Riccetti, L., Russo, A., and Gallegati, M. (2013). Leveraged network-based financial accelerator. *Journal of Economic Dynamics and Control*, 37(8):1626–1640.

Rossignolo, A. F., Fethi, M. D., and Shaban, M. (2012). Value-at-risk models and basel capital charges: Evidence from emerging and frontier stock markets. 8(4):303–319.

Roukny, T., Battiston, S., and Stiglitz, J. (2016). Interconnectedness as a source of uncertainty in systemic risk. *Journal of Financial Stability*, 35:93–106.

Rubio, M. and Carrasco-Gallego, J. A. (2016). The new financial regulation in basel iii and monetary policy: A macroprudential approach. *Macro-stability and International Finance*, 26:294–305.

Sarin, N. and Summers, L. (2016). Understanding bank risk through market measures. *Brookings Papers on Economic Activity*, 2016(FALL):57–127.

Sarlin, P. (2016). Macroprudential oversight, risk communication and visualization. *Data Standards, Information and Financial Stability*, 27:160–179.

Saunders, A. and Wilson, B. (2001). An Analysis of Bank Charter Value and Its Risk-Constraining Incentives. *Journal of Financial Services Research*, 19(2-3):185–195.

Schenck, N. and Thornton, J. (2016). Charter values, bailouts and moral hazard in banking. *Journal of Regulatory Economics*, 49(2):172–202.

Schmaltz, C., Pokutta, S., Heidorn, T., and Andrae, S. (2014). How to make regulators and shareholders happy under basel iii. *Journal of Banking and Finance*, 46(1):311–325.

Seuring, S. (2013). A review of modeling approaches for sustainable supply chain management. *Decision Support Systems*, 54(4):1513 – 1520. Rapid Modeling for Sustainability.

Shleifer, A. and Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance*.

Shrieves, R. and Dahl, D. (1992). The relationship between risk and capital in commercial banks. *Journal of Banking and Finance*, 16(2):439–457.

Silva, W., Kimura, H., and Sobreiro, V. A. (2017). An analysis of the literature on systemic financial risk: A survey. *Journal of Financial Stability*, 28:91 – 114.

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the Association for Information Science and Technology*, 24(4):265 – 269.

Small, H. (2004). On the shoulders of Robert Merton: Towards a normative theory of citation. *Scientometrics*, 60(1):71 – 79.

Sorokina, N. Y., Thornton, J. H., and Patel, A. (2017). Why do banks choose to finance with equity? *Journal of Financial Stability*, 30:36–52.

Sundaresan, S. M. (2000). Continuous–time methods in finance: A review and an assessment. *The Journal of Finance*, 55:1569–1622.

Tasca, P., Mavrodiev, P., and Schweitzer, F. (2014). Quantifying the impact of leveraging and diversification on systemic risk. *Journal of Financial Stability*, 15:43–52.

Tayler, W. J. and Zilberman, R. (2016). Macroprudential regulation, credit spreads and the role of monetary policy. *Journal of Financial Stability*, 26:144–158.

Thimann, C. (2015). Systemic features of insurance and banking, and the role of leverage, capital and loss absorption. *Geneva Papers on Risk and Insurance: Issues and Practice*, 40(3):359–384.

Tongurai, J. and Vithessonthi, C. (2018). The impact of the banking sector on economic structure and growth. *International Review of Financial Analysis*, 56:193–207.

Triantis, G. G. (2000). Financial Slack Policy and the Laws of Secured Transactions. *Journal of Legal Studies*, 29(1 PART I):35.

Valencia, F. (2014). Monetary Policy, Bank Leverage, and Financial Stability. *Journal of Economic Dynamics and Control*, 47:20–38.

Valencia, O. C. and BolaÃ±os, A. O. (2018). Bank capital buffers around the world: Cyclical patterns and the effect of market power. *Risk, financial stability and banking*, 38:119–131.

Vallascas, F. and Keasey, K. (2012). Bank resilience to systemic shocks and the stability of banking systems: Small is beautiful. *Journal of International Money and Finance*, 31(6):1745–1776.

van Eck, N. J. and Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2):523–538.

van Raan, A. F. J. (2003). The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments. *Technikfolgenabschätzung - Theorie und Praxis*, 1(12):20–29.

Vazquez, F. and Federico, P. (2015). Bank funding structures and risk: Evidence from the global financial crisis. *Journal of Banking and Finance*, 61:1–14.

Vinais, J. (2013). Making Macroprudential Policy Work. *International Monetary Fund*. Remarks by José Vinais at Brookings Event, [Accessed: 2018 02 13].

Wagner, W. (2010). Diversification at financial institutions and systemic crises. *Journal of Financial Intermediation*, 19(3):373–386.

Walther, A. (2016). Jointly Optimal Regulation of Bank Capital and Liquidity. *Journal of Money, Credit and Banking*, 48(2-3):415–448.

Wang, S., Chen, L., and Xiong, X. (2019). Asset bubbles, banking stability and economic growth. *Economic Modelling*, 78:108–117.

Wang, Y., Chen, S., and Zhang, X. (2014). Measuring systemic financial risk and analyzing influential factors: an extreme value approach. *China Finance Review International*, 4(4):385–398.

Weiß, G. N., Bostandzic, D., and Neumann, S. (2014). What Factors Drive Systemic Risk during International Financial Crises? *Journal of Banking and Finance*, 41(1):78–96.

Wilmarth, A. E. (2014). Citigroup's unfortunate history of managerial and regulatory failures. *Journal of Banking Regulation*, 15(3):235–265.

Wolf, F. (1986). *Meta-analysis: Quantitative Methods for Research Synthesis. Quantitative Applications in the Social Sciences*. Sage Publication, 59 edition.

Wu, H.-M. and Zhao, Y. (2016). Optimal leverage ratio and capital requirements with limited regulatory power. *Review of Finance*, 20(6):2125–2150.

Yang, S.-Y., Hwang, Y.-W., and Chang, S.-C. B. (2012). The bankruptcy cost of the life insurance industry under regulatory forbearance: An embedded option approach. *North American Actuarial Journal*, 16(4):513–523.

Zamora-Mesinas, R., Cruz, G. G., and Pérez, A. L. (2011). A policy proposal to manage the risk of leveraged MBS and CDO purchases. *Journal of Derivatives and Hedge Funds*, 17(2):151–164.

Zamore, S., Djan, K. O., Alon, I., and Hobdari, B. (2018). Credit Risk Research: Review and Agenda. *Emerging Markets Finance and Trade*, 54(4):811–835.

Zupic, I. and Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18(3):429 – 472.