Hacettepe University Graduate School of Social Sciences
Business Administration

BANKING REGULATION AND THE BASEL ACCORDS: A COMPARATIVE INVESTIGATION ON CAPITAL-RISK RELATIONSHIP IN TURKEY AND WAEMU

Tchignagbé Guy Crescent MEBOUNOU TOSSOU

Ph. D. Dissertation

Ankara, 2017

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ACCEPTANCE AND APPROVAL

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ETİK BEYAN

Bu çalışmadaki bütün bilgi ve belgeleri akademik kurallar çerçevesinde elde ettiğimi, görsel, işitsel ve yazılı tüm bilgi ve sonuçları bilimsel ahlak kurallarına uygun olarak sunduğumu, kullandığım verilerde herhangi bir tahrifat yapmadığımı, yararlandığım kaynaklara bilimsel normlara uygun olarak atıfta bulunduğumu, tezimin kaynak gösterilen durumlar dışında özgün olduğunu, Doç. Dr. Göknur BÜYÜKKARA danışmanlığında tarafımdan üretildiğini ve Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Yazım Yönergesine göre yazıldığını beyan ederim.

Tchignagbé Guy Crescent MEBOUNOU TOSSOU

DEDICATION

This work is dedicated to my daughters E'Lonm and E'Yram, my wife Edwige C. IKO AFE, my sisters (Marceline, Celestine, Monique, Marguerite, Francisca, and Anna), my brother Claude, my mother Henriette, and to the memory of my late father Nestor and sister Rita.

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ABSTRACT

Tchignagbé Guy Crescent MEBOUNOU TOSSOU. *Banking Regulation and the Basel Accords: A Comparative Investigation on Capital-Risk Relationship in Turkey and WAEMU.* Ph.D., Ankara, 2017.

Following the development of the Basel Accords, posited as the benchmark regulatory standards in global banking system, investigations to examine the impact of capital requirements on bank risk-taking behaviors aroused a substantial interest. Indeed, despite a significant amount of research carried out, and since both theoretical and empirical findings yield mixed evidence, the debate is yet to be settled. Yet, the prior empirical investigations often failed to connect the issue to the type of the Basel Accords implemented. Since the implementation constraints of capital requirements may widely vary between BCBS member- and non-member BCBS countries, this dissertation aims to examine the capital-risk interrelationship in both Turkey and WAEMU banking systems through a comparative analysis. More specifically, the study compares the trends of the capital-risk relationship in Turkish banking industry to that of the WAEMU. It also gauges the impact of change in capital regulatory standards following the implementation of more stringent regulatory rules and changes in membership status on the capital-risk relationship. Using the three-stage least squares estimations in the framework of Simultaneous Equations Modelling as developed by Shrieves & Dahl (1992), the findings reveal a negative association between bank risk-taking behaviors and flat capital ratio (CAP) for the time span 2002-2006, implying that banks in Turkey and WAEMU with low risky assets portfolios hold high equity capital positions when subject to the Cooke ratio. In the period 2007-2015, the unweighted capital ratio was irrelevant to explain risk-behaviors for both Turkish and WAEMU's banks while risk-based capital ratio became a relevant indicator for risk profile of banks in Turkey, indicating that banks with higher level of risky investments hold higher capital positions. The study also confirms that changes in regulatory standards in Turkey from 2007 have affected the trends of capital-risk relationship. Yet, change in membership status does not affect capital positions but rather reduces risk-taking behaviors of banks in Turkey. Finally, the findings show that banks specific features (size, profitability, liquidity, and off-balance sheet activities) and macroeconomic indicators (inflation and GDP growth) also affect capital adjustments and bank risks.

Keywords

Banking Regulation, Basel Accords, Regulatory Capital requirements, Bank Risks, Turkey, WAEMU

ÖZET

Tchignagbé Guy Crescent MEBOUNOU TOSSOU. *Bankacılık Düzenlemesi ve Basel Normları: Türkiye ve BAEPB için Sermaye-Risk İlişkisi Üzerine Karşılaştırmalı bir Araştırma*. Ankara, 2017.

Küresel bankacılık sisteminde düzenleyici standartlar olarak kabul edilen Basel Anlaşmalarının geliştirilmesinin ardından, banka risk alma davranışlarının üzerinde sermaye yükümlülüğünün etkilerini araştırmayı tespit etmeye olan ilgi artmıştır. Nitekim, önemli miktarda araştırma yapılmış olsa da hem teorik hem de ampirik bulgular karışık kanıtlar sunarken, tartışma henüz halledilmemiştir. Bununla birlikte önceki araştırmalarda bu konunun hangi tür Basel anlaşması ile ilişkilendirildiği pek fazla işlenmemiştir. Sermaye gereksinimlerinin uygulama kısıtlamaları, BBDK üyesi ve üye olmayan ülkeleri arasında ciddi farklılık gösterebileceğinden, bu tez, karşılaştırmalı bir analizle hem Türkiye hem de BAEPB bankacılık sistemlerinde sermaye-risk ilişkilerini incelemeyi amaçlamaktadır. Daha belirgin bir biçimde, bu çalışma, Türkiye ile BAEPB bankacılık sektöründeki sermaye-risk ilişkisinin eğilimlerini karşılaştırmaktadır. Ayrıca, daha sıkı kuralların uygulanması ile birlikte değişen sermaye düzenleyici standartların ve ülkelerin üyelik durumlarındaki değişiklerin sermaye-risk ilişkisi üzerindeki etkileri incelenmiştir. Shrieves & Dahl (1992) tarafından geliştirilen Simultane Denklem Modellemesi kapsamında üç aşamalı en küçük kareler metodu kullanarak, elde edilen bulgular, 2002-2006 dönemi için banka risk alma davranışları ile sabit sermaye oranı (CAP) arasında negatif bir ilişki olduğunu ortaya çıkarmaktadır. Nitekim Cooke oranı, düşük riskli varlık portföylerine sahip olan Türk ve WAEMU bankalarının yüksek sermaye pozisyonlarına sahip olduklarını göstermektedir. 2007-2015 döneminde, ağırlıksız sermaye oranı, hem Türk hem de WAEMU bankalarının risk davranışlarını açıklamakta geçersizken, riske dayalı sermaye Türk bankalarının risk profilleri için risk göstergesi olarak algılanmaktadır. Yani yüksek riskli yatırımları olan Türk bankaları daha yüksek sermaye pozisyonlarına sahiptir. Ayrıca, 2007 yılından itibaren Türkiye'de düzenleyici standartlarda meydana gelen değişiklikler sermaye-risk ilişkisinin eğilimlerini etkilemektedir. Bununla birlikte, üyelik statüsündeki değişim sermaye pozisyonlarını etkilememekte, Türkiye'de bankaların risk alma davranışlarını azaltmaktadır. Son olarak, bulgular, bankaların spesifik özelliklerinin (büyüklük, kârlılık, likidite ve bilanço dışı faaliyetler) ve makroekonomik göstergelerin (enflasyon ve GSYİH büyümesi) sermaye düzenlemelerini ve banka risklerini de etkilediğini göstermektedir.

Anahtar Sözcükler

Bankacılık Düzenlemesi, Basel Normları, Düzenleyici Sermaye Yeterliliği, Banka Riskleri, Türkiye, BAEPB

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GLOSSARY FOR ABBREVIATIONS AND ACRONYMS

2SLS	Two-Stage Least Squares
3SLS	Three-Stage Least Squares
AIRB	Advanced Internal Rating Based
AMA	Advanced Measurement Approach
ASEAN	Association of South East Nations
BAEPB	Batı Afrika Ekonomik ve Parasal Birliği
BBDK	Basel Bankacılık Denetim Komitesi
BC	Before Christ
BCBS	Basel Committee on Banking Supervision
BEP	Bureau of Engraving and Printing
BHC	Bank Holding Company
BIS	Bank of International Settlement
BRSA	Banking Regulation and Supervision Agency
BRVM	Bourse Régionale des Valeurs Mobilières
CBWAS	Central Bank of West African States
CBWAS	Central Bank of West African States
CDO	Collateralized Debt Obligations
CPMI	Committee on Payments and Market Infrastructure
E.U.	European Union
EAD	Exposure at Default
F CFA	Franc de la Communauté Financière d'Afrique
FATF	Financial Action Task Force
FDIC	Federal Deposit Insurance Corporation
FDICIA	Deposit Insurance Corporation Improvement Act
FGLS	Feasible Generalized Least Squares
FSB	Financial Stability Board
FSI	Financial Stability Institute
GHOS	Group of Governors and Heads of Supervision
GMM	Generalized Model of Moments
IADI	International Association of Deposit Insurers
IAIS	International Association of Insurance Supervisors
IFAC	International Federation of Accountants
IFIAR	International Forum of Independent Audit Regulators
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
NSFR	Net Stable Funding Ratio

OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Prompt Corrective Action
PD	Probability of Default
SEM	Simultaneous Equations Modelling
UK	United Kingdom
US	United States (of America)
USA	United States of America
USD	United States Dollars
WAEMU	West African Economic and Monetary Union

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INTRODUCTION

BACKGROUND OF THE STUDY: MOTIVATION, RESEARCH QUESTIONS AND OBJECTIVES

The financial sector plays a prominent role in the growth and development of any country. Stemming from the savings and deposits of excess financial capacity of economic agents, the financial sector ensures the funding of the economy by facilitating access to credits to people, in need of financial resources, for their investments and consumption. It contributes to the development of entrepreneurship, investment, business growth, and industrialization. To this end, higher level of financial development, i.e. the potency, the quality and the efficacy of financial sector, appears as a key lever to promote current and future economic growth, economic efficiency, capital accumulation, and technological change (Arestis & Demetriades, 1997; Levine R. , 1997; King & Levine, 1993).

In the financial system, funding can be accessed directly from stock markets or indirectly through financial intermediation. In the latter case, banks appear as the key component of the lending process whereby they create money through lending policies to borrowers. Yet, banking activities are very sensitive to a range of factors, including mainly interest rates, liquidity risk, credit risk, macroeconomic shocks, and adverse economic conditions. Furthermore, the increasing cross-border activities combined with the integration of the global financial system expose banks to more systemic risks since the failure of a single bank spread over the entire financial system with potentially severe economic crises. To prevent these challenges, banks are encouraged to operate under a stringent regulatory and supervisory framework making banking industry one of the most regulated system.

For nearly three decades, banks are governed by international regulatory standards through the Basel Accords, which aim to harmonize banking practices, set up common safety guards, and provide administrative and disciplinary measures for more resilient global banking system as well as financial stability. Since 1988, when the Basel Committee on Banking Supervision (BCBS) issued the first Accord, the benchmark regulatory standards have evolved over time to consider the flaws highlighted by the major crises in order to improve the resilience of the banking

systems. To this end, the Basel II Accord introduced in 1999 and implemented from 2004 refined and strengthened the Basel I standards by designing new rules for minimum capital requirements taking into account the evolution of the structure and practices on banking and financial markets. The 2008 financial crisis also revealed the shortcomings of Basel II Accord and therefore forced the Basel Committee to pass a third agreement, the Basel III accord. It was published in the late 2010 with a planned implementation between 2012 and 2019. The new agreement includes more pressure on capital adequacy requirement and introduced for the first time minimum standards for liquidity. Overall, the global banking regulatory provisions have been highly improved after three iterations of the Basel Accords with the focus still on capital adequacy.

The capital adequacy requirement can be traced back to 1800s and remains, heretofore, the backbone and the cornerstone of modern banking regulations (Mongid, Tahir, & Haron, 2012). Among the various devices and prudential mechanisms, it holds the leading role in the regulatory process (Mosko & Bozdo, 2016). At its early stage, the required minimum capital of a bank was designed to prevent the moral hazard problems following the introduction of deposit-insurance system in U.S. banking industry in the early 1800s. It was first calculated as a percentage of deposits, not on the basis of bank assets. Since then, the calculation rules of the minimum capital requirements have greatly evolved to become more stringent and complex. The current banking capital regulations are built around two main capital devices, including the flat and the risk-based capital requirements.

The prominence of capital requirements in banking regulation is related to the role it may play in controlling risks. In fact, the required minimum capital may not only prevent banks from developing excessive risk-taking behaviors; it can also be used as a cushion during economic crisis. According to Mongid, Tahir, & Haron (2012), the importance of capital regulation derives from the main role it plays in the banks' health and risk-taking behavior, and its impact on their competitiveness. Indeed, it is an important tool to ensure solvency and prevent banks from default risks. Avery & Allen (1991) argues that bank capital shields the deposit-insurance system from liability to absorb losses and related cost in event of bank insolvency.

Though common sense suggests a negative relationship between bank capital level and risk-taking behavior, a higher level of capital decreases bank risk, and vice-

versa (Hogan, 2015), the actual relationship is much more complicated. Both theoretical and empirical investigations have reached mixed and controversial findings. Not surprisingly, Vanhoose (2007) reported that it quite impossible to get a unanimous conclusion in the studies on capitalization and risk-taking behaviors of commercial banks.

In the extant literature, three major schools of thought controversially discuss the relationship between capital regulation and bank risk. On one extreme, there are the proponents of the negative association, which have provided both theoretical and empirical evidence to the normative or traditional perspective whereby regulatory capital requirement reduce bank risk-taking behavior, and ultimately should contribute to preventing bank failures (Bouheni & Rachdi, 2015; Hogan, 2015; Mongid, Tahir, & Haron, 2012; Santos, 1999; Keeley & Furlong, 1990; Furlong & Keeley, 1989). On the other end, there are those who argue on a positive relationship between regulatory capital requirement and bank risks (Javed, 2016; Floquet & Biekpe, 2008; Altunbas, Carbo, Gardener, & Molyneux, 2007; Bichsel & Blum, 2004; Blum, 1999; Besanko & Kanatas, 1996; Shrieves & Dahl, 1992; Gennotte & Pyle, 1991; Flannery, 1989; Kim & Santomero, 1988). The proponents of this approach advocate that an increase of capital requirements lead to an excessive risk-taking behavior in banking industry.

Yet, between these two extremes lies a more moderate thesis which, reveals a U-shaped relationship between regulatory capital and bank risk. Emerged in the late 1990s, the proponents of this view argue that well-capitalized banks direct their investments to high-risk assets; less well-capitalized banks pursue a more conservative risk strategy, while poorly capitalized banks develop more risk-taking behaviors (Iwatsubo, 2007; Calem & Rafael, 1999).

Each of these schools of thought built its arguments on the relationship between regulatory capital requirements and bank risks by referring to classical theories of finance and corporate governance. In fact, the capital-risk relationship in banking industry has been discussed in the light of one or more of the following theories: modern portfolio theory, agency theory, moral hazard problems, information asymmetry, self-interest behaviors, monitoring-based incentives, and put option framework of deposit-insurance. The rationales linking these theories to the

association between capital requirement and bank risks will be examined later in Chapter 4, which focuses on the literature review.

Though the introduction of the Basel standards has reignited interest on the effects of bank capital regulations, to our knowledge, no previous research has yet investigated the relationship between regulatory capital requirement and bank risks by providing insight into the dominant trend in the BCBS member countries and/or in non-member countries as well. Indeed, as above-mentioned, the Basel Accord has become the benchmark in the banking regulation and supervision worldwide although the implementation constraints may widely vary between the BCBS member and non-member countries. While the BCBS member counties have shifted to implement the more stringent capital requirements of the latest Basel Accords, some non-member countries are still using the original Cooke ratio for capital regulation. It seems then to be relevant to compare the relationship between capital and bank risk in BCBS member and non-member countries as it would allow us to gauge the impact(s) of more stringent capital requirement on bank risks.

In fact, does the capital-risk relationship of banks regulated with the Cooke ratio differ from the one submitted to more stringent capital requirements as developed under Basel II or Basel III Accords? Moreover, can changes in capital regulation standards—the transition from Cooke ratio to more stringent capital requirements—modify the capital/risk relationship in the same banking industry? To answer these research questions, the thesis aims to examine the capital-risk relationship in both Turkey and WAEMU[1] banking systems through a comparative analysis. To this end, this main goal will be split into the following specific objectives:

- To compare the trend of the capital-risk relationship in Turkish banking industry to the trend in WAEMU banking industry.
- To compare the trend of capital-risk relationship in Turkish banking industry before and after the introduction of Basel II capital adequacy requirements in 2007.

[1] The West African Economic and Monetary Union (WAEMU) is a group of eight countries located in sub-Saharan African region, which develop and share a common vision for economic policies under the same currency for internal trades and financial transactions. The WAEMU brings together countries such as Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau Mali, Niger, Senegal and Togo.

- To compare the trend of capital-risk relationship in Turkish banking industry before and after getting the full membership to the BCBS in 2009.

INSTITUTIONAL CONTEXT OF THE STUDY: RATIONALE OF CHOOSING TURKEY AND WAEMU

Despite the increasing integration of international financial system with the harmonization efforts of banking regulations and supervisions through the Basel Accords, the banking systems in the world are far from converging the capital adequacy requirements. While some banking systems comply with more stringent and complex capital adequacy requirements, others are still referring to loose and weak form of capital regulations. These discrepancies may be an explanatory factor behind the controversial relationship between capital and risk evidenced in the banking sector. It seems then to be relevant to examine capital-risk relationship in banking systems subject to dissimilar capital adequacy requirements. To this end, banking industries of Turkey and WAEMU appears to be suitable frameworks to perform such an investigation.

There are compelling arguments in favor of choosing these two banking industries for the empirical framework of this research. First, the banking regulation and supervision systems of both Turkey and WAEMU have started complying with the Basel provisions from the year 2000 onwards as BCBS non-member countries. Since then, the Cooke ratio has been heretofore applied to regulate the capital adequacy in WAEMU while the regulation of capital requirements in Turkey has evolved to converge towards more stringent rules as issued by Basel II and Basel III Accords. Indeed, the Basel II capital adequacy requirements have been included in Turkish regulatory standards since 2007. Like a number of emerging countries, Turkey was granted BCBS full member status from 2009. In July 2012, Turkey adopted the Basel II Accord and progressively begun to introduce the Basel III requirements into its banking regulatory system from January 2014. Meanwhile, WAEMU banking system has continued to comply with the Basel I capital adequacy requirement with the status of BCBS non-member country.

Furthermore, Turkey and WAEMU display significant dissimilarities with regard to their economic, demographical, and socio-cultural features. On the economic front, Turkey is classified as an emerging country with significant improvements in

all areas including its financial system. For instance, the steady improvement of banking industry combined with a quick development of stocks market has raised the financial sector contribution to the Turkish economy. In contrary, all the WAEMU's countries are underdeveloped with no significant improvements over the last three decades. The development gap between Turkey and WAEMU[2] is relevant to perform robustness tests using macroeconomic variables in the regression models.

Two samples will derive from banking industries of Turkey and WAEMU for the purpose of empirical investigation on the capital-risk relationship. Compared to one another, each sample is quite internally homogeneous and externally heterogeneous. This is due to the fact that each sample includes banks operating in completely dissimilar economic and financial environments.

In 2015, the ratio of bank total assets to GDP[3] was established at 107 percent in Turkey while it only reached 65 percent in WAEMU. This revealed a significant contribution of banking industry to the economy in Turkey contrary to the WAEMU, where it is weak. This discrepancy may partly be explained by the fact that Turkey uses its own language in all sectors while all of the WAEMU countries refer to their colonizers' language in official operations, including banking activities. With a literacy rate close to 100%, which ease communication, Turkish citizens can easily access the banking services. By contrast, the rate of people accessing banking services in WAEMU is still low since a large share of the population is excluded partly owing to language issue. The main reasons may be related to low literacy rates, insufficient banking information, or the rigid conditions/guarantees, which may prevent a wide portion of the population from accessing banking services and/or easy access to credit. The illiterate population is often faced with the dilemma of finding someone lettered and honest to help them easily access efficient banking services. Compared to WAEMU's stock market (*Bourse Régionale des Valeurs Mobilières*—aka BRVM), Istanbul Stock Exchange (BIST) can be considered as a dynamic and competitive financial marketplace, which appears as a compelling alternative for banks funding. Furthermore, Turkey

[2] The Table 31 in Appendix provides a comparative overview of key economic and development features of Turkey and WAEMU.

[3] See a comparative overview from 2001 to 2015 of the weight of the banking sector in the economy in Turkey and WAEMU in the Table 32 in Appendix.

is a potential candidate for the European Union and is therefore forced to modernize its institutions and adapt to the standards and regulations implemented in the European Union (E.U.).

Overall, various compelling reasons support banking industries of Turkey and WAEMU as the relevant context to perform the empirical investigations in order to achieve the goals of this research since capital regulation requirements have undergone major changes in the Turkish banking industry while they remained quite stable in WAEMU. During the period under review, Turkey evolved from non-member status to get full BCBS membership in 2009. In Turkey compared to WAEMU, stock market is well developed and it provides more investment opportunities. All these factors show that the banking industries of Turkey and WAEMU provide an adequate framework for testing our assumptions in order to achieve relevant conclusions.

RESEARCH INTERESTS AND CONTRIBUTIONS

By making both theoretical and empirical contributions, this study advances the extant literature. Theoretically, the research has contributed to the literature in three ways.

First, we discussed the foundations of banking regulation by going beyond the traditional theories usually retained, including modern finance and corporate governance. Beyond these classical grounds, we discussed the root of the banking regulation in the light of the systems theory and general theory of regulation. In fact, we posit that the banking is a very sensitive open system by highlighting the highly integrated relationships among banks and the complex interactions they develop with the other financial institutions and the economy as a whole. This sensitive interdependence is so complex that a minor malfunction may amplify into serious unintended consequences in terms of systemic risks, procyclicality, or even in major economic crises, which may result in devastating socio-economic consequences. This has been the case with the 2008 financial crisis, which continues to have dire repercussions almost a decade later. Therefore, regulation appears as a key device to maintain in the safety of the banking system. As such, hierarchical control, market control and prudential regulations and supervisions are combined to ensure that safety. Furthermore, we have argued that the error-

controlled approach specific to closed system is also effective in banking through the thresholds related to prudential standards. In event of non-compliance with these thresholds, managers, board authorities, and/or supervisory boards can take actions to bring the situation back under control. From the perspective of the general theory of regulation, banking regulation seems to be closer to the meta-regulation philosophy rather than command and control or self-regulation approach.

Second, we delved in the literature to propose a new typology to the controversial developments on the capital-risk relationship in the light of recent advances. We have organized the theoretical findings into three schools of thought, including: the proponents of the first school of thought advocating a negative association between capital regulation and bank risk; the second arguing for a positive relationship between regulatory capital requirement and bank risks; and the third revealing a U-shaped relationship between regulatory capital and bank risks. It is worthwhile to emphasize that the first two schools of thought are well documented compared to the third, as it is an emerging philosophy.

Third, we reviewed the previous empirical investigations from a different perspective. In fact, we have examined the empirical results in BCBS member countries, on one hand, and those in non-members on the other, in order to come up with the general trend in each cluster. Overall, the positive capital-risk relationship is more perceptible in the banking industries of BCBS member countries while the negative relationship prevails in non-member countries. This difference could be explained by high availability of investment opportunities offered by the developed and dynamic stock markets in BCBS member countries while non-members lack these opportunities.

As for the empirical contribution, we perform statistical tests using the three-stage least squares estimations in the framework of Simultaneous Equations Modelling (SEM) as developed by Shrieves & Dahl (1992) to examine the capital-risk relationship for banks operating in Turkey and WAEMU. The findings reveal a negative association between bank risk-taking behaviors and flat capital ratio (CAP) for the time span 2002-2006, implying that banks in Turkey and WAEMU with low risky assets portfolios hold high equity capital positions when subject to the Cooke ratio. On the period 2007-2015, the unweighted capital ratio was irrelevant to explain risk-behaviors for both Turkish and WAEMU's banks while

risk-based capital ratio became a relevant indicator for risk profile of banks in Turkey, indicating that banks with higher level of risky investments hold higher capital positions. Furthermore, the study points out that the transition from the Cooke ratio of Basel I Accord to more stringent regulatory capital standards, as required under Basel II and Basel III Accords, modifies the trend of capital-risk relationship. Yet, change in membership status does not affect capital positions but rather reduces risk-taking behaviors of banks in Turkey. In addition, the findings show that banks specific features (size, profitability, liquidity, and off-balance sheet activities) and macroeconomic indicators (inflation and GDP growth) affect capital adjustments and bank risks.

Beyond the theoretical and empirical contributions, this research also provides useful information for academic purposes. Indeed, the research presents a historical review of banking industry from Babylonian civilization to contemporary period with an emphasis on the organization and functioning of modern banking. Then, it provides relevant information on banking regulation and supervision. Finally, the thesis presents a dynamic and critical review on the Basel Accords as well as its worldwide implementation with a focus on Turkey and WAEMU.

ORGANIZATION OF THE THESIS

The remainder of this thesis is structured in five chapters. The first chapter delineates regulation concept in the banking industry and discusses its theoretical foundations. The second chapter examines international standards for banking regulation and supervision through the Basel Accords. The penultimate chapter reviews the literature related to capital regulation and risk-taking in banking systems and draw the general trend prevailing in BCBS member and non-member countries. The fourth chapter carries out a comparative analysis on the capital-risk relationship in Turkey and WAEMU banking systems. It outlines the research method, describes variables, presents model specifications, runs statistical estimations on panel data, and comes up with comments and discussions on findings. Finally, the thesis ends with a conclusion summarizing the findings with an outline of their mains limitations and suggestive directions for future research.

CHAPTER 1: REGULATION IN BANKING INDUSTRY

The banking industry plays a prominent role in the financial system of any country because it significantly provides funding to the whole economy through loans for both investments and consumption. Although there are various alternatives to accessing funding, banks differ from other financial institutions as they carry out specific activities such as financial intermediation, provision of liquidity, money creation and payment services. Due to the sensitivity of these functions and the drastic consequences their potential failure or default would have on the economy and the global financial system, banks are subject to strict governance mechanisms known as banking prudential regulation. The banking industry then appears as one of the most strictly regulated sector. Throughout this chapter, we delved into the literature to delineate the regulation concept in the banking industry, examine its main rationales, and, finally, discuss the classical theories underpinning banking regulation.

1.1. REGULATION AND DEREGULATION: WHAT IS THE MATTER IN BANKING SYSTEM?

We introduced this section by defining banking regulation and its related concepts while contrasting it with the emerging issue of deregulation.

1.1 1. The Concept of Regulation

In the strict sense of the term, regulation refers to a set of rules, principles, and legislative arrangements designed by an authority or a regulatory body in order to direct, manage, monitor, control or govern a behavior, a procedure, an activity, an organization, or a system as a whole. This is in line with the Latin etymology of the word regulation, i.e. "*regula*", which means a rule or a law. From this perspective, Den Hertog (1999) depicts regulation as the implementation of legal instruments designed by government in order to compel individuals, organizations, or social groups to comply with prescribed rules under penalty of sanctions, including fines, publicizing of violations, imprisonment, an order to make specific arrangements, an injunction against withholding certain actions, or closing down the incriminated

business. Regulation also describes the government or other public authorities' interventions in order to maintain macroeconomic stability and social balances.

Obviously, no system can survive or consistently be operating without an appropriate regulating mechanism. To this end, regulation is a key mechanism utilized in various fields to enhance consistency and maintain coherence and stability within any system whether natural, physical or socio-technical. Hence, regulatory mechanisms are available in thermodynamics, biology, environmental science, economics, and so on. For instance, public authorities have developed an arsenal of instruments and devices to protect environment and manage negative externalities from economic activities in order to achieve the objectives of sustainable development (Grolleau, Mzoughi, & Thiébaut, 2004). In economics, regulatory mechanisms are designed to ensure an efficient functioning of markets or the entire economic system. However, what does banking regulation mean? More specifically, what does prudential regulation refer to in the banking industry?

1.1.2. Regulation in Banking and Related Concepts

Regulation is a substantial component in the operation of the banking system. The concept will be better understood through the appropriate expressions used in the banking jargon. In this section, we review the two most important expressions used in banking to describe the concept of regulation: prudential regulation and supervision.

1.1.2.1. Definition of Bank Prudential Regulation

Like any business, banks are subject to a battery of governance mechanisms to maximize value for all stakeholders. Hence, banking industry must comply with specific regulatory provisions known as prudential regulation. The prudential regulation is a set of mechanisms set up to prevent and/or handle the occurrence of a crisis in banking system. Banks' prudential regulation encompasses all the regulatory provisions and arrangements that govern the proper functioning of the banking system. It refers to the set of rules, standards, guidelines, procedures and codes of best practice designed to regulate the behavior of banking operators in order to govern a proper functioning of the industry. Prudential regulation not only

provides an overall reference framework for the banking system as a whole; it also serves as the basic operational guidelines at the level of each bank. More simply, it is the arsenal of regulatory rules to ensure safety, soundness, and stability of the banking system.

Since banking industry is a very sensitive sector, prudential regulation is a powerful tool to control and monitor risky behaviors in order to prevent crashes and the related systemic consequences. Yet, the most important thing in banking regulation is not merely designing perfect regulatory provisions. It is also the ability to effectively implement those provisions through coherent and appropriate compliance that can ensure soundness and stability. Therefore, prudential regulation alone is not sufficient; it must be associated with sound mechanisms of enforcement and control known as prudential supervision.

1.1.2.2. Bank Prudential Supervision

Supervision can be broadly defined as a system set up to coordinate, direct, or oversee a person or a group of persons to ensure that the planned activities are performed correctly and effectively. Supervising a process means that someone or a team is mandated to oversee and manage people working on a project and make sure that all the necessary tasks are properly carried out. Supervision enables one to observe and direct the execution of organized tasks, and, likewise, monitor the implementation of standards developed for their effective performance. Supervisors are provided with discretionary authority enabling them to force the implementation of the requirements.

In banking system, prudential supervision refers to a comprehensive set of mechanisms designed to ensure an effective implementation of regulatory provisions. It helps maintain order and keep a watching eye on the functioning of banking system. To this end, Pauget (2009) describes supervision as the device ensuring that financial institutions effectively apply the rules set by regulators. It is a monitoring mechanism of banks' activities implemented by authorities to enforce banking regulations (Nyantakyi & Sy, 2015). Since banking industry is a very sensitive sector with permanent exposure to systemic risks, prudential supervision has become an essential tool to discipline and monitor the various actors in the industry. Indeed, lack of strict supervision usually exposes banks to failure and the

subsequent financial crisis. Prudential supervision encourages and promotes prudent behavior in order to ensure the stability and viability of financial institutions (Thompson, 1996), including banks. A robust prudential supervision should enhance soundness and efficiency of banking system by focusing on an accurate implementation of regulatory provisions. Yet, an efficient system of prudential supervision requires consciousness of those in charge as well as a proper understanding of banking functioning (Tsytsyk, 2013).

Although regulation and supervision fall under two different logical frameworks, they are not merely perfectly interconnected, but also complementary. Indeed, prudential regulation is the regulatory framework where supervision must be responsible for a proper implementation. While the former deals with design and development of the regulatory provisions useful for efficiently operating banking system, the latter ensures their proper implementation. Prudential regulation cannot be operated effectively without a suitable supervision. Inversely, no supervision can be adequately performed adequately without an appropriate regulatory framework. It is then clear that regulation and supervision must be considered as the two main components of banking governance system (Pauget, 2009); not surprisingly, the regulation concept is confusedly used to depict both prudential regulation and supervision.

The supervisory authorities such as central banks and national supervisory bodies usually implement the prudential supervision devices. They are in charge of inspecting and monitoring banking officials responsible for implementing prudential regulatory provisions and control whether they are behaving or working correctly. Supervisory authorities usually have a discretionary order-making power to force the right implementation of regulatory provisions. They are competent to take disciplinary measures against actors who do not comply with the regulatory arrangements. It is also worthwhile noticing that some international institutions such as rating agencies are able to put pressure on banks by constraining them to comply with the regulatory provisions; though both national and supranational institutions may carry out regulations. For instance, Basel Committee usually develops regulatory provisions, which national institutions may adopt in order to be in line with the global financial structural design and show consistency with international best practices.

1.1.3. Regulation versus Deregulation: The Ongoing Debate

Regulation is a key device in banking governance and experts in this field usually advocate for the need to strengthen it. However, an excess of regulatory provisions may become overly cumbersome for banking industry and hamper its effective functioning. In essence, banking system should exhaust inappropriate and inflexible regulation as it becomes repressive and distort arrangements with opposite effects. Even the best regulatory provisions carried to excess may hinder effective supervision in banking, increasing the risk of failure and eroding public confidence in the banking system as well as imposing higher regulatory costs and impeding competition (Olokoyo, 2012).

On the other end on the spectrum is the issue of deregulation. It refers to mechanisms whereby regulatory boards or governments remove or reduce regulatory provisions and standards. In banking system, deregulation is primary concerned with removing complex regulatory provisions in order to foster competition, which is deemed the stepping stone to higher level of efficiency (Olokoyo, 2012; Sarkar & Bhaumik, 1998). It may include removal of barriers to entry and liberalization of bank licensing policies as well as the dismantling of ceilings and floors on interest rates, capital adequacy, and liquidity and credit restrictions. Deregulation grants banks with the freedom to set their own governance rules. This may be helpful in addressing and rectifying the distortion of regulatory arrangements since deregulation relies on control measures imposed by market forces. Deregulation may also entail development of newer banks as well as better diversification opportunities for new products and other related advantages. For instance, McLeod (1999) argues that deregulation in Indonesian in the 1980s led to a great improvement in its banking system. During the period 1983-1990, Indonesian experienced a great competition in its banking industry due to policy changes, including the removal of interest rate caps, controls of lending and expansion of branch networks, elimination of barriers to entry as well as dismantling of loan subsidy programs. Similar to Indonesian, Nigeria banking industry has also experienced deregulation through liberalization of interest and lending rates, removal of ceilings on interest rates and barriers to entry (Olokoyo, 2012). The deregulation reforms had led to high efficiency in banking intermediation and payments services. They also enabled a huge expansion of

branch networks, new entrants in banking industry as well as the introduction of new savings products and rapid expansion of public's access to banking system (McLeod, 1999).

Perhaps the most prominent example of banking deregulation occurred in U.S.A. The U.S. banking deregulation is an old story and was rooted in the free banking laws, the most important of which was proposed in New York in 1838. The U.S. free banking followed the federal withdrawal from banking legislation and the subsequent limitation of restrictive laws and regulations. The two prominent provisions of free banking aimed to ease entry into the banking industry and promote the demand for State debts. To this end, Rolnick & Weber (1982: 18) portray free banking as the period "when entry into banking was nearly unrestrained, when banks could issue their own currency, when the government did not insure banks, and when there was little supervision and regulation of bank activity". Yet, banks must comply with two basic requirements, including backing bank notes by State bonds and being able to redeem demand at par or face value. The State auditory board had legal obligation to close any bank that failed to redeem even one note presented for payment, and ensured refunding the noteholders by selling the bonds or the other assets of the defaulted bank.

Furthermore, Strahan (2003) discusses U.S. banking deregulation and argues that the removal of limits on bank entry and expansion leads to better performance of the real economy in terms of faster growth, higher rates of new business formation, improvement of macroeconomic stability as well as less sensitivity to local banks' fortunes. In the same vein, Jayaratne & Strahan (1996) show that deregulation through the relaxation of bank branch restrictions in U.S. led to the rise of the rates of real per capita growth in income and output as well as the improvement of the quality of loans. Banking deregulation also enhances competition and leads to increasing rate of new business incorporations by reducing the negative effect of concentration on or the monopoly of incorporations (Black & Strahan, 2002).

Free banking greatly contributes to expansion of banking industry due to a massive influx of new banks and branches stemming from the relaxation of barriers to entry. However, this expansion may belie the negative sides of deregulations since a significant number of these banks may end up defaulting. Indeed, Rolnick & Weber (1982: 18) emphasize that the free banking era marked the period when many banks

closed and many noteholders reportedly suffered from losses of notes value because of little government intervention that led to the development of the so-called wildcat banking. Rockoff (1974) depicts wildcat banking as a fraudulent system formed to bilk the public by taking advantage of the loopholes in free banking. In fact, the dishonest bankers knowingly issued more notes than they planned to redeem or would never redeem in specie (gold or silver) since they know that they can close within a few months. To this end, deregulation, which is an advanced form of free banking, has been targeted as the main source of crisis in banking as well as the whole financial sector (Crotty, 2009) since it favors high speculation and its related riskier environment. Beck, Demirgüç-Kunt, & Levine (2006) also provide support for this assertion by reporting that concentrated banking systems reduce the likelihood of crises in economies.

Overall, deregulation should no longer be regarded as a panacea for addressing the adverse impacts that excess and inflexible regulatory provisions create for the banking system (Sarkar & Bhaumik, 1998). Rather, deregulation can perform better when it is effectively combined with appropriate and flexible regulatory policies. That is, if deregulation is associated with efficient supervision and regulation, it would mitigate excessive risk-taking and reduce the likelihood of banking crisis (Ganioglu, 2007; Noy, 2004). As such, deregulation should no longer be perceived as complete removal of restrictions designed in regulatory provisions to protect banking industry, but as the removal of the inappropriate and inflexible arrangements combined with the strengthening of those providing stability and soundness to the banking system.

1.2. RATIONALE BEHIND BANKING REGULATION

Crisis and its associated systemic risks and procyclicality are the major drivers for implementing comprehensive regulatory arrangements for banking industry as well as undertaking reforms by strengthening existing standards. This section, first addresses the issues of crisis, systemic risk and procyclicality. It then introduces the main objectives of regulating banking industry. Finally, it ends with the debates related to macro- and micro-regulation.

1.2.1. Crisis, Systemic Risk and Procyclicality as Starting Point for Regulating Banking Industry

1.2.1.1. Crises in Banking Industry

A banking crisis refers to the collapse or near-failure of banks or bank-like financial institutions, which generally leads to the crash of the banking industry. It usually jeopardizes savings, credits to businesses and consumers as well as the whole payments system. Yet, a banking crisis should not be confused with the failure of an individual bank with no significant implications for the banking and the financial systems. Individual bank's failure should be experienced as idiosyncratic crisis for depositors, bond holders and shareholders who lose their investments. Systemic effects in the financial sector as well as procyclicality in the real economy usually accompany banking crises.

Among the various reasons underpinning systemic distress in the banking sector, informational imperfection and market inefficiency seem to be the most prominent factors (Hellmann, Murdock, & Stiglitz, 2000). Indeed, informational imperfections and the related market inefficiencies usually pave the way to lack of transparency, opaque accounting standards and distorted legal framework, which reduce the incentives of supervisors, bank owners, managers, and depositors (Noy, 2004). These shortcomings may then undermine prudent behavior in banking system and create adverse selection, moral hazard, and principal-agent issues (Ganioglu, 2007). It then follows excessive risk taking laying the basis of banking distress, contagion, and systemic failure of the banking sector (Fernandez-Bollo, 2013; Noy, 2004). The issue is even more problematic when it is associated with an ill governance board combined with a weak regulation and supervision framework for the banking sector (Fernandez-Bollo, 2013; Ganioglu, 2007).

Such challenging and deficient environment raises crisis of confidence and then evolves to bank runs. The subsequent crisis may have large economic and social costs. The crisis, for example, can dramatically reduce financial intermediation causing a collapse in investment and production (De Moraes, Gutierrez, & Barbosa, 2015). The resulting economic downturn often has highly detrimental effects on the economic growth and the government's budget since it may significantly decrease

tax revenues and increase the country's indebtedness level due to the capital injecting in the economic and/or the purchase of banks' bad assets.

Overall, crises in banking industry seem to be major drivers of regulation since it is a key device preventing or at least mitigating the impacts of economic crises (De Moraes, Gutierrez, & Barbosa, 2015; Tabak & Roberta, 2007). In the same vein, Llewellyn (1999) argues that the regulator should act to limit the regulated parties' degree of freedom to prevent market failures and its related severe effects on society. Fiennes and O'Connor-Close (2012) also maintain that the most compelling reasons for regulating and supervising financial institutions are to prevent crises and their negative consequences. Crises also greatly contribute to improve and strengthen the existing regulatory provisions in order to provide better safeguards for financial stability. As portrayed by Ganioglu (2007), regulatory improvements should contribute to discourage excessive risk-taking by financial institutions.

1.2.1.2. Systemic Risks in Banking

Systemic risk in banking is a serious brainteaser ushering in the need to submit the industry to strict regulation. The systemic risk increases the likelihood of sudden and simultaneous defaults of a large number of financial institutions leading to a deficient functioning of the financial system (De Jonghe, 2010; Huang, Zhou, & Zhu, 2009). It is triggered by a shock located in the financial system, then transmitted to the whole system through interconnected exposures and correlated positions, which may lead to the collapse of the economy (De Moraes, Gutierrez, & Barbosa, 2015). The systemic risk occurrence requires two main components, including an initial random shock and a contagion mechanism (Martínez-Jaramillo, Pérez Pérez, Embriz, & Dey, 2010).

The initial shock can start from a payment failure or an insolvency of one or more financial institution(s). It then spreads throughout the channel owing to the existence of a network of interconnected financial contracts stemming from the payments system, the interbank connections creating correlation of bank asset portfolios, and the market for derivatives (Freixas, Parigi, & Rochet, 2000). The contagion mechanism propagates the negative effects to other institutions within the same country or even internationally. Ultimately, as Dasgupta (2004)

emphasizes, financial crises begin locally in some region, country, or institution and subsequently spread elsewhere.

Lehar (2005) splits contagion into information contagion and counterparty contagion. The information contagion refers to the fact that the information related to the distress of one financial institution leads to negative shocks at other financial institutions largely because of the common shared risk factors. As for the counterparty contagion, the failure of one important financial institution leads directly to the collapse of other financial institutions. Hence, systemic risk may wreak havoc in today's highly integrated financial systems since the simultaneous failure of several banks usually results in a severe economic crisis (Helwege, 2010).

Overall, systemic risk appears to be an amplifier of financial crises and their large social and economic costs. Systemic risk has become a matter of great concern to central bankers, regulators, and politicians around the world (Bartram, Brown, & Hund, 2007) especially after the recent crisis. Acharya (2009) even depicts it as the heart of bank regulations. De Jonghe (2010) argues that systemic risk has been the focus of banking regulations from the beginning. Hence, more focus is increasingly put on the mechanisms that can enable banking system to withstand the insolvency and prevent the chain reaction of one bank default on the rest of the system. Hence, these mechanisms should enable regulators to identify the banks with the highest contribution to systemic risk and the riskiest countries as well as the periods of increased systemic risk (Lehar, 2005).

1.2.1.3. Procyclicality: The Ultimate Consequence of Banking System Distress

Procyclicality refers to the tendency of financial institutions to amplify the real economic cycle. It is the adverse upheavals resulting in the interaction between the financial sector and the functioning of the real economy during instable periods. Since banks hold a prominent role in the financial infrastructure, any disruption occurring in the banking system quickly spills over and leads to devastating consequences damaging the real economy (Fiennes & O'Connor-Close, 2012). Accordingly, Athanasoglou, Daniilidis, & Delis (2014) emphasize the critical role of banking sector in exacerbating cyclical fluctuations, which then lead to an inefficient allocation of resources in the economy due to the financial instability and the chaos in credit granting.

During expansion cycles, over-optimism may give way to more risk-taking and banks often end up increasing their lending activities. In fact, banks grant more confidence to borrowers' creditworthiness because of inflated assets values. Logically, the declining interest rate margins accompanied by less stringent lending conditions follow, which in turn exacerbate investments and amplify the economic boom until the process stop abruptly when tail risks reach the peak (Hardouvelis, 2010). Then, a trend reversal begins and usually an economic recession expands. In these circumstances, banks become pessimistic and restrict lending terms and conditions. Even credible borrowers will face serious difficulties in accessing credit. Investments start experiencing lack of funding and many companies may simultaneously become bankrupt. The vicious circle could worsen the downturn with an ultimate boomerang effect to the financial sector. The following cascading bank insolvencies and bank-runs may lead to additional financial and economic spillovers (Bartram, Brown, & Hund, 2007).

Academics and experts in bank regulation ascribe the disasters of the procyclicality to causes ranging from market inefficiencies to imperfections in regulation provisions. Procyclicality derives from deviations from the efficient market hypothesis, and is exacerbated by regulatory and accounting standards (Athanasoglou, Daniilidis, & Delis, 2014). To this end, asymmetric information, principal-agent issues, moral hazard problems as well as herding behavior are pointed as the most serious causes of the market inefficiencies. Most of these issues will be discussed later in agency theory as one of the key theoretical foundation of banking regulations. Furthermore, VanHoose (2008) reports that regulatory tightening of capital ratios leads to aggregate shocks and enhance the procyclicality already inherent in banking, especially during downturn periods.

Hardouvelis (2010) carries out a more thorough and comprehensive analysis identifying twenty factors as key reasons of procyclicality. He categorizes these factors into four groups namely economic, financial, policy-related and institutional.

Factors related to the economic environment:

a) the advent of globalization, which enhances interconnectedness of countries, increases interrelations among financial institutions, and synchronizes the business cycles across the globe,

b) the technological improvements in information dissemination across the globe making decision making more efficient,
c) short-termism bias in the behavior of firm managers who cannot see beyond the current cycle and seek short-term profits, and
d) the inertia in household and business sentiment in which future forecasts are perceived as simple replications of past and present events.

Factors related to the financial environment:

a) the similarity of techniques and input data used to assess banking risk,
b) the concentration of risk management and money making business in the same unit,
c) the herd behavior of fund managers, and
d) the bias induced by the behavior of rating agencies which tend to be more lenient on the upside of the cycle and stricter on the downside.

Factors related to economic policy making

a) the political pressures on regulators to behave in a way similar to the market and the powerful financiers,
b) the moral hazard induced by policy makers when they usually rush to save "too big to fail" financial institutions at the expense of tax payers, and
c) the apparent bias of policy makers in favor of the wealthy financial sector due to an increasing dominance of the financial sector over the other sectors of the real economy.

Factors related to the institutional features of the financial system:

a) the capital requirements or capital adequacy ensures the risk coverage of the capital framework in order to counterparty credit exposures and reduce the related moral hazard,
b) the degree and type of banks provisioning for non-performing loans contributes to control lending during booms and strengthens banks in bad times since bank provisions are computed based on both cumulative historical revealed and future expected losses,
c) the mark-to-market accounting emphasizes the true value of assets and liabilities over time, which then makes the bank balance sheet and its capital base pro-cyclical,

d) leverage is often blamed for spreading and worsening crisis and so, regulators require its restriction or its counter-cyclical variation,
e) funding liquidity is deemed to be highly pro-cyclical since its sudden disappearance exacerbates the crises, especially when liabilities have a very short-term maturity and policy makers insist on a minimum liquidity requirement.
f) collateral requirements, for instance loan-to-value ratios for car financing, are pro-cyclical since they rise during economic expansions and fall during economic contractions whereas margin requirements are countercyclical.
g) the size and the interconnectedness of financial institutions raise the issues of systemic risk and "too big to fail" that are pro-cyclical factors, rising in booms and declining in busts,
h) home versus host country regulation is a challenging issue since it opens the way to foreign banks operating internationally to escape from host countries during crisis, causing a worse than expected domestic host country recession, and
i) financial market structure and organization are key factors to control procyclicality since they influence the flow of information, the level of transparency as well as the level of counterparty risk.

Overall, procyclicality appears as a very worrying issue in financial and economic stability since it is a powerful amplifier of crises. It has even become one of the main concerns for reforming banking regulation after the recent crisis. The solutions introduced in Basel III to deal with procyclicality will be discussed in the next chapter.

1.2.2. Objectives of Banking Regulation

The banking industry is a very delicate sector since a failure of a single bank may negatively affect others and usher in a major crisis in the whole economy. This is why banks are subject to a strict regulation. Thus, the key purpose of this regulation is to reduce banking industry exposure to risks (Fiennes & O'Connor-Close, 2012) in order to maintain financial system stability and protect consumers of financial services (Pauget, 2009; Llewellyn, 1999; Koehn & Santomero, 1980). This core

objective can be split into three sub-objectives: to reduce banking industry exposure to risks; to ensure financial system stability; and to protect investors and depositors.

1.2.2.1. To Reduce Banking Industry Exposure to Risks

Banks are exposed to various risks, the most daunting of which are credit risk, liquidity risk, currency risk, and the interest rate risk. These risks are potential sources of default risk or bank run that can induce the collapse of the whole banking industry. The tight connectedness prevailing among financial institutions (including banks) further exacerbates the adverse effects of these risks. Although no device is yet available to fully eliminate risks, there are compulsory mechanisms design to monitor and prevent their occurrence. This is one of the key objectives of bank prudential regulation. In fact, regulators have set up rules and standards to control the excessive risk-taking behavior of banks in order to minimize the likelihood of their bankruptcies.

1.2.2.2. To Maintain Financial System Stability

Both academics and policymakers usually acknowledge financial system stability as the core purpose of banking regulation. For instance, Brownbridge (2002) and Nyantakyi & Sy (2015) emphasize that the focus of regulatory authorities is to maintain the stability of the financial system and to safeguard deposits. Stability is primarily ensured through protecting banking system from recurring crises (Acharya V. V., 2009). As argued by Jordana & Rosas (2014), governments have long regulated banking activity, often by empowering banking regulators with a mandate to promote overall financial stability against the destructive power of banking crises. To this end, regulators must watch over efficiency, safety and soundness of financial institutions and strive to reduce adverse selection and moral hazard problems in banking industry.

1.2.2.3. To Protect Banking Services' Consumers

In a general sense, regulation intends to circumscribe self-interest behaviors and to address its potential abuses and/or anti-competitive practices, which can take place on a market at the expenses of consumers. In banking sector, regulation ultimately

aims to protect depositors, investors as well as all consumers of financial services from market imperfections and failures such as asymmetric information, high transactions costs, sub-optimal returns and loss of welfare. Indeed, prudential regulation safeguards the interests of many non-specialists and unsophisticated depositors (Nyantakyi & Sy, 2015) who are not able to make accurate assessment of the soundness of financial institutions to which they entrust their savings. In that regard, it provides a degree of assurance to consumers by preventing a crisis of confidence that may result in bank runs and lead to the freezing of the economy funding. In a nutshell, prudential regulation ensures continuous improvement for the banking solvency and the safety of depositors' funds.

Overall, prudential regulation is a key governance mechanism for the proper functioning of banking system and a vital guide of the behaviors of the main stakeholders in charge of its functioning. The prudential provisions evolve over time given the fact that reforms are introduced to strengthen the existing standards (often after major crises that shake the entire economy). Nevertheless, it is worthwhile to notice that the implementation of these objectives varies according to the micro- or macro-prudential nature of the regulatory approach.

1.2.3. Micro and Macro Prudential Regulation

For a long time, banking regulation was essentially micro-prudential-oriented since it was focusing on soundness of individual financial institutions. Nevertheless, the recent financial crisis exposed many flaws of this perception of regulating banking industry. This paved the way for a new dynamic with the introduction of macro-regulation perspective. Thus, the current prudential regulation mechanisms integrate both micro and macro components.

1.2.3.1. Bank Micro-Prudential Regulation

Micro-prudential regulation is designed to focus on the safety and soundness of individual financial institutions (Clark & Jokung, 2015). In micro-prudential regulation perspective, a financial system is sound only if each individual institution is sound. The micro-prudential regulation then creates efficiency and better economic performance for individual banks. This is even more critical since an

efficient and stable banking system is crucial for sound payment services and savings mobilization at the most favorable conditions of quality, cost, and safety (Pollin, 2011).

Micro-prudential regulation aims to strengthen the requirements on banks according to their individual risk. The micro-prudential approach sets up appropriate measures to prevent the risk of financial distress in the individual institutions regardless of their impact on the overall economy. It provides individual responses to banks to deal with idiosyncratic and exogenous risks. To this end, micro-prudential regulation requires strict measures to prevent banks from engaging in excessive risk taking or massive investments in too risky assets. It is concerned with sound banking practices in order to prevent the costly failure of individual financial institutions as well as protecting non-specialist depositors from moral hazard.

However, the micro-prudential regulation has shown its limits with the recent failure of the financial system. Indeed, the 2008 financial crisis revealed that micro-prudential regulation alone is inadequate to cope with large financial shocks (De Nicolò, Gamba, & Lucchetta, 2014). Furthermore, Clark & Jokung (2015) argue that micro-prudential regulation does not ensure the integrity of the overall system because of its major shortcomings in preventing systemic risk. This vulnerability of micro-prudential regulation is unfortunately exacerbated by three recurring phenomena in banking industry: the procyclicality problem, the interconnectedness of banks, and the liquidity and maturity mismatches. It is then clear that micro-prudential regulation needs to be strengthened with wider mechanisms that can fully monitor the financial system as a whole. That is precisely the reason why macro-prudential regulation was introduced after the 2008 financial crisis.

1.2.3.2. Bank Macro-Prudential Regulation

Although macro-prudential theories were developed several decades ago, it was not until the 2008 crisis that the relevance in preventing bank distresses and financial failures was realized. Specifically, notwithstanding the fact that macro-prudential was first introduced in banking regulation jargon more than three decades ago, it was only in the late 2000s that it began to be introduced in national and supranational regulation provisions, and ultimately became effective in practical

operations. It is even considered as a key device in the Basel III standards since the financial crisis revealed the need to include in prudential regulatory measures that can ensure the stability of the financial system as a whole and take into account the interconnection of financial institutions and their effects on the global economy in the event of crisis. To this end, Hanson, Kashyap, & Stein (2011) portray the urgent requirement of macro-prudential regulation in the aftermath of the crisis in order to maintain general equilibrium, safeguard the financial system and, therefore, control the social costs of the financial instabilities. Macro-prudential regulation in fact seeks to identify and control risks at individual institutions as well as across the financial system. It mainly aims to address the systemic risks in banking industry while reducing the procyclicality issues in order to prevent social costs induced by crises.

To address systemic risks, macro-prudential regulators have developed a set of provisions to tracks interactions and interconnectedness among financial institutions (Borchgrevink, Ellingsrud, & Hansen, 2014). It relies on clearly designed mechanisms to avoid excess build-up of systemic risks over time and address the likelihood of its adverse impacts at the macroeconomic level; it also aims to restrict the contagion effects of failing institutions during crisis. Indeed, macro-prudential mechanisms target and monitor complex transactions occurring among financial institutions, which are potential crisis amplifiers. In essence, macro-prudential regulation is designed to identify and address potential sources of contagion and spillover risks and maintain overall financial system balance and stability. To this end, macro-prudential regulators provide special regulatory treatments to institutions whose failure might pose a major systemic risk, i.e. the "too big to fail" banks.

Macro-prudential regulation addresses procyclicality issues in controlling feedback loops of the financial sector to the real economy (Borchgrevink, Ellingsrud, & Hansen, 2014; Jeanne & Korinek, 2014). In economic downturn for instance, the counter-cyclical capital buffer is one of the main devices used in macro-prudential regulation to protect the banking sector from excess losses and to ensure that credits remain available during periods of stress. The counter-cyclical capital buffer is also operated as a brake on banks' lending by restricting the cost of credit in the building-up period. Macro-prudential regulation may also control procyclicality by requiring banks to set aside dynamic provisions and excess capital stock to cover

risks resulting from procyclicality between the banking sector and the real economy (Saurina, 2009).

Macro-prudential regulation also targets herd behavior in order to prevent the collective moral hazard. In banking industry, the herding behavior refers to the tendency for individual banks to mimic the rational or irrational actions occurring or in vogue in the banking industry at a specific time. For instance, banks can overexpose themselves with upward credit cycle during rapid economic expansion due to hunting for short-term profit combined with risk myopia. This could lead to a joint failure of banks as an inevitable consequence of systemic risk (Acharya & Yorulmazer, 2008). Inversely, there is a strong likelihood that banking industry becomes overly risk-averse in downturn period. Macro-prudential regulation can then help to cope with these herd behavior risks.

1.2.3.3. Contradictions and Complementarities of Micro and Macro-Regulation

At first glance, macro- and micro-prudential approaches seem to be two contradictory mechanisms to regulate banking industry because of the major discrepancies they display. An analogy with a securities portfolio can be used to make a caricatured illustration of the distinction between micro and macro-prudential regulation (Borio, 2003). To this end, micro-prudential mechanisms are designed to manage and reduce risks on every financial institution or bank caricatured as a security of the portfolio of all banks, i.e. the banking industry. In contrast, the macro-prudential approach seeks to deal with the risks of the portfolio as a whole. A more structured logic to decipher the discrepancies between macro- and micro-prudential regulations is suggested by Borio (2003) as shown in the table 1 below.

Table 1: The Macro- and Micro-Prudential Perspectives Compared

	Macro-prudential	**Micro-prudential**
Proximate objective	Limit financial system-wide distress	Limit distress of individual financial institutions
Ultimate objective	Avoid output (GDP) and social costs associated with crisis	Protect consumers (investors/depositors)
Model of risk	Endogenous (in part)	Exogenous
Correlations and common exposures across institutions	Important	Irrelevant
Calibration of prudential controls	Top-down control in terms of preventing system-wide distress	Bottom-up control in terms of reducing risks of individual institutions

Source: Adapted from Borio (2003)

The first difference obviously relates to the main objectives of these two regulation approaches. In the short run, the micro-prudential regulation aims to prevent individual financial institutions from failing while the macro-prudential approach focuses on avoiding distress of the financial system as a whole. In the medium and long run, the micro-prudential regulation aims at safeguarding investors and depositors while the macro-prudential approach tries to avoid or limit social costs associated with financial system instability and crisis.

The second difference relates to the risk perception for each approach. Micro-prudential approach assumes that risk is exogenous while the macro-prudential perspective considers the risk as partly endogenous with respect to the behavior of the financial system. In macro-prudential perspective, risk is perceived in terms of dispersion of the output of the whole economy and that the financial system has first-order effects on it.

The third difference concerns the inclusion or not of interdependencies, interconnectedness and correlations among financial institutions for risks' mapping and assessment. Micro-prudential approach tends to set aside the interrelationships among financial institutions and the impact of their risk-taking on the financial system as a whole. Under this approach, the regulation of the entire system is seen as a simple aggregation of individual measures applicable to each financial institution while ignoring the correlations between them. In contrary, the macro-prudential perspective mainly focuses on the correlation and covariance of idiosyncratic and systematic risks among financial institutions as well as their common interdependency to the financial system at large.

The fourth and last difference is based on the calibration of control device. The micro-prudential regulation follows a bottom-up approach by setting prudential control mechanisms in relation to the risk of each institution. Inversely, the macro-prudential regulation is built upon a top-down approach since it first sets the relevant threshold of acceptable risks for the financial system and, then, calibrates the prudential controls based on the marginal contribution of each institution to the relevant measure of the system. This approach helps to identify vulnerabilities and design appropriate policy responses to the financial system.

Though macro- and micro-prudential regulations are designed in two completely different perceptions, it would, ultimately, be misleading to draw a binary distinction between them. That is to say, macro- and micro-prudential regulations are not mutually exclusive. What matters is the balance between the micro and macro-prudential approaches. For instance, the macro-prudential regulation is an essential complement to the micro-prudential device despite their conceptual differences. Not surprisingly, both academics and regulators agree on the complementary and mutually reinforcing nature of macro- and micro-prudential regulations (Faia, Hackethal, Haliassos, & Langenbucher, 2015). Neither macro- nor micro-prudential regulation can address all deficiencies in banking system alone. They need to be associated for a more accurate and effective control in the banking industry as well as the development of a more coherent framework to mitigate excessive risk-taking in banking in order to maintain financial stability and the conditions for sustainable economic growth.

1.3. MAIN THEORIES UNDERPINNING BANKING REGULATION

The world economy is dominated by the paradigm of liberalism based on the maxim of "Laissez-Faire" developed in the early 18th century by Vincent de Gournay and later widely echoed by most liberals. For instance, Adam Smith used the metaphor of an "invisible hand" to depict economy as a natural system whereby equilibrium is achieved through market mechanisms and free from government interference through regulations. However, the banking industry escapes from this logic and is subject to strict regulatory mechanisms even in the so-called capitalist economies. The rationales underpinning this trend are rooted in different theories, the most

important of which are the system theories, the corporate governance theories, and the general theories of regulation.

1.3.1. System Theories

System theories refer to a multidisciplinary field of research (Mele, Pels, & Polese, 2010) since it covers various scientific domains with different theoretical areas of focus as well as competing paradigms. Indeed, system conceptualizations evolve simultaneously across various disciplines and are built upon a holistic approach of knowledge in different fields ranging from natural to social sciences. However, the advent of General System Theory contributed to bring together models, principles, and laws in order to create a universal framework applicable to any discipline irrespective of whether they are of physical, engineering, biological, sociological, or economic in nature (Amagoh, 2008; Wang, 2004; Dubrovsky, 2004; Boulding, 1956; von Bertalanffy, 1951). Despite this ambition to establish unity of science, systems as well as the related mechanisms of regulation are widely discussed from two different perspectives viz. the open system and the closed system. After examining the logics behind closed and open system theories, banking industry will be analyzed as a system and the mechanisms set up to ensure its regulation will be discussed.

1.3.1.1. Closed versus Open Systems Theories

Von Bertalanffy (1956) broadly defines a system as a complex and interrelated elements standing in interaction. Yet, the focus of systems theory is on interactions, that are the interrelation among the components, rather than reducing an entity into its parts or elements (Chikere & Nwoka, 2015). In this respect, Mele, Pels, & Polese (2010) argue that the relationships and interactions among the system's components are more important. It is obvious that this line of thinking emphasizes on a holistic perspective to investigate any phenomenon. Based on this logic of wholeness with efficiently connected components towards a shared purpose, the boundary of the systemic entity must be clearly identified in order to separate internal components from external ones and to identify input and output relating to and emerging from the entity (Ng, Maull, & Yip, 2009). This is also the main rationale behind the distinction between closed systems and open systems.

In a closed system, there is no exchange of information and matter with the external environment; there is just exchange of energy (Mele, Pels, & Polese, 2010). In this respect, a closed system is perceived as isolated from environment. The closed system thinking has its roots in the classical Newtonian physics by focusing only on the functioning of internal elements since interactions with external environment are considered inconsequential. A closed system deals with relatively few variables, clockwork precision, and returns to original stable states of equilibrium. Small errors can be tolerated since they can be corrected before they yield a significant impact on the whole system (Amagoh, 2008). Accordingly, the second law of thermodynamics states that the total entropy of an isolated system always increases to a maximum, and eventually the process comes to a stop at a state of equilibrium, or remains constant in ideal cases. The final state is unequivocally determined by the initial conditions. Consequently, the final state will change when the initial conditions are modified or the process is altered.

Contrary to the closed system, the components of an open system interact with external environment (Chikere & Nwoka, 2015; Amagoh, 2008) and maintain themselves in a steady state rather than in a thermodynamic equilibrium. To this end, Mele, Pels, & Polese (2010) emphasize that there are exchanges of energy, matter, people, and information with the external environment. The open systems are experienced in every living organism, which maintains itself in a continuous inflow and outflow, a building up and breaking down of components, never being, so long as it is alive. The open system is based on equifinality principle in which the same final state may be reached from different initial conditions and in different ways. The open system also refers to the Darwin's law of evolution. As depicted by Chikere & Nwoka (2015), the main distinctions between open and closed systems are summarized in the table 2 below.

Table 2: Main Distinctions between Closed and Open Systems

	Closed System	**Open System**
Relations with the external environment	No interaction with environment	Interchange between a system and its environment
Variables considered	Few number of variables	More complex set of interrelationships
Form of regulation	Error-controlled regulation	Anticipatory control.
Purpose of Regulation	Returning a system back to some predetermined stable state to maintain static equilibrium	Adjust and move the system on a dynamic path to maintain dynamic equilibrium

Source: Adapted from Chikere. and Nwoka (2015)

1.3.1.2. Regulation in the System Theories

In a broader sense, regulation has been introduced in the system theory as the device enabling an organism or an organization to maintain equilibrium and constancy of direction with change of position or when interacting with other components of the system including the environment (Emery & Trist, 1960; von Bertalanffy, 1950). It is a set of mechanisms that maintains stability and cohesion in a system despite the impact of disturbance variables. It can also be viewed as the techniques implemented to organize and operate flows and interactions within a system by referring to a schedule designed in advance and to identify and tackle the inadequacies in order to bring the situation back to normal. Yet, regulation in closed and open systems is not proceeding in the same way.

The closed system regulation is activated following a disturbance. Regulation is triggered by an upstream action. In cybernetics, automation, and computer technologies for instance, a device or a process ensures regulation or controls a servomechanism used to balance and to maintain a desired level of equilibrium in order to keep proper functioning of the system as it is the case for the thermostat used in temperature setting (Simon, 1952). This is the so-called error-controlled regulation in cybernetic terminology (Chikere & Nwoka, 2015; Amagoh, 2008). The error-controlled regulating approach aims to prevent large errors based on information provided by small errors. As soon as the entropy in the closed system increases to a maximum acceptable disorder, error-controlled regulation will be able to bring back the system to a desired stable state. If the entropy increases over this buffer, the closed system will inevitably tend to breakdown since there is no possibility to import energy from environment to counteract the growth in entropy.

Unlike error-controlled regulation that may be fatal for the system, the open system follows an anticipatory regulating process, the so-called feed forward control. This mechanism anticipates errors before they occur and takes corrective measures before final output (Amagoh, 2008). Since there is no predetermined equilibrium to achieve in an open system, the regulation process usually moves the system on a dynamic path in order to adapt it to the needs of the external environment. In this respect, open systems constantly evolve for a continuous improvement.

1.3.1.3. Banking Industry as a System and its Regulation

The Proponents of the classical school consider business organizations as closed systems focusing on the efficiency and effectiveness of its integrated components. However, very early, this view was challenged because it put aside interactions with external environment by viewing the organization in a steady state, which ultimately impedes the possibility of its growth. It is then quite impossible for social organizations such as business companies to survive without interacting with its external environment. Indeed, business organizations always interact with the external environment to get inputs in term of raw material, labor, technology and process in order to produce outputs (goods and services) to the same environment (Chikere & Nwoka, 2015). Nevertheless, beyond discussing social organizations as open systems, Emery and Trist (1960) place greater emphasis on their socio-technical nature, underlining the two main components which are the social component (people), and the technical one (technology and machines).

The systemic approach has also been extended to banking industry. Like any other social organizations, every bank works as an open system. Because of the highly integrated relationships among banks, the banking industry can be represented as a whole composed of a variety of banks subjected to a broader structure known as financial system. As discussed early, the interdependencies in banking industry are so complex that a minor malfunction may amplify into serious, unintended, consequences in terms of systemic risks, procyclicality, or other major economic crises. Furthermore, the banking system is constantly in a dynamic motion in order to adjust to political instabilities and changes in economic conditions.

Several regulatory mechanisms are combined to maintain the banking system in an equilibrium state. Indeed, banking system is monitored through hierarchical control, market control as well as specific regulatory arrangements. These mechanisms comply with both error-controlled approach and anticipatory regulating logic. As aforementioned, in a closed system the error-controlled regulation focuses on taking actions to deal with the malfunction of a component of the banking system. The error-controlled regulation effectively operates in banking because of the various prudential ratios existing in both local and global regulatory arrangements. In events of non-compliance with the thresholds set for prudential ratios, bank managers or board authorities can directly take the necessary

measures to bring the situation back under control. The supervisory boards also play a major role by forcing each bank in the system to comply with the thresholds of prudential standards or to carry out immediate actions to get back to the thresholds. In addition, the anticipatory regulation refers mostly to the traditional monitoring devices (organizational structure, internal control, or audits, etc.) designed to anticipate errors or malfunctions before they occur.

1.3.2. Modern Firm-Based Theories and Corporate Governance in Banking

Regulation is one of the key components of corporate governance. It deserves special consideration due to the sensitivity of sectors like the banking industry. Hence, corporate governance is one of the theoretical mainstreams utilized in explaining banking regulation. Nonetheless, it would be superfluous to discuss the regulation issues in the light of corporate governance theories without screening transaction costs, asymmetric information, and principal/agent issues in banking intermediation.

1.3.2.1. Reducing Transaction Costs: The Basis of Banking Intermediation

The original meaning of transaction costs sprung from the famous paper titled “The Nature of Firm” where Coase (1937) coins the concept to explain the existence of the firm and the integration of the activities in organizational context. Thereafter, transaction costs theory became the source of social, political, and economic institutions (North, 1990). Transaction costs include efforts carried out to reduce and limit the uncertainty of human cooperation in order to enforce, preserve, and improve proper running of institutions. Transaction costs mainly built upon the costliness of information, encompass the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights, policing and enforcing agreements. From the perspective of institutional economists, transaction costs include information costs, negotiating costs, the costs of writing contracts, the costs of protecting property rights, and the costs of enforcing rules and agreements from different contractual arrangements. To this end, transaction costs is considered to be the cornerstone of efficiency analysis of institutional arrangements since high transaction costs are assimilated to inefficiency while low transaction costs reflect institutional efficiency (Marinescu, 2012).

In fulfilling the intermediating function, bankers always engage in a long and complex process of assessing the financial feasibility of the proposed project as well as the creditworthiness of potential borrowers. They incur operating expenses to gather information about current and potential partners, inform them on the smoothness of the negotiation and cooperation, draw up contracts, inspect to ensure that the terms of the contract are being observed. In essence, these transaction costs are the expenses (interests and ancillary charges) incurred to mobilize deposits, transfer lending from savers to borrowers and recovering them in later date. They fall into the category of market transaction costs as opposed to state imposed transaction costs. The latter refers to costs related to the existence and functioning of external institutional arrangements, i.e. the entire rules, regulations, and norms as well as many constraints that the state system enforces in society.

Despite the absolute consistency of transaction costs in financial intermediations, banks are still better and relevant alternatives compared to the direct lender/borrower exchange. In fact, banks provide better efficiency because of scale economies leading to very low transaction costs compared to the tremendously high expenses related to a potential direct lender/borrower interaction. Even the communication revolution and the development of new technologies that has drastically altered the traditional way of making transactions have not led to the obsoleteness of intermediation. Rather, they generate new methods and various types of intermediation. Nevertheless, bank intermediation cannot thrive in the context of perfect and complete markets where exchanges are quite free of transaction costs (Allen & Santomero, 1998). In this respect, Benston & Smith (1976) emphasizes that the "*raison d'être*" of banking industry is the existence of transactions costs. Therefore, the theory of financial intermediation seems to be consistent with Coase (1937) perspective since banking firms serve to reduce and control transactions costs. In addition to transaction costs, there is another major challenge in bank intermediation. This is the information asymmetry and the corollary principal/agent problems.

1.3.2.2. Agency Theory: From Asymmetric Information to Principal/Agent Problems in Banking

Agency theory depicts a contractual relationship whereby a person (the principal) engages another person (the agent) to perform some services or tasks on their behalf involving delegating some decision-making authority to the agent (Jensen & Meckling, 1976). Following the failure of market auto regulation, agency theory emerged to raise the major problems related to the principal/agent relationship and paved the way to the main mechanisms to addressing them. The main issues discussed in agency theory include informational asymmetry, moral hazard, adverse selection, and conflicting interest behavior between the principal and the agent. The banking industry seems to be one of the most suited environments for theoretically as well as empirically discussing the principal/agency issues (Shah, 2014; Palia & Porter, 2007).

The informational asymmetry is the most important market imperfection in financial intermediation and the backbone of principal/agency issues in banking industry. Though financial intermediary should contribute to alleviate information asymmetries, banking intermediation still leads to a twofold problem of informational asymmetry – informational asymmetry between savers and the banking firm and that of the banking firm and borrowers – since banks operate as agents or "middlemen" between savers and borrowers. In the first instance, banks have a comparative informational advantage over ultimate savers. In the second instance, borrowers know more about themselves than banks know about them, and therefore may sometimes have incentives to overestimate their creditworthiness (Woodward, 1988). They possess relevant details and private information on their willingness to repay, on their already pledged collateral, or further, on their skills in industry as well as the internal information on their projects (Barbosa & Marçal, 2011; Leland & Pyle, 1977). In dealing with such an eventuality, banks usually expend resources to collect relevant data about borrowers and accurately evaluate them to make informed decisions by screening creditworthy borrowers from non-credit worthy ones (Kemei & Kerongo, 2014). The informational asymmetry often paves the way to moral hazard and adverse selection (Barbosa & Marçal, 2011) because it is virtually impossible for the principal to monitor all of the agent's actions.

Moral hazard appears in principal/agent relationship when agent develops riskier behavior because he/she is partly or fully exempted from the adverse consequences resulting in such a behavior. For instance, the informational asymmetry between the borrower and the lender (bank) may expose the latter to moral hazard whereby the borrower inefficiently uses the obtained credit and ultimately fails to refund it. This may occur because the borrower does not face the full cost of wrongly using the loan.

In another vein, Fiennes & O'Connor-Close (2012) argue that the prominence of the financial system in the functioning of the economy can amplify moral hazard since the expectations of government supports increase in the event of difficulties. Indeed, operations carried out by central banks during financial crises, when directly targeting failing institutions rather than the overall system, get the banks to feel protected against their own carelessness and may induce them to excessively take riskier transactions in the future, which increases the probability of financial crises. This is the main shortcoming in the too big to fail theory, which will be discussed later.

The principal/agent problems can also create the adverse selection issue in which an offer on a market leads to opposite results because of information asymmetries. It is primarily based on the uncertainty regarding the type of agent to choose. In banking intermediation, adverse selection occurs when a wrong borrower is chosen because of biased information provided. It happens when the borrower deliberately hides certain relevant and critical information from the banker, which may distort assessments and lead to faulty determination of the recipient of the loan. This is consistent with the Gresham's law (bad money drives out the good) adapted in the market of lemon for bad and good cars (Akerlof, 1970). In short, bad borrowers may tend to drive out the good ones in the financial intermediation because of adverse selection.

The agency issues, furthermore, usually lead to self-interested behaviors and conflicts among stakeholders, which usher in the organizational failure. Since, banking industry form a very sensitive device in the economic system, it will be quite perilous to leave the industry under the effects of informational asymmetry and its related moral hazard and adverse selection. In that respect, the amount and quality of available information in financial market and banking industry should

increase in order to align the conflicting goals. This is possible with the adoption of suitable governance mechanisms operated by neutral performers having no personal interest in the credit market or in the banking industry (Gul, Sajid, Razzaq, & Afzal, 2012; McKnighta & Weir, 2009). Prudential regulators seem to be the most suitable super structure to carry on this governance function in the banking system.

1.3.2.3. Prudential Regulation as a Specific Banking Governance Device

The corporate governance tenets largely developed in response to the major problems raised by the modern firm-based theories, including transaction costs and agency theories. To this end, the Organization for Economic Co-operation and Development (OECD) set up the core principles or perhaps the most comprehensive guidelines for corporate governance. Emerged in May 1999 and subsequently revised in 2004 and 2014/15, these standards aim to improve the legal, institutional and regulatory framework for good governance practices in order to maintain high level of transparency, accountability and confidence in both financial and non-financial companies. In today's changing environment with increasing complexity, the OECD governance principles appear as the globally recognized benchmark to foster economic efficiency, sustainable growth and financial stability (OCDE, 2015). The Table 3 below summarizes the six key main scopes covered in the 2015 revised principles.

Table 3:The OECD Governance Principles

	SCOPES	SHORT DESCRIPTIONS
i.	Ensuring the basis for an effective corporate governance framework	- Promote transparent, efficient and fair markets; - Develop sound legal, regulatory and institutional framework for governance practices; - Design and articulate clear division of responsibilities for regulatory, supervisory and enforcement authorities to serve the public interest; - Highlight the prominent role of stock markets in corporate governance; - Provide supervisory, regulatory and enforcement authorities with the necessary resources and adequate powers in order to enhance independence, integrity and objectivity in their duties; - Promote cross-border co-operation among regulators.
ii.	The rights and equitable treatment of shareholders and key ownership functions;	- Protect and facilitate the exercise of shareholders' rights (secure methods of ownership registration; convey or transfer shares; obtain relevant and material information; participate and vote in general shareholder meetings; elect and remove members of the board; share in the profits of the corporation; etc.); - Ensure the equitable treatment of all shareholders, including minority and foreign shareholders.
iii.	Institutional investors, stock markets and other intermediaries	- Provide sound economic incentives throughout the investment chain, with a particular focus on institutional investors; - Ensure disclosing and minimizing of conflicts of interest that may distort information and technical services provided by proxy advisors, analysts, brokers, rating agencies, and others to support investors decision-making; - Prohibit insider trading and market manipulation and harshly punish offenders. - Require clear disclosing of corporate governance laws and regulations applicable when companies are listed in foreign jurisdiction.
iv.	The role of stakeholders in corporate governance	- Recognize the rights of stakeholders established by law or through mutual agreements; - Encourage active co-operation between corporations and stakeholders; - Supports stakeholders' access to relevant, sufficient and reliable information on a timely and regular basis; - Enable stakeholders to obtain redress for violations of their rights.
v.	Disclosure and transparency	- Ensure that timely and accurate disclosure is made on all material regarding the corporation, including the financial situation, performance, ownership, and governance of the company.
vi.	The responsibilities of the board	- Ensure the strategic guidance of the company, the effective monitoring of management by the board, and the board's accountability to the company and the shareholders; - Empower board of directors in risk management, tax planning and internal audit.

Source: Adopted from OCDE (2015)

The corporate governance principles may be implemented through two major orientations: the shareholder value and the stakeholder perspective. The early perception of corporate governance termed as shareholder value approach suggests that corporation must be run in the best interest of shareholders by creating value for them (Chilosi & Damiani, 2007; Letza, Sun, & Kirkbride, 2004). Corporate governance in this perspective should address deficiencies and conflicting interests related to the separation of management and ownership in organizations. In this respect, corporate governance encompasses the set of coordinating, monitoring and regulating mechanisms, including laws, regulations and the business practices to direct and control the relationship between the corporate managers and the shareholders. The main criticism regarding the traditional shareholders approach is its failure to integrate other stakeholders, which also constitute key components of the organization. This shortcoming paves the way to the stakeholder orientation of corporate governance.

In the stakeholder perspective, the corporation is considered as a legal function based on property rights, within which different economic actors achieve specific utility functions based on varieties of contracts. Ultimately, the proponents of stakeholder view emphasize the relevance of groups and individuals such as employees, creditors/debtholders, customers, the general public, the government, etc., who can affect, or are affected by, the achievement of an organization's mission (Waldkirch, 2008; Letza, Sun, & Kirkbride, 2004; Freeman, 1984). In the light of this orientation, corporate governance refers to a system of laws, rules, procedures and factors that monitor operations in an organization by ensuring the best distribution of rights and responsibilities among stakeholders, including the board of directors, managers, shareholders and other participants in the entity (Gillana & Starks, 2000).

For several reasons, the corporate governance of banks and other financial institutions is quite different from general corporate governance (Hopt, 2013; Marcinkowska, 2012). First, banks are involved in more complex and more opaque money based business (Mehran, Morrison, & Shapiro, 2011; Levine, 2004). Second, the complexity of the banking business increases informational asymmetry and diminishes stakeholders' capacity to monitor bank managers' decision (de Andres & Vallelado, 2008). Third, banking governance requires high quality financial information and transparency to maintain depositors' confidence and

attain greater stability on the financial markets in order to reduce the social costs of bank risk taking (Alexander, 2006). Fourth, the scope of corporate governance in banking goes beyond the shareholders' value approach to include debtholders in the focus (Hopt, 2013). No wonder, Mehran, Morrison, & Shapiro (2011) argue that the boards of directors of banks direct their actions primarily in the interest of the debtholders rather than in the interest of banks' shareholders. Fifth, the breakdown in the corporate governance in banking has negative consequences for the financial system as a whole and reverberates negative ramifications for the economy throughout the induced procyclicality effects leading to major crises. Thus, Marcinkowska (2012) concludes that weak and ineffective corporate governance mechanisms in banks represent the main causes of the recent financial crisis.

The corporate governance in banking follows the stakeholder perspective with more focus on debtholders. It is built upon a robust legal and regulatory framework known as prudential regulation. In this vein, banks differ from nonfinancial firms because banking is a regulated sector with a vast number of legal, supervisory, and informal rules (Mehran, Morrison, & Shapiro, 2011) strictly implemented to balance the relevant stakeholder interests in order to achieve economic development objectives, while minimizing the externalities of systemic risk (Alexander, 2006). Overall, prudential regulation appears to be the cornerstone of corporate governance in banking regulation. Furthermore, the regulatory dimension included in banking governance make it more complex and challenging than corporate governance implemented in non-financial corporations (Wilson, Casu, Girardone, & Molyneux, 2010; Adams & Mehran, 2003).

1.3.3. General Theories of Regulation

General theories of regulation will be discussed in this section according to the level of discretion available for the target entity despite the broader array of alternatives designed to shape firms' behaviors and address market failures and other public issues. The level of discretion depends on the degree of freedom and control displayed by the regulatory system. In fact, regulation may vary from leaving the regulated entity with complete discretion to imposing arrangements combined with threatening sanctions. The traditional command-and-control regulation and self-regulation appear then as the two extreme forms available in the extant literature.

However, between these two spectra of absolute discretion and total control, lies a hybrid type termed meta-regulation.

1.3.3.1. Conventional Regulation Theory: The Command and Control Perspective

The command and control approach in regulation–aka the conventional regulation–assumes that the targeted firm has no discretion to design by itself rules and regulatory provisions. In this case, a superstructure or regulatory body designs the relevant rules, guidelines, standards and disciplinary sanctions with which a set of firms or a whole industry must comply. In this context, Bardach & Kagan (1982) argue that discretion is removed from regulated targets in conventional regulation and the regulator tells them exactly what they must do or achieve. Only the regulatory body has an absolute control over the decisions concerning rules that must be applied by the regulatory entities. In case of noncompliance, the offensive entity is exposed to penalties.

The effectiveness of the command and control regulation basically depends on two key factors namely the degree of complexity and the uncertainty in the system to be controlled. The uncertainty imposes an unpredictability and instability of the environment and prevents to establish reliable rules of regulation. The complexity involves extreme nesting components and mechanisms of functioning of a system causing comprehension difficulties. The complexity combined with the uncertainty usually prevents the regulator to have some visibility into the operating system and does not help anticipating possible failures.

Obviously, the command and control regulation cannot work for highly complex system operating in an uncertain environment. In such circumstances, the regulator fails to have good understanding of the system and the regulatory mechanisms are not suitable for all the units forming the global entity. Furthermore, the command and control regulation lacks the necessary flexibility for a better adaptation or adjustment to changes. It follows that the regulator should give more discretion in situations of complexity and uncertainty and avoids enforcing common rules and standards to the whole system–a one-size-fits-all approach.

1.3.3.2. Self-Regulation Theory

Based on a high level of discretion, self-regulation is in direct contrast with the command and control perspective and displays a perfect unity between the regulator and the regulated entity. According to Coglianese & Mendelson (2011: 12), self-regulation ranges from absence of rules imposed by an external regulatory body to a rule created and enforced by the regulated entity itself. The regulated entity is left with complete discretion to act according to their own interests and designs its own regulating mechanisms. In this respect, Sinclair (1997) argues that self-regulation is a type of regulation that relies substantially on the goodwill and cooperation of individual firms for their compliance. In the same vein, Freeman (2000) describes it as the process by which standard-setting bodies operate independently of, and parallel to, government regulation and with respect to which, government yields none of its own authority to set and implement standards.

Self-regulation may involve an individual firm or a group of firms belonging to the same industry. For instance, a specific firm can monitor itself by designing its own regulatory mechanisms imposed on all the components of the firm-system namely shareholders, managers, and employees. Self-regulation may also engage a group of firms operating in the same industry that voluntarily develops self-regulatory instruments, rules or codes of conduct and monitors compliance while ensuring enforcement of rules to regulate or guide the behavior, actions and standards of its members.

According to Coglianese & Mendelson (2011: 12), "self-regulation tends to work best when the industry being regulated is small, relatively homogeneous, and interconnected, as well as when the implicit threat of outside regulation provides an industry with the incentive needed to regulate itself". It is also worthwhile to notice that self-regulation usually provides greater learning in complex and uncertain environments where it is quite impossible to implement the command and control philosophy in regulating targeted entities. However, self-regulation seems to be more self-interest-oriented since its regulatory rules and mechanisms are usually designed to protect the interests of the targeted firm or industry without adjusting them to the public interests. Hence, self-regulation may totally be inappropriate or ill-adapted when the main objective is to provide better protection to the public and prevent them from the adverse consequences resulting from the malfunction of the

system. The inadequacies and shortfalls of both self-regulation and command-and-control have paved the way for a more-moderate approach of regulation termed the meta-regulation.

1.3.3.3. Meta-Regulation

Gunningham & Grabosky (1998) were probably the forunners in laying the theoretical foundations of the meta-regulation even though they did not expressly mentioned this denomination when developing what they termed "smart regulation for an efficient environmental protection". They advocated the use of multiple rather than single policy instruments combined with a broader range of regulatory actors to optimize the effectiveness and reach better regulation. In fact, Gunningham & Grabosky (1998) argue that the environmental regulation must be carried on with more imaginative, flexible, and pluralistic approach, which jointly and smoothly implement the conventional form of command and control regulation, the self-regulation and the co-regulation as well as facilitating the involvement of various stakeholders (governments, businesses, third parties) with opposing or conflicting goals.

Later, Parker (2002) coins the concept "meta-regulation" with a precise and concise meaning, which is "the regulation of self-regulation" or "the regulation of regulators" regardless of whether they are public agencies, private corporate self-regulators or third party gatekeepers. In essence, the meta-regulation focuses on the ways that outside regulators deliberately induce targets to develop their own internal, self-regulatory responses to public problems (Coglianese & Mendelson, 2011: 12). In this respect, the outside regulators can direct or shape targets to regulate themselves and explicitly set up disciplinary rules and sanctions for offenders as well as provide rewards or recognition for regulated entities that adequately fulfill the rules and requirements laid down (Akinbami, 2013). Thus, the meta- regulation appears as a mixture of the command and control carried out by an external regulator and the self-regulation. The meta-regulation can be perceived as a regulating process whereby outside regulators (government for instance) controls the self-monitoring of regulated entities by coaching them. The meta-regulation can be implemented through the legal regulation of self-regulation (putting an oversight board above a self-regulatory professional association), non-

legal methods of regulating internal corporate self-regulation or management (voluntary accreditation to codes of good conduct) or the regulation of national lawmaking by transnational bodies (Parker, 2002). It then appears as a set of mechanisms (legal or no) to force self-regulated entities to evaluate and report on their own self-regulation strategies, which subsequently must enable external regulatory agencies to determine whether the ultimate substantive objectives of regulation are being achieved.

Morgan (2003) further advances this research agenda and described meta-regulation as a mode of governance that excludes competing ways of understanding regulatory policy choices designed to deal with failures and vulnerability in social welfare into the language of market failures or market distortions. A decade later, Papadopoulos & Roumpakis (2013) apply this concept to describe the transnational governance to tackle conflicting issues emerging in European industrial relations. In fact, the meta-regulation is a general theory of regulation that puts more emphasis on self-regulating mechanism while requiring compliance on the general framework designed by an external regulatory body. It goes beyond self-regulation by allowing third-party accreditation and certification. The meta-regulation is a hybrid approach that lies between self-regulation and conventional regulation.

Black (2012) also makes significant contributions to the meta-regulation theory by exposing its four compulsory key requirements. First, the regulated entities must have the appropriate culture to support the implemented compliance systems. Second, the regulated entities must have the right incentives to pursue public objectives as well as private profits. Third, the regulators must possess sufficient skills and industry experience to evaluate regulated entities. Finally, the regulators must have sufficient courage and political support to challenge regulated entities. Furthermore, the relevance of the meta-regulation is justified by the fact that regulators cannot be present at all times and in all places, and consequently there is a need to rely on firms consciously and willfully complying with regulation without waiting for the monitors' pressure.

Accordingly, banking regulation seems to be designed and run following the logic of meta-regulation as exemplified through the Basel arrangements and standards. For instance, Black (2012) argues that Basel III Accord is a meta-regulation since banks are allowed to use their own internal risk models to design their capital

adequacy, which then had to be approved by the outside regulators. To this end, banks (the regulated entities) seem to be best placed to understand the issue of risk in their industry and then design adequate internal risk management systems.

However, meta-regulation approach has some limitations due to its underlying mode of operation. First, in addition to the inability of regulators to critically evaluate the designed systems, meta-regulation often fails to overcome the conflicting objectives of regulated entities when designing risk management systems (Andenas & Chiu, 2013). Second, the regulated entities often design systems and processes to achieve their own goals which are not necessarily aligned with those of the regulators (Black J. , 2012). To this end, Kokkinis (2012) argues that some banks have been motivated only by a desire to maximize profits and not by social considerations.

CHAPTER 2: GLOBAL BANKING REGULATION SYSTEM: THE BASEL ACCORDS

The increasing complexity in cross-border lending and borrowing activities combined with integrated global markets has expanded the level of systemic risk, which is perceived as the root of global financial crises. The so-called "too big to fail" banks also play a leading role in systemic risks because of the interconnectedness they create with the rest of the financial sector. They also contribute more in transmitting shocks across the globe in times of crisis. It follows that regulation in banking industry should no longer be considered as a national issue or a matter of national sovereignty as it was prior to the 1970s. The concern of banking regulation must, therefore, be thought up and designed in a transverse and global perspective. Not surprisingly, the Basel standards have emerged after the collapse of Long Island's Franklin National Bank in the US and Bankhaus Herstatt in Germany in 1974 (Jablecki, 2009). Since Basel regulation is regarded as the highest international standards designed to regulate banking industry, this chapter examines the context of its emergence, its structural organization, and the developed standards over time as well as their implementation around the globe.

2.1. THE BASEL ACCORDS: EMERGENCE AND STRUCTURAL ORGANIZATION

This section examines the emergence and operational framework of the Basel Accords. It begins by exploring the regulatory scope in the banking industry before the 1970s. Then, it explores how the failure of the "too big to fail" theory led to the development of global regulations in banking. The section ends with the description of the organizational structure and functioning of the Basel Committee.

2.1.1. Banking Regulation Framework prior to 1970

Before the emergence of the Basel Committee, the banking industry was essentially characterized by the prominence of national regulating systems with no reliable framework to cope with financial transactions in international markets. Nevertheless, U.S. banking already had a sound and comprehensive regulatory

system supported by the development of the Banking Law called the Glass-Steagall Act of 1931.

2.1.1.1. Prevalence of National Regulating Bodies

Prior to the 1970s, the banking industry stood as an important symbol of national sovereignty. In France for instance, the central bank (*La Banque de France*) was responsible for setting up strategic objectives and commercial choices for banks and other financial intermediaries as well as monitoring their functioning. Regulation was focused on liquidity and solvency control. The banking supervisory commission technically designed various ratios, which were imposed on banks. The bulk of the banking legislation was built with the laws set up in 1941 and 1945. In 1945, the banks were separated into three categories, including deposit banks, investment banks and medium and long-term lending banks (Blot, Creel, Delatte, Labondance, & Levasseur, 2014). Similarly, the German Federal Bank *(Deutsche Bundesbank)* held the prominent role in the country's financial system and banking industry after the World War II. It was an issuing bank, which guaranteed the stability of the monetary system, regulated the circulation of money, and safeguarded the supply of credits for the economy (Baums & Gruson, 1993).

Everywhere in the world, central banks usually held the prominent role of monitoring the whole financial system including banks. They were in charge of designing the regulatory provisions and responsible for supervising the banks' compliance with the designed standards. Governments of each country organized its banking system by focusing on national priorities. That is, each designed policies to preserve banks from domestic risk factors without necessarily controlling for interconnectedness with global financial framework. Though the Treaty of Rome, signed in 1957, set out the main principles for a single banking market in the European Communities, Member States failed to design an early common banking regulating body. According to Petria, Capraru, & Ihnato (2015), the adoption in 1977 of the first directive on the coordination of laws, regulations and administrative provisions followed by the second banking directive related to the single banking license marked the main steps in the process of European integration. However, as explained below, the Glass-Steagall Act was the soundest

and comprehensive regulating provisions designed around that time to ensure an efficient functioning of a banking system.

2.1.1.2. The Specific Case of US Regulation: The Glass-Steagall Act

As a response to the 1929 financial crisis and the subsequent Great Depression, the Glass-Steagall Act was adopted on 16 June 1933 in the United States and became effective on January 1, 1934 (Dwyer Jr., 1981). As the best banking regulatory arrangements that could have existed at that time, the Glass-Steagall Act was depicted "*as an absolute safeguard against bank failures, as the greatest and most constructive statute in American history, as a complete protection against the danger of panics and depressions, and as a charter of financial liberty*" (Willis, 1934: 101). It was designed to increase the banks' responsibility in order to protect depositors, stockholders, and the public. In fact, Preston (1933) summarizes the prominent features of the Banking Act of 1933 as follows: the separation of investment and commercial banking; authorization of statewide branch banking; federal supervision of group banking; modification of double liability; regulation of interest on deposits, and increased power to supervising officers.

White (1986) depicts the strict separation of commercial and investment banking as the most important feature of the U.S. banking system since the Glass-Steagall Act. Indeed, the Banking Act of 1933 enforced a tight restriction on competition in financial industry by splitting financial activities into three main categories, namely deposit, investment and insurance. Each institution was required to operate only in one of the mentioned activities in order to avoid excessive concentration of financial power in a limited number of large institutions and prevent unsophisticated investors from being sold risky investments. The Glass-Steagall Act prohibited universal banking and prevented their directors from serving on other banks' boards. As a result, it led to a structural change in banking business and helped limit the excess speculations, which were partly held responsible for the 1929 crisis (White, 1986).

Though the Banking Act of 1933 did present some shortcomings, the United States experienced no major financial crises during the 66 years of its implementation period (Lucas Jr., 2013). These shortcomings include the lack of regulation on the risk characteristics of bank assets and the prohibition of paying interest on demand

deposits. Neal & White (2012) also report that the Banking Act of 1933 restricted entry of new banks, reduced the capital base for investment banks, and ultimately impeded small- and medium-size enterprises to access external funding.

2.1.1.3. Deficiency of Regulation for International Banking Market

Prior to the 1970s, there was no supreme authority or international body to monitor financial transactions in the global market. The regulatory mechanisms to control international banking transactions were nearly non-existent, and the national ones faced serious information problems regarding international banking cooperation. They lacked reliable means to track and monitor international financial transactions since the existing regulatory provisions were usually directed to control banking issues within states. In short, there was no prudential regulation for the international banking market. Yet, this deficiency in banking regulation remained without disastrous consequences until the 1970s.

However, the increasing development of foreign exchange after the World War II combined with more integrated financial markets raised more concerns about systemic risks. Thus, bankers and regulators realized that a banking crisis in one country could quickly spillover in other banking industries and might ultimately result in disastrous effects. The punchline was reached with the German Herstatt bank default in 1974, which shed light on the deficiencies and shortcomings of the "too big to fail" policy in the banking industry. Above all, it drew attention on the hazards associated with the gaps in national regulatory systems around the world and raised the absolute need for setting up a global regulation in banking industry. Hence, the Herstatt bank default can be considered as the stimulator of the Basel regulations. In this vein, Goodhart (2011) argues that the Herstatt crisis of 1974 triggered the formal establishment of the Basel Committee on Banking Supervision (BCBS).

2.1.2. The "Too Big to Fail" Policy and Global Regulation in Banking

In the history of the global regulation in banking industry, the "too big to fail" policy played a key role. As expounded above, for instance, the Herstatt bank default paved the way to the establishment of the Basel Committee. Equally, in the 2008

financial crisis, the collapse of Lehman Brothers can also be used as a prominent example to explain the major changes that occurred in global regulatory provisions leading to Basel III standards. After all, what is the "too big to fail" policy?

2.1.2.1. The "Too Big to Fail" Policy in Banking

The "too big to fail" concept were introduced in banking industry in 1984 following the failure of the Continental Illinois National Bank, which instilled fear in regulators because of the potential subsequent spill-over costs it might have induced to the economy. To efficiently tackle this threat and maintain stability in the financial system, the U.S. Office of the Comptroller of the Currency made the first distinction between systemically and non-systemically important banking institutions. It began by separating the biggest eleven banks from a total of approximately fourteen thousand others and designed a special safeguarding scheme to protect them or provide them with full deposit insurance when facing hard financial times (Grammatikos & Nikolaos , 2013). In fact, the basic rationale behind the "too big to fail" policy is that the default of a large bank might contagiously affect a larger chain of banks, which, in turn, may create huge losses in the financial system, and an ultimate collapse of the whole economy due to systemic interconnectedness and procyclicality effects. In this respect, Helwege (2010) maintains that the failure of a large bank or financial institution will have adverse impacts on other financial institutions and increase severity to the economy at large.

The proponents of "too big to fail" paradigm argue that regulatory authorities should give special and favorable treatments to banks of a certain size to maintain them still when they get into economic troubles. Governments and policymakers should bail out large banking organizations when they are close to defaulting in order to limit the losses for uninsured creditors and avoid disproportionate negative externalities on the economy (Ennis & Malek, 2005). That is, they argue, the government should intervene to prevent bank runs and panics, disruption to the stability of the financial system while also reducing the collateral spill-over costs to the economy, including tightening effect on the availability of credits, decreasing of production and employment, major decline in the national outputs, etc. The

implementation of the “too big to fail” policy in a banking system also protect depositors and encourage them to put their funds into the banks.

Kaufman (2014) describes a “too big to fail” firm as a large complex organization, especially a financial or banking firm, which requires either a special regulation to discourage failure while alive and/or a special resolution regime when defaulting. A “too big to fail” does not comply with the usual bankruptcy resolution processes applicable to other firms in the same industry, at least with respect to allocating losses. However, the size is not the most important issue in the concept of “too big to fail” though most definitions refer to large banking institutions; rather, the systemic importance is the key concern (Zhou, 2010) since it plays the pivotal role of the “too big to fail” firms. In fact, the “too big to fail” firms are usually involved in complex interconnectedness with the rest of the network. To this end, the bankruptcy of a “too big to fail” firm increases the risk of the whole economy collapsing.

While recognizing the undeniable benefits of the “too big to fail” policy, its implementation in the banking industry also has very serious drawbacks, mainly including the opportunity costs and the moral hazard problems leading to poor governance. The opportunity costs issues derive from the challenges related to the funding of the bailouts when implementing the “too big to fail” policy. The money to be spent to rescue failing banks could be used for investments that are more relevant. The bailouts funds could serve to finance productive sector in the real economy or to improve social welfare through improved education, health services, community infrastructures, etc. Instead, governments fund the costs of the bailouts by deriving the needed financial resources from taxpayers (Kaufman, 2014). They can raise taxes, issue and sell bonds. In extreme case, they can print money though this action may lead to high level of inflation, which are equally harmful to the economy.

According to Zardkoohi, Kang, Fraser & Cannella (2016), the “too big to fail” policy usually increases the risk-taking behavior of management teams with no counterpart in terms of improving financial performance. This is contrary to the rule of thumb of portfolio theory whereby managers seek the maximum return for an additional level of risk-taking. In the “too big to fail” financial institutions, managers can develop self-interest behavior by participating in riskier activities

without taking necessary safeguards. They believe that their actions are risk free since they are protected from bad outcomes through bailouts' supports. Such self-interest behaviors make bank failures more likely and raise the overall risk in the whole system. Consequently, Ennis & Malek (2005) argue that the expectation of contingent bailouts tends to create efficiency costs in the economy. In fact, the "too big to fail" policy weakens the banking governance structure since depositors and lenders are less motivated to efficiently monitor risk-taking levels as they do not bear the full effects of a crisis. They are confident to get subsidies from governments' bailouts in the event of bankruptcy. Hence, the "too big to fail" policy has become highly controversial to the point that its detractors argue for its abolition (Kaufman, 2014).

2.1.2.2. The Collapse of Herstatt Bank: The Starting Point of Global Regulation

Bankhaus Herstatt was a family-owned bank founded in Cologne in 1956 by Iwan Herstatt. At the end of 1973, Herstatt was ranked as the thirty-fifth largest bank in Germany with the total assets amounted to DM[4] 2.07 billion. It was a medium-sized bank that highly concentrated in foreign exchange markets (Galati, 2002). This business line in banking industry was quite free of major risks under the Bretton Woods System, which imposed fixed exchange rates. However, the collapse of the Bretton Woods System in March 1973 paved the way to the free floating of currencies resulting in higher exchange risks. Then, Herstatt bank got involved in speculation on the foreign exchange markets with risky bets.

Despite its relatively small size in German banking industry, Herstatt reached a proven level of systemic importance in international market because of its large and risky foreign exchange business. The fraudulent bookkeeping practices maintained by Herstatt bank's managers also led to major financial problems and exacerbated the systemic risks (Alford, 2005). For instance, Herstatt suffered losses four times higher than the size of its own capital because of wrong forecasts and unanticipated appreciation of the dollar. In March 1974, its open exchange positions amounted to DM 2 billion and it failed to meet the requirements imposed by the clearing house.

[4] DM stands for Deutsche Mark, which was the official currency of West Germany (1948-1990) and unified Germany (1990-2002) until its replacement by euro notes and coins introduced in European Monetary System in early 2002.

In June 1974, its losses on its foreign exchange operations amounted to DM 470 million and the three largest German banks refused to organize a joint rescue plan owing to the lack of transparency about the magnitude of actual losses of Herstatt. On 26 June 1974, the German supervisory office confirmed the failure of the bank and withdrew its license to conduct banking activities (Mourlon-Druol, 2015; Galati, 2002).

The decision to shut down Bankhaus Herstatt ensued in a significant time-lag effects in the foreign exchange transactions. It created what is so-called "Herstatt risk", that is, the risk taken by making operations across different time zones (Mourlon-Druol, 2015). In fact, the German supervisory office closed Bankhaus Herstatt at 16:30 Germany time, the end of the working day in Frankfurt, which was in the morning (10:30) of a working day in New York (Mourlon-Druol, 2015; Schenk, 2014). This discrepancy led to a number of unfinished operations since it left claims in European time without US dollar transfers to counterparties in New York time, leaving the correspondent banks out of pocket. The Herstatt collapse prompted withdrawals from commercial banks in Germany, a sharp increase in Eurodollar market interest rates, and a contraction in international banking activity as banks around the world repatriated their assets (Schenk, 2014). Small banks were squeezed since large investors in foreign exchange business became more cautious and preferred dealing with larger and familiar banks.

Overall, the collapse of Bankhaus Herstatt produced a domino effect and created a chain reaction that disrupted the international payment and settlement systems (Galati, 2002). It resulted in a widespread of fear, vulnerability and instability in the foreign exchange markets. It nearly led to the collapse of the global banking system, which could had resulted in a major economic crisis. The Herstatt bank's failure exposed the vulnerability of national banking regulatory systems as well as the poor performance of market self-regulation (Mourlon-Druol, 2015). At the same time, it aroused a heightened awareness and shared understanding on systemic risks in the banking market because of an increasingly globalizing network of exchanges, the size of the volumes traded, and the time difference. Henceforth, central bankers knew that national banking default could rapidly spread to global market. It became obvious to rethink banking sector regulatory practices on the international level.

Thus, central bankers of the G-10[5] countries and Switzerland came together to create the Basel Committee, the first international superstructure to develop best practices for global regulation and supervision in banking industry (Kapstein, 1989).

2.1.2.3. The Demise of "Too Big to Fail" Banks in 2008: A Further Evidence for Global Regulation

The recent crisis was the most severe financial disaster ever experienced since the Great Depression (Sieczka, Sornette, & Holyst, 2011). It nearly led to the collapse of the global economy. In this vein, Lo (2009) argues that *"with its shockwaves that have impacted every major country and market center in the world, the financial crisis of 2007-2008 is likely to become the most far-reaching dislocation in global markets in recorded history"*. The root causes behind the crisis are the growing complexity of banking organizations, i.e. the deregulation of the U.S. financial industry, which was greatly facilitated by the repeal of Glass-Steagall Act in 1999, and the extremely low interest rate policy implemented by the Federal Reserve (FED) in early 2000s. These paved the way to the increasing development of securitization, namely mortgage-backed securities, collateralized debt obligations and other derivatives traded by hedge funds (Barth, Li, & Lu, 2010). This crisis successively disrupted financial markets with the collapse of the subprime, caused the default of large banks, and finally spilled over into the real economy.

The subprime mortgage referred to loans granting to low-income U.S. households, which did not fulfill adequate guarantees to subscribe conventional property loans. The subprime loans were pledged on real estates and their unrealized capital gains since they displayed higher risk of default than classic loans. The FED's extremely low interest rates created a booming real-estate market as well as an uncontrolled development of mortgage-backed securities, such as Collateralized Debt Obligations (CDO) and their related default insurance contracts, the so-called credit default swaps. Despite their very poor quality, the ratings agencies overestimated the benefits of diversification in the housing market and ranked AAA, the top rating. This provided investors all over the globe with more incentives to get involved in

[5] The G-10 is made up of ten industrial economies, which cooperate on economic, monetary and financial matters. It comprises Sweden, Germany, the US, the UK, the Netherlands, Japan, Italy, France, Canada and Belgium.

acquiring these securities. Even the top investment banks such as Morgan Stanley, Lehman Brothers, Merrill Lynch and Bear Stearns borrowed vast amounts of money at low rates in the short term and invested these resources to buy the mortgage-backed securities.

In 2006, after several years of exceptionally high growth, the U.S. subprime mortgage market suddenly collapsed because the Federal reserve raised the interest rate from 1% in 2004 to more than 5% in 2006 in order to reflect the real inflation and the U.S. economic growth. The rise in interest rates increased the financial burden and led to the default of borrowers of residential mortgage loans. The massive auction-based trading of the mortgages caused a quick decline of the real estates' values. The unexpected downfall resulted in a widespread of toxic assets and the crash of the global stock market because of the interdependence of financial institutions through sophisticated derivative contracts, namely, the credit default swaps and the collateralized debt obligations. This shed light on the significant externalities and systemic risks that arise from the interconnectedness of financial intermediaries' risk portfolios (Ibragimov, Jaffee, & Walden, 2011). Hence, lenders and specialized credit institutions experienced serious troubles in the wake of considerable losses they faced.

In the aftermath of the stock market crash, many leading banks collapsed. The most prominent example was Lehman Brothers Holdings Inc., which filed for Chapter 11 bankruptcy on 15th of September 2008, after more than 150 years of business. Indeed, Lehman Brothers was the fourth world largest investment bank by asset size with over USD 600 billion in assets and 25,000 employees. Its collapse is seen as the largest bankruptcy filing in U.S. history (Mishkin, 2011). The Lehman Brothers bankruptcy sent a shockwave through the world's financial industry and became a significant turning point in the ongoing global financial crisis. Stresses and tensions in global financial markets amplified and reached a climax with a major loss of confidence combined with a widespread distrust vis-à-vis the finance sector.

By refusing to provide any kind of support to Lehman Brothers, the U.S. government sent to the international markets the signal of the demise of the "too big to fail" policy. In essence, it sent the general perception that large banks were no longer "too big to fail" and might filed for bankruptcy when defaulted though

market participants may have expected the Lehman Brothers to be bailed out (Labonte, 2013).

The collapse of Lehman Brothers then resulted in a domino effect of disruptive consequences through the global financial system, which eventually forced governments worldwide to rescue defaulting banks. To stop the ongoing failure of large financial institutions, they took extraordinary measures such as insuring risky assets, providing liquidity for exceptionally long periods and against collateral of depressed value, and injecting public capital to the benefit of shareholders of banks (Barth, Prabha, & Swagel, 2012). Hence, the collapse of Lehman Brothers ultimately revealed that the “too big to fail” policy cannot “die”. Rather, governments can either prevent banks to become “too big to fail” institution or protect them when they have reached such a stage. After the recent financial crisis, it becomes quite clear that “too big to fail” banks cannot be left to fail without imposing high macroeconomic costs to the whole economic system (Panzera & Rossi, 2011).

Despite the vast bailouts actions that followed the collapse of Lehman Brothers, it was already too late to prevent banking crisis to spill over in the real economy. Thus, began the Great Recession. In fact, banks choked off credits access to the private sector and therefore reduced investments opportunities, which resulted in a slowdown in international trade combined with a rising unemployment rate all over the globe. In 2013, the estimated cost for the crisis amounted 14 trillion dollars for the USA only after taking into account costs related to output, wealth, effects of national trauma and extraordinary government interventions (Choi, 2013). Ultimately, the international policymakers designed new rules and strengthened the regulatory standards through the Basel III Accords in order to reduce the size of the "too big to fail" banks. In this regard, Spendzharova (2010) argues that Lehman Brothers collapsed because of the subprime mortgage crisis, which highlighted the need to keep international banking supervision practices up to date.

2.1.3. General Overview and Mandate of the Basel Committee[6]

The Basel Committee on Banking Supervision (BCBS) is the supreme international governing body of global regulation for banking industry. This section first reviews its foundation and agenda, then discusses its functioning, and finally sets forth its member countries.

2.1.3.1. The Basel Committee on Banking Supervision: Foundation and Agenda

Following the breakdown of the Bretton Woods' exchange rates system in 1973, and the subsequent disruptions in international banking as well as financial markets, the G10 central bank governors set up the Basel Committee on Banking Supervision (BCBS) in 1974 (Alexander, 2008). The Basel Committee's office is located in the city of Basel (Switzerland) in the building of Bank of International Settlement (BIS)–to which it is closely associated. Although it was originally a framework to design best practices for its member-countries on banking supervisory matters, the BCBS eventually became the international reference for banking prudential regulations.

The Basel Committee is primarily responsible for analyzing the complexities of the modern banking system and respond to them by developing sound principles and guidance for effective banking supervision in order to withstand crises and ultimately improve financial stability worldwide (Jablecki, 2009). In this respect, it designs adequate and consistent banking regulating standards and promotes common understanding to close gaps in international supervisory coverage and ensure cross-border cooperation (Goodhart, 2011). It focuses on developing supervisory knowhow and expertise, corporate governance as well as recommendations for managing a wide range of emerging risks in global financial system. The Basel Committee ultimately aims to design efficient regulatory and supervisory systems to reach a harmonization in Banking industry (Penikas, 2015).

[6] The bulk of the information used in this section is available on the website of the Bank of International Settlement (Http://www.bis.org/bcbs/), which is the institution hosting the headquarters of the Basel Committee.

2.1.3.2. Administration and Governance of the BCBS

The Basel Committee carries out its duties in a highly structured framework, as it can be seen below.

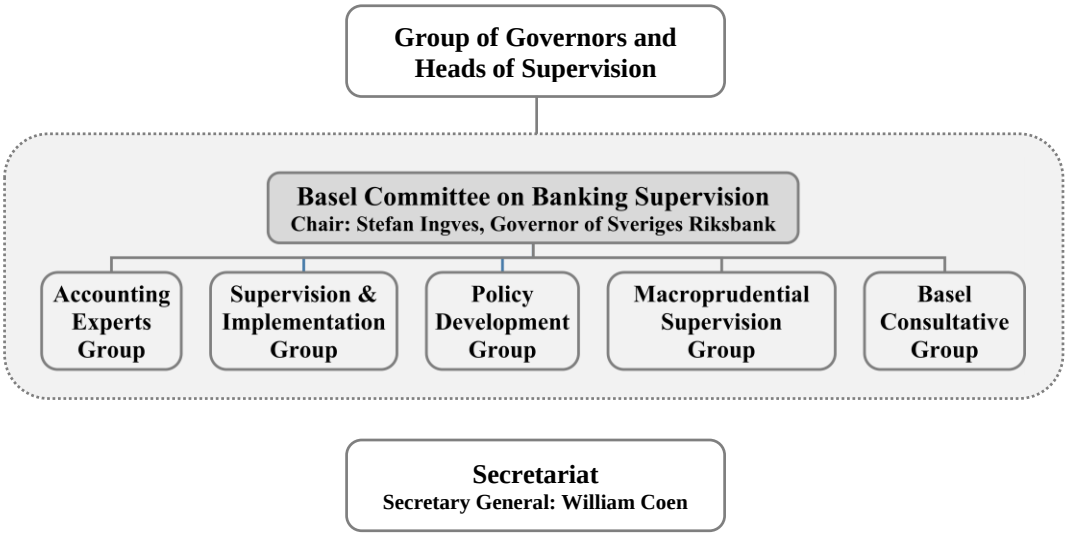

Figure 1: The Basel Committee's Administrative Chart
Source: Available on Bank of International Settlement website (http://www.bis.org/bcbs/organigram.pdf)

The Group of Governors and Heads of Supervision (GHOS) is the oversight body of the Basel Committee on banking Supervision. It provides general direction for the BCBS's work program. It approves the BCBS charter and provides amendments, if necessary. It endorses the major decisions and the work program for an effective functioning of the institution. It supplements the BCBS Chairman from among its members, if needed.

The Committee represents the permanent internal structure and is organized under five main groups presented as follows:

- **The Accounting Experts Group** works to ensure that international accounting and auditing standards and practices promote sound risk management at banks, support market discipline through transparency, and reinforce the safety and soundness of the banking system.
- **The Supervision and Implementation Group** is responsible for improving and fostering the timely, consistent and effective implementation of the Basel Committee's standards and guidelines, particularly across Basel Committee members.

- **The Policy Development Group** proposes and develops policies designed to promote a sound banking system and high supervisory standards. It also identifies and reviews emerging supervisory issues.
- **The Macro-Prudential Supervision Group** deals with the systemic issues in the global banking. It monitors systemic risks and reports global developments related to supervisory policies for systemic important banks. It also provides guidance to address inconsistencies and tackles unintended consequences in the overall framework of macro-prudential supervision.
- **The Basel Consultative Group** provides a forum for deepening the Committee's engagement with supervisors around the world on banking supervisory issues and facilitates broad supervisory dialogue with non-member countries.

The Committee generally meets four times every year. However, the Chairman can decide to hold additional meetings as necessary**.** The Committee takes decisions by consensus among its members. Decisions of public interest are communicated through the BCBS website though it can use press statements when necessary.

The Committee Secretariat is hosted and fully funded by the Bank for International Settlements. The Secretariat provides support and assistance for the proper functioning of the Committee; ensures timely and effective information flow to all BCBS members; facilitates coordination throughout the whole institution; constitutes a contact bridge between BCBS members and non-member authorities; supports cooperation between the BCBS and other institutions; maintains the BCBS records; administers the BCBS website and deals with correspondence of the BCBS; performs all other functions that are assigned by the Committee and the Chairman; etc.

2.1.3.3. Member-Countries of the Basel Committee

At its very beginning, the Basel Committee was established by the G10[7] countries plus Luxembourg and Switzerland, the host country (Jablecki, 2009; Herring,

[7] The G10 was establish in 1962 as the group of the 10 leading industrialized countries worldwide. The G10 comprised countries such as Sweden, Germany, the US, the UK, the Netherlands, Japan, Italy, France, Canada and Belgium. Switzerland joined the G10 in 1964, but the name of the group remained the same; The "Ten" refers to the IMF members.

2007). It was established with nine countries from Europe, two from North America and one from Asia. It represented around 16% of the world population and 67% of the global wealth measured in terms of GDP. In 2001, Spain joined the Basel Committee, which then regrouped countries owning approximately 70% of the global wealth but with a slightly decrease in represented population: 13% against 16% previously. In 2009, the Basel Committee expanded its membership with the entry of fourteen countries, including Argentina, Australia, Brazil, China, Hong Kong, India, Indonesia, Korea, Mexico, Russia, Saudi Arabia, Singapore, South Africa, and Turkey. The Committee then included a set of countries holding 84% of the global wealth and 63% of the world population. During that same period, the Committee also granted observer membership right to Chile, Malaysia, and United Arab Emirates. The Table 4 summarized some important features of the Basel Committee's member countries.

Table 4: Characteristics of Member-Countries of the Basel Committee

	1975	2001	2009	2015
Number of BCBS member countries in Africa	0	0	1	1
Number of BCBS member countries in America	2	2	5	5
Number of BCBS member countries in Asia	1	1	8	8
Number of BCBS member countries in Australia	0	0	1	1
Number of BCBS member countries in Europe	9	10	11	11
Total number of BCBS member countries	12	13	27	27
BCBS' member countries share of global GDP (%)	67,09	70,56	83,55	83,41
BCBS' member countries Share of the world population (%)	15,59	12,70	63,44	62,16

Source: Computed by the author based on statistic from World Bank database (see details in Table 32 in Appendix)

Currently, the Basel Committee has representatives from 27 countries and the European Union. Their central bankers and/or national authorities on banking supervision represent the member countries. It has usually placed emphasis on promoting close cooperation with non-member countries as well as with other standard-setting bodies and international financial institutions in order to ensure effective supervision and appropriate information sharing across industries and across international borders. The Committee works with a range of standard-setting bodies and institutions, including the International Monetary Fund (IMF), the World Bank, the Financial Stability Board (FSB), the International Association of Insurance Supervisors (IAIS), the International Association of Deposit Insurers (IADI), the Committee on Payments and Market Infrastructure (CPMI), the

Financial Action Task Force (FATF), the International Organization of Securities Commissions (IOSCO), the International Financial Reporting Standards Foundation (IFRS Foundation), the International Federation of Accountants (IFAC), the International Forum of Independent Audit Regulators (IFIAR), etc.

2.2. DYNAMIC OVERVIEW OF THE BASEL ACCORDS

At its early stages, the Basel Committee developed a set of principles in a document called the "Concordat", which evolved to become the Basel Accords from 1987 (Penikas, 2015). Since then, three main Accords have successively been adopted in global banking regulation, namely the Basel I, the Basel II and the Basel III Accords. Although pursuing the same mission, each Basel Accord was designed depending on the specific risk context and the major challenges and strategic issues prevailing in the global market. This section is devoted to scrutinizing the contents and scope of the three Basel Accords. To this end, we examine the main objectives of each Accord, the instruments and standards developed, the shortcomings, and the related criticisms.

2.2.1. The Basel I Accord

2.2.1.1. The Main Objectives of the Basel I Accord

The Basel I Accord marked watershed in the philosophy and practices of banking regulation, both in form and in substance. It was the starting point of international coordination for regulatory provisions and an effective supervision of international banking operations Heffernan (2005) by promoting stronger risk management practices in order to ensure stability and soundness of the global financial system. It should be recalled that banks' capital was already perceived as an essentially cushion against bank loans defaults even before the setting up of the first Basel Accord. Unfortunately, the capital adequacy policy was built upon a simply leverage ratio without accounting for the assets quality. In essence, the 8% leverage ratio failed to make difference between assets and risk (Hussain, et al., 2012). The introduction of the Basel I Accord came to rectify this aberration by designing capital adequacy upon the risk structure of banks' portfolios, and harmonizing capital regulation policy in banking industry as well.

The Basel I Accord focused on two interacting concerns; the first was to initiate internationally standardized bank capital requirements, and the second was to reduce sources of competitive inequality among international active banks (Tarullo, 2008). Indeed, the Basel I Accord introduced a set of requirements to harmonize various national capital adequacy regulations, or at least imposed in the member countries common standards of risk assessment for banks, which are active in the global market (Jablecki, 2009). It aimed to unify the capital adequacy measurement methods and align capital requirements for banks competing across national boundaries (Dănilă, 2012). The requirements on capital adequacy put emphasis on a substantial regulatory reliance on specific capital ratio calculations that were based on a risk weighting of assets. In fact, it prescribed a minimum capital risk adjusted ratio almost entirely directed to credit risk (Kumari & Dinesha, 2015). It was a mechanism to control bank risk taking behavior (Allen L. , 2004).

By requiring a common capital adequacy policy in member countries, the Basel policymakers also aimed to monitor the competitive advantages accruing from banks subjected to lower capital requirements (Roy, Bindya, & Swati, 2013; Tarullo, 2008). This could enable them to better tackle dumping practices of banks operating in the global market as it was the case with Japanese banks. For instance, Japanese banks were involved in offering loans at unbeatable rates in Euro markets. At the same period, the Bank of Japan granted unfair competitive advantages (cheaper capital, protection measures, etc.) to Japanese domestic banks, which impeded free competition for European and US banks (Tarullo, 2008). To reduce such discrepancies and decrease competitive inequality, the Basel I Accord appeared as the ideal framework to urge international active banks to boost their capital positions so that they could no longer build business volume without adequate capital backing (Roy, Bindya, & Swati, 2013).

The final version of the Basel I Accord was released in July 1988 with four-year transition period extended until the end of December 1992. So, the Accord became effective at the end of 1992 for full implementation of the minimum capital requirements by national supervisors. Yet, it is worthwhile reminding that the common capital adequacy policy was first established between United States and United Kingdom in the late 1986 before expanding to all of the Basel Committee's members. The Basel I Accord had also been amended a number of times. For instance, the Accord had been supplemented with the treatment of off-balance-sheet

items, which are direct credit substitutes such as letter of credit and guarantees to be included in risk weighted assets calculation. The Accord dealt with off-balance-sheet items in two-step process. First, a conversion factor was used to discount the value of the item in an equivalent balance sheet asset. Second, the converted asset would be assigned to one of the risk categories. Nevertheless, the most important amendment occurred in 1996 with a special measure devoted to derivative trading positions, which means capital charges must be clearly separated from capital related to credit-risk (Tarullo, 2008).

2.2.1.2. Instruments and Prudential Standards Developed in the Basel I Accord

In the Basel I Accord, regulatory policymakers designed a benchmark capital adequacy framework built upon three main components. The first component defined the risk-based capital, which is divided into two main constituents called Tier 1 and Tier 2 capital.

Tier 1 refers to the universally recognized core capital, which includes common stock or shareholders' equity, retained earnings or declared reserves set aside to cushion future losses or for smoothing out income variation, and perpetual preferred stock. The Tier 1 ratio is calculated as follows:

$$\text{Tier 1 Ratio} = \frac{\text{Core Capital}}{\text{Credit Risk Weighted Assets}}$$

Tier 2 refers to the supplementary or supporting capital, which includes all other capital such as revaluation reserves (gain on investment assets), loan loss reserves, hidden reserves, general provisions, certain hybrid capital (debt/equity capital), subordinated debts, long term debt with maturity greater than 5 years, unpaid dividends, etc. The constituents of Tier 1 may vary widely from one country to another because of discrepancies in national legislations and accounting systems. Perhaps, this was the rationale behind the definition of another capital buffer called the solvency or Cooke ratio, which is computed by putting together Tier 1 and Tier 2 elements as shown below:

$$\text{Cooke Ratio} = \frac{\text{Core Capital} + \text{Supplementary Capital}}{\text{Credit Risk Weighted Assets}}$$

Following the 1996 amendment, the solvency or Cooke ratio was adjusted to incorporate market risks. This reform led to the definition of Tier 3 capital consisting of short-term subordinated debt, and the Cooke ratio then became:

$$\text{Cooke Ratio} = \frac{\text{Core Capital} + \text{Supplementary Capital} + \text{Short Term Subordinated Debt}}{\text{Credit Risk Weighted Assets} + \text{Market Risk Assets}}$$

The second component of this Accord specified universal required minimum standards for bank capital adequacy to handle credit risk. The mainly required thresholds under Basel 1 are presented as follows:

- The core capital must cover at least 4 percent of risk weighted assets of a bank (Tier 1 $\geq$ 4%), i.e. risk weighted asset must be less than 25 times of core capital;
- The core capital together with the supporting capital must cover at least 8 percent of risk weighted assets of a bank (Cooke Ratio $\geq$ 8%), i.e. risk weighted asset must be less than 12,5 times of total capital;
- The core capital must constitute at least 50 percent of the total capital base of a banking institution (Tier 1 $\geq$ 50% (Tier 1 + Tier 2)), i.e. total of Tier 2 elements must be limited to a maximum of 100 percent of the core capital.

The third component depicted a comprehensive system of risk weights assigned to different categories of bank assets. In fact, the 1988 Basel Accord set up risk weights for assets portfolio according to the risk level of each item based on the generic nature of borrowers, rather than borrowers' credit history or true creditworthiness. The five risk-weight categories are summarized in the following Table 5:

Table 5: Risk Weights according to Assets Class under Basel I Accord

Risk-weights (%)	Related assets
0	- Cash; - Claims on, or loans guaranteed by OECD[8] central banks or governments.
0, 10, 20, or 50	- Claims on, or loans guaranteed by OECD domestic public sector entities, excluding central governments.
20	- Claims on, or loans guaranteed by OECD banks; - Short term (≤ 1year) claims on, or guaranteed by banks incorporated outside OECD; - Claims on, or loans guaranteed by non-domestic OECD public sector entities; - Cash items in process of collection.
50	- Uninsured residential mortgage loans
100	- Claim on the private sector; - Long term (≥ 1year) claims on, or guaranteed by banks incorporated outside OECD; - Claims on, or loans guaranteed by non OECD central banks or governments; - Other assets (premises, plant and equipment, etc.).

Source: Adapted from Basel Committee on Banking Supervision (1988)

2.2.1.3. Criticisms and Drawbacks of the Basel I Accord

The Basel I Accord had the merit of revolutionizing banking regulation with the development of a single risk-adjusted capital standard for the major banking systems of the world. However, the risk approach adopted under this initial attempt of global regulation in banking industry became the main source of criticism. In effect, the Basel I Accord was designed to provide adequate capital to guard against risk in the creditworthiness of the banking loan book. That is, it only focused on credit risk in the measurement of capital adequacy (Dănilă, 2012). It was not risk sensitive and required fixed risk weights on all assets based on their generic nature but irrespective of the quality of items belonging to the same category. Items within each weight category were considered equally risky and assigned the same risk weight while the credit quality might differ from one debtor to another. It also failed

[8] The OECD stands for the Organization for Economic Co-operation and Development (OECD). It was originally established in 1960 with 18 European countries plus the United States and Canada. Today, it is a forum of 35 industrialized countries and more than 70 non-member economies. It mainly aims to stimulate economic progress, promote free market policies, and expand world trade in order to build strong economies and sustainable development. The Organization provides a setting for its member countries to share policy experiences, seek answers to common problems, identify good practice, coordinate domestic and international policies, and build a valuable source of policy analysis and internationally comparable statistical, economic and social data.

to encompass risks pertained to exchange rate fluctuations, changes in interest rates, general macroeconomic downturns, and operational activities.

This narrow risk structure is described as “one-size-fits-all” approach in risk management (Blundell-Wignall, Atkinson, & Roulet, 2014). This approach actually led to the development of riskier behavior in banking industry. In fact, it created an incentive for banks to increasingly get involved in regulatory capital arbitrage especially through securitization, which ultimately inflated innovation and sophistication of financial markets. The securitization process enabled banks to shift their risk exposure from highly risky to less risky category assets in order to substantially reduce their regulatory capital requirements with little or no corresponding reduction in their overall economic risks (Jones, 2000). More broadly, Merton (1995) describes regulatory capital arbitrage as techniques used to restructure a bank’s asset portfolio in order to lower its capital requirement but with the same or even greater risks. In this scope, banks can also reallocate their portfolio assets mixed by selling existing high-risk rating assets and investing the proceeds in low risk assets i.e. government securities (Tarullo, 2008).

The rule of low and uniform risk weights associated with the credits granted to institutions operated in the OEDC environment may also be considered as a shortcoming. In the Basel I Accord, the same risk level characterized the OEDC countries though they were not all members of the Basel Committee of Banking Supervision. Even within Basel member countries, it is inconsistent to believe that risk structures are quite similar. For instance, Japan banking industry experienced serious problems during the Basel I Accord implementation lifespan.

Furthermore, capital adequacy requirements are also sensitive to the procyclicality effects. In this regard, Tarullo (2008) argues that minimum capital requirement may constrict lending, which in turn prevent companies and other borrowers from accessing needed funding even though they are creditworthy. Indeed, when banks suffer capital losses after loan defaults, they are likely to reduce their assets since additional capital raising is more difficult and expensive in such a context. These assets reduction through lending constriction may result in negative effects on economic activities and ultimately drive the global economy into a global recession.

To address the shortcomings and weaknesses of the 1988 Accord, the Basel Committee made a manifold of amendments. Yet, the amendments failed to yield

an adequate regulatory system, which can deal with the increasing innovation and sophistication of the marketplace or capable of responding to emerging challenges at the late 1990s, such as complex correlations, diversifications and portfolio effects in financial transactions. The revision to account for market risks also brought a radical overhaul in the "*esprit*" of the risk approach comparing to the initial agreement. All this has led to the establishment of a new agreement for bank regulation known as Basel II Accord.

2.2.2. The Basel II Accord

2.2.1.1. The main Objectives of the Basel II Accord

Basel II is an improved and refined version of the 1988 Basel I Accord built for the furtherance of the original goals of regulating internationally active banks. It is the second iteration of the Basel Accords to capture the full spectrum of risks associated with banking activities. It intended to promote safety and soundness in the financial system and enhance fair competition for international banks. Thus, the Basel II Accord has brought a great improvement of the risk management philosophy in banking industry by developing new policies and standards. To this end, Docherty (2008) argues that the Basel II introduced several innovations to improve the effectiveness of bank regulation and to reduce the likelihood of large bank collapse and its corollary of financial instability. It brought a new perspective in banking governance with the disclosure requirements and the promotion of self-regulation practices through an increasing use of banks' internal models in risks management (Carretta, Farina, & Schwizer, 2010). Basel II expanded some new measures to overcome the shortcomings of Basel I and respond to the aforementioned criticisms as well.

Though it was aligned on the fundamental stated goals of the original agreement, the Basel II Accord displayed important specific features in its main objectives. Indeed, the Basel Committee on Banking Supervision designed these new global banking supervisory provisions to increase the sensitivity to risk of regulatory capital requirements, and to provide incentives to banks to enhance their risk-management systems and processes (Yeh, Twaddle, & Frith, 2005). More precisely, the Basel II Accord was designed to achieve the following specific objectives:

- To render a more comprehensive approach for more risk-sensitive capital adequacy relevant to the complexity and sophistication of bank's position and activities;
- To enhance the contribution of individual banks' internal risk assessing models to an effective global regulatory and supervisory process;
- To improve requirements for extensive disclosure obligations to ensure high quality information for market participants in order to increase their involvement in an efficient banking governance.

Essentially, these goals intended to align Basel regulatory provisions on an increasing complexity of banking risks in more sophisticated financial markets. For this purpose, an initial version of the Basel II Accord was published in June 2004 (Yeh, Twaddle, & Frith, 2005). This new Basel Accord was an expanded version after several iterations of an earlier proposal issued in June 1999, whose roots could be traced back to the 1996 amendment introducing market risk coverage in the capital adequacy requirement. In 2005, the Accord was amended and the full revised version was released in June 2006 (Dănilă, 2012).

2.2.1.2. Instruments and Prudential Standards of the Basel II Accord

While Basel I Accord was essentially built on capital adequacy requirements, the Basel II Accord moved beyond and introduced new instruments and approaches in global regulatory provisions. The new agreement consists of three mutually reinforcing pillars designed for a better protection of the national and international banking systems. The first pillar, known as "the minimum capital requirements", is an improved version of the Cooke Ratio designed in the Basel I Accord. The second pillar deals with the supervisory review process. The third pillar focuses on the market discipline through disclosure requirements.

2.2.1.2.1. Pillar 1 of the Basel II Accord: The Minimum Capital Requirements

The Basel II broadened the scope of risks in banking and required to calculate the capital adequacy ratio with three types of risks, including credit risk, market risk, and operational risk. In this respect, Yeh, Twaddle, & Frith (2005) state that the

pillar 1 of Basel II addresses the core risks that a bank faces. Under Basel II, the risk weights also depart from the "one-size-fits-all" approach and are more sensitive to the quality of items of a given category (Docherty, 2008; Yeh, Twaddle, & Frith, 2005). Hence, the pillar 1 evidenced that the Basel II Accord provided a more comprehensive framework to increase the risk sensitivity for minimum capital requirements, which is determined by the following formula:

$$\text{Risk Based Capital Ratio} = \frac{\text{Total Capital}}{\text{Credit Risk} + \text{Market Risk} + \text{Operational Risk}}$$

The Basel II Accord maintained a minimum level of total capital to 8% as it was the case in the first agreed requirements. The Tier 2 capital was still limited to 100% of Tier 1 capital. The main differences with the Basel I capital requirements come from the inclusion of the operational risk and the options that suggested assessing each type of risk.

Credit risk is the basic risk in banks' activities. Yeh, Twaddle, & Frith (2005) describe it as the risk of loss arising from a borrower defaulting on their obligations. It refers to the probability that a borrower or counterparty will fail to meet its obligations towards a bank in accordance with agreed term (Basel Committee on Banking Supervision, 2000). Under Basel II, there are two main possibilities to measure credit risk: the standardized approach and the internal-ratings based (IRB) approach.

The standardized approach, used as the default option for determining minimum capital requirements, is merely an extension of the risk-weight assets method developed in Basel I Accord. The standardized approach in Basel II Accord shifted from the "one-size-fits-all" asset categorizations to allow the use of risk weights assigned to credits by internationally approved external credit rating agencies. This approach is more risk sensitive since various risk weights can be assigned to various types of exposures to banks, companies and sovereigns (Roy, Bindya, & Swati, 2013; Dănilă, 2012; Yeh, Twaddle, & Frith, 2005). For instance, the Basel II Accord assigned different risk weights based on the rating scores as presented in the Table 6, unlike the Basel I Accord where all types of corporate lending were clustered in the category with a single 100% risk weight.

Table 6: Risk Weights of Rated Corporate Claims

Rating Scores	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Unrated
Risk Weights	20%	50%	100%	150%	100%

Source: Adapted from Basel Committee on Banking Supervision (2001)

Another example refers to sovereign claims discounted according to the credit rating scores as depicted in Table 7 instead of being classified according to the participation of the sovereign in the OECD.

Table 7: Risk Weights of Rated Sovereign Claims

Rating Scores	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below BB-	Unrated
Risk Weights	0%	20%	50%	100%	150%	100%

Source: Adapted from Basel Committee on Banking Supervision (2001)

An alternative to the standardized approach is termed internal rating approach since it provides incentives for banks to develop their own internal systems to rate risk with the help of regulators rather than external credit rating agencies (Roy, Bindya, & Swati, 2013). The internal rating combines the individual banks' predictions on probability of default (PD) associated with each client with variables such as the loss given default (LGD) and exposure at default (EAD)—provided by the supervisory authorities (Dănilă, 2012). This approach is a key contribution brought by Basel II Accord to acknowledge the economic capital models and systems developed within individual banks to accurately capture, assess, and manage risks (Yeh, Twaddle, & Frith, 2005). There is a more robust and improved version of this approach termed "the advanced internal rating" approach whereby individual banks are also responsible for determining the loss given default (LGD), the exposure at default (EAD) and the credit maturity based on their historical data. Dănilă (2012) reports that only institutions wishing to adhere to the most rigorous market authorities standards apply this approach.

As for the market risk, the Basel II Accord has merely perpetuated the market risk measuring methods set by the 1996 amendment of Basel I. According to the Committee on Payment and Settlement Systems (2003), the market risk refers to "the risk of losses in on- and off-balance sheet positions arising from movements in market prices", which can arise from changes in interest rates, exchange rates, and equity values, etc. It may be related to the traded market risk deriving from possible losses on financial instruments held for trading purposes or securitization

risk associated with buying or selling asset-backed securities (Yeh, Twaddle, & Frith, 2005). The Basel II Accord proposed to measure the market risk with the standards prescribed by either supervisory authorities or internal value at risk (VaR) models.

The operational risk refers to the possible loss resulting from inadequate or failed internal processes, people, and systems, or from external events. Docherty (2008) describes it as the possible failure of the internal system to identify and prevent frauds or serious mistakes in planning, calculation, or execution of standard operating procedures causing threat or likely to jeopardize the viability of the bank.

Though operational risk itself is not a new concept, the innovation in the Basel II Accord is related to the design and development of an explicit regulatory capital charge to address the unexpected loss that could arise from the failure of operational activities (Yeh, Twaddle, & Frith, 2005). The Basel II Accord provided three options for assessing the operational risk, namely basic indicator approach, standardized approach and advanced measurement approach (Dănilă, 2012). The contents of these three options are summarized as follows.

- In the basic indicator approach, the operational risk capital is measured as a proportion of a basic indicator such as income, revenues, etc. The proportion of capital charge to cushion operational risk is determined based on a percentage prescribed by the supervisory authorities. It is a simplified version of the standardized approach.
- In the standardized approach, the bank's activities are split into several business segments and risks weights indicated by the supervisory authorities are assigned to each category.
- The advanced measurement approach uses a similar technique as the internal-ratings based approach for assessing credit risk. It measures the operational risk capital charges with the individual bank's internal operational risk measurement system. Only banks that comply with relevant internal risk measurement system are qualified to use this complex method.

2.2.1.2.2. Pillar 2 of the Basel II Accord: The Supervisory Review Process

The second pillar of the Basel II Accord defined the scope and the content of the monitoring actions of the supervisory authorities in a banking industry. It drew the outline of regulator-bank interaction according to the ideas promoted by the proponents of meta-regulation theory. Indeed, the Basel II Accord have empowered banking institutions to design and implement their own risk management system. At the same time, it recommended the supervisory authorities to make sure that the implemented risk management system is accurate and robust. Hence, in the so-called supervisory review process, regulators are responsible for checking bank's risk management system and capital assessment policy, and if needed, they can require additional capital buffer and apply appropriate sanctions and penalties to offenders (Roy, Bindya, & Swati, 2013; Yeh, Twaddle, & Frith, 2005). In the same vein, Dănilă (2012) argues that the bank's management team is responsible for controlling risks and maintaining adequate capital to the institution's risk profile. Supervisory authorities are responsible for creating a proper regulation environment, supervising its applicability and taking actions to correct potential imbalances. Docherty (2008) supports the relevance of the pillar 2 by advocating the prominent roles of prudential regulators to address risks out of control of the pillar 1's provisions. These encompass the following three categories of risks:

- The risks arising from high concentrations of lending to particular industries or geographical areas, which fall within the scope of pillar 1 but remain more difficult to be assessed under this provision.
- The risks not covered by pillar 1 procedures but related to banking internal factors, such as the changes in bank profitability, the net worth of interest rate changes, etc.
- The risks not covered by pillar 1 procedures but arising from external factors, such as variations in the business cycle.

Overall, the second pillar of Basel II Accord set up the framework of the supervisory review process to evaluate and monitor the internal risk measurement system of banking institutions, especially those opting to develop an internal-rating based approach. In this respect, the regulators or supervisory authorities must preventively approve the internal risk management model of each individual

institution and carry on ex post evaluation to control the system's efficiency, adequacy of resources, and efficacy of corrective measures, vis-a-vis any shortcomings identified by the monitoring procedures put into place (Carretta, Farina, & Schwizer, 2010). To effectively govern this review process, the Basel Committee on Banking Supervision suggests four guiding principles presented as follows:

- Principle 1: Banks should develop internal processes and procedures to determine the adequate capital in relation with their risk profiles and strategies to maintain capital levels and deal with any contingencies.
- Principle 2: The supervisory authorities are required to review and evaluate such internal procedures and strategies, monitor their compliance with regulatory capital ratios, and take appropriate actions when/if needed.
- Principle 3: The regulators or supervisory authorities must strive to ensure that banks maintain capital position above the minimum regulatory requirements.
- Principle 4: The regulators or supervisory authorities must undertake preventive and rehabilitating actions at an early stage to prevent capital from falling below the minimum required levels.

2.2.1.2.3. Pillar 3 of the Basel II Accord: The Market Discipline

In the third pillar of the Basel II Accord, the Committee introduced strict disclosure requirements for banks. This pillar imposed biannual or quarterly reporting of critical quantitative and qualitative information relevant to banking activities (Dănilă, 2012). Within this scope, banks have to provide information to the market about their risk profiles, risk assessment methods, risk management procedures, risk mitigation approaches, and overall capital positions, including aggregate amounts of surplus capital (both Tier 1 and Tier 2), risk-weighted capital adequacy ratios, reserve requirements for credit, market, and operational risks, etc.

The disclosure requirements ensure fair and adequate information to all various banking stakeholders. Hence, bank customers, institutions, and other market participants may access the appropriate information that allows them to monitor bank performance and risk-taking behaviors. The market participants or at least the

most sophisticated stakeholders can then penalize banks with poor risk management structures and weak capital adequacy while rewarding those with prudent risk monitoring system (Yeh, Twaddle, & Frith, 2005). The pillar 3 then appears as a true strategic tool for banking governance to maintain market discipline. It provides incentives to bank management teams to maintain risk monitoring system in relation to the risk profile in order to avoid facing adverse market discipline effects (Carretta, Farina, & Schwizer, 2010; Docherty, 2008).

2.2.1.3. Drawbacks and Main Criticisms of the Basel II Accord

The Basel II Accord has made a very significant improvement to the legislation of global banking regulation, specifically by introducing greater risk sensitivity in capital regulations. It has mainly contributed in expanding the scope of risks to be included in the capital adequacy assessment as well as enhancing requirements for high quality and transparent information through supervisory review process and the market discipline in order to ensure equitable bank competition and sound financial system (Daniela & Raluca-Dorina, 2009). To this end, Dănilă (2012) argues that the Basel II has definitely benefited from the prudential rules and regulations through clear and strong connections between calculation rules for capital, adequacy standards, market supervision and market discipline. However, the Basel II contains significant loopholes and shortcomings; the most glaring of which are the non-inclusion of some prominent risks brought to light with the recent financial crisis, the biases related to the rating agencies, and the complexity of its provisions.

To put it more plainly, the Basel II only focuses on credit risk, market risk and operational risk. Though it is more comprehensive and risk sensitive than Basel I, it failed to address reputation risk, systemic risk, liquidity risk and strategic risk. Those risks do not fit in the clearly delineated risk categories of the Basel II Accord. Daniela & Raluca-Dorina (2009) report that the above-mentioned risks are not operational risks even though they are striking on the capital markets.

The first two Basel Accords granted no special treatment to systemically important institutions though the systemic risk issues were at the very beginning of global banking regulation. They rather ignored this issue and focus only on risks affecting individual institution. Furthermore, no provision of the Basel II Accord was

designed to tackle liquidity risks, macroeconomic shocks, contagion and procyclicality until the 2008 financial crisis brought to light these shortcomings.

The reliability of the internal-ratings based approach has been questioned since they failed to include the above-mentioned risks, especially macro and systemic risk variables. These shortcomings are responsible for an imbalance between exposures and capital adequacy leading to either undercapitalized or overcapitalized banks (Dănilă, 2012; Daniela & Raluca-Dorina, 2009). Both undercapitalization and overcapitalization are detrimental to banking institutions. While overcapitalized institutions may face competitiveness problems, the undercapitalized are exposed to higher risk of bankruptcy stemming from their lack of sufficient capital to meet the obligations in turbulent periods (Daniela & Raluca-Dorina, 2009).

Beside this loophole of the internal-ratings approach, the external credit rating has also introduced two main biases in the bank-risk management system. On the one hand, the rating agencies usually amplify procyclicality since they may tend to grant less favorable ratings during the downturn. By doing so, the downgraded banks have to raise their capital adequacy in recession period and thus limit their credit offers. On the other hand, the rating agencies may be too optimistic in growth period and upgrade credits. For instance, on the eve of the recent financial crisis, the rating agencies were accused of giving high ratings to the mortgage-backed securities despite their very poor quality (Bayar, 2014). Second, the Basel II Accord did not provide any methodology or regulatory framework for the rating agencies. The rating agencies have then enjoyed a complete freedom in performing risk assessment. This made it very difficult to ensure the reliability of the rating scores provided by the external credit rating institutions.

The high complexity of internal rating method of risks evaluation was also a major shortcoming of the Basel II Accord. Indeed, the implementation of a complex risk management system may result in requirements of highly qualified staff for both banking institutions and supervisory bodies. The banks willing to apply the internal-ratings based approach have to hire experts in risk management and ensure continuing training to upgrade their skills and expertise in order to keep them in pace with increasingly risky environment related to technological and financial market developments. The development of internal risk ratings resulted in high operational costs. In this context, only large banks owning infrastructure and

adequate resources can afford internal credit ratings while the middle and small size institutions are left with no choice but to comply with the standard approach requirements. In this regard, the Basel II have generated competitive advantage for the large banks (Dănilă, 2012). It ultimately impeded to set up a uniform and homogenous regulatory capital in global banking industry since every bank was allowed to define its capital charge according to its risk exposure.

2.2.3. The Basel III Accord

2.2.3.1. The Main Objectives of the Basel III Accord

The 2008 financial crisis revealed that the Basel Committee on Banking Supervision laid far away from designing the suitable provisions for global regulation. That is, despite its comprehensive structure and sensitivity to risks, the Basel II Accord failed to withstand the recent turmoil in banking industry and maintain stability in financial markets. For instance, Roy, Bindya, & Swati (2013) reports that banks in the developed economies were under-capitalized, over-leveraged and relied on short term funding. The Basel II regulatory framework was unable to maintain the adequate capital to absorb additional level of risks in the banking system. These shortcomings triggered a wave of reforms in the aftermath of the crisis to introduce tighter capital adequacy and liquidity guidelines in the Basel regulatory provisions (Vassiliadis, Baboukardos, & Kotsovolos, 2012).

There was a transitional step with the so-called Basel 2.5. At this stage, the global regulatory body strengthened market risk capital for the trading book, introduced stress testing[9] in Value at Risk, and revised the treatment of securitizations. Following this step, the Basel regulators went further to achieve thorough amendments in order to supplement the existing global regulatory framework with new provisions. This led to the Basel III Accord, which is considered as an extension to address the weaknesses of the Basel II and provide concrete and innovative solutions to the emerging challenges in the global banking industry and financial system as well.

[9] The stress testing aims to identify hidden vulnerabilities by running simulations under crises assumptions.

Released in December 2010, the new Basel Accord is expected to be a stringent reference in prudential regulation in global banking system. Contrary to the previous accords, the Basel III introduced macro-prudential norms in banking regulation to handle systemic risk (Vassiliadis, Baboukardos, & Kotsovolos, 2012). It combined both micro- and macro-prudential measures to increase the resilience of the banking sector to financial stress and macroeconomic shocks. The Basel Committee on Banking Supervision designed the Basel III's provisions to react to emerging risk issues in banking industry although its main goal still remains to ensure stability in global financial system. The new provisions increased minimum capital requirement, set up, for the first time, liquidity regulation, and reinforced supervision and governance in order to reduce the probability and severity of future crises (Msatfa, 2012; Vassiliadis, Baboukardos, & Kotsovolos, 2012; Dănilă, 2012). In this respect, the Basel Committee on Banking Supervision assigned the following two specific objectives to the new Accord:

- Strengthen global capital and liquidity regulations with the goal of promoting a more resilient banking sector; and
- Improve the banking sector's ability to absorb shocks arising from financial and economic stress.

To achieve these purposes, the Basel Committee on Banking Supervision developed a comprehensive set of new regulatory instruments by focusing on four vital banking parameters, namely: capital, leverage, funding and liquidity.

2.2.3.2. Instruments and Prudential Standards in the Basel III Accord

Despite its intensive contribution to enhancing global banking regulation, Basel III Accord has not significantly altered the main structure of the previous provisions. It rather brought qualitative and quantitative improvements to the existing global regulatory framework to handle the emerging challenges in financial system. It strengthened banking specific measures and developed macro-prudential regulations to prepare the banking industry for any future economic downturns. The new Accord has introduced three major contributions such as raising banking capital adequacy, introducing minimum liquidity requirements, and designing specific guidelines for systemic important institutions.

2.2.3.2.1. Strengthening Banking Capital Requirements

The Basel III Accord strengthened banking capital requirements for better risks coverage. It provided greater accuracy in capital definition, increased the minimum capital levels to be held by financial institutions, introduced additional capital buffers and a non-risk-weighted leverage ratio. Under the Basel III Accord, the regulatory capital is divided into Tier 1 and Tier 2.

Tier 1 is, in turn, split into common equity and additional Tier 1 capital. Common equity Tier I capital is the best form of capital that includes common shares, and retained earnings. The common equity Tier 1 encompasses equity instruments that have discretionary dividends and no maturity, while additional Tier 1 capital comprises securities, which are subordinated debt with no maturity, and their dividends can be cancelled at any time. The Tier 1 Capital must predominantly build up with the common equity and retained earnings. It can be depleted without placing the bank into insolvency or an awkward position.

Tier 2 capital includes unsecured subordinated debt with an original maturity of at least five years. It is phased out over 10-year horizon beginning from 2013. In addition to the classical cushion, two capital buffers have been introduced to further increase the minimum requirements. These include a capital conservation buffer and a countercyclical buffer.

The Basel Committee on Banking Supervision designed the capital conservation buffer, which is exclusively built with common equity outside periods of stress, as a cushion to absorb losses during periods of financial and economic stress. When an institution fails to maintain the required level of the capital conservation buffer, it should face restrictions on payouts of dividends, share buybacks, and bonuses. The design intends to prevent institutions with heavy losses and depleted capital from continuing to make distributions to shareholders as it was the case during the recent crisis. Instead, this restriction should help them rebuild their capital by retaining earnings and/or raising new capital. The capital conservation buffer enables to transpose the risk as much as possible from depositors to shareholders and bank staff.

The countercyclical buffer is designed to protect the banking industry from periods of excess aggregate credit growth. It is an additional capital requirement to dampen

excess credit growth. It is built up with common equity or other fully loss-absorbing capital. It aims to increase capital requirements in good times and decrease it in bad times. The countercyclical buffer will slow banking activity in excessive growth period and will encourage lending in bad times. The national supervisors are responsible for determining the level of the buffer according to the intensity of systemic risks resulting from excess credit growth in the macro-economic environment.

Beside the improvements in the quality of regulatory capital in banking industry, the Basel Committee on Banking Supervision has significantly increased the required level of the capital adequacy. Under Basel III, the minimum requirement for common equity is raised from 2% to 4.5% of total risk-weighted assets. Financial institutions will be required to hold a capital conservation buffer of 2.5% to withstand future periods of stress; thus, bringing the total common equity requirement to 7% (4.5% common equity requirement and the 2.5% capital conservation buffer). In addition, they will be required to hold a countercyclical buffer ranging from 0% to 2.5%. The minimum total capital requirement, adopted in Basel II, has been maintained at the level of 8%; but it will increase to 10.5% when combined with the conservation buffer; and to 13% if the upper bound of the countercyclical buffer is added.

In addition to the risk-based capital requirements, the Basel III Accord introduced a simple risk free leverage ratio of at least 3% to constrain the build-up of leverage in the global banking sector. As shown below, the leverage ratio is calculated by dividing Tier 1 capital by the bank's average total consolidated assets:

$$\text{Leverage Ratio} = \frac{\text{TIER}_1 \text{ Capital}}{\text{Total Consolidated Assets}}$$

The Basel Committee on Banking Supervision proposed the following timetable to phase in the various capital requirements.

Table 8:Basel III Phase-in of Capital Requirements

Phases	**2013**	2014	2015	2016	2017	2018	**2019**
Leverage Ratio (3.0%)	Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1Jan 2015					Migration to Pillar 1	
Minimum Common Equity Capital Ratio	3.5%	4.0%	4.5%				**4.5%**
Capital Conservation Buffer	-	-	-	0.625%	1.25%	1.875%	**2.5%**
Minimum Common Equity + Capital Conservation Buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	**7%**
Phase-in of Deductions from CET1*		20%	40%	60%	80%	100%	**100%**
Minimum Tier 1 Capital	4.5%	5.5%	6.0%				6.0%
Minimum Total Capital	8.0%						
Minimum Total Capital + Conservation Buffer	8.0%			8.625%	9.25%	9.875%	**10.5%**
Capital Instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital	Phased out over 10 year horizon beginning 2013						

Source: Available on Bank of International Settlement website (http://www.basel-iii-accord.com/img/251.jpg)
* Including amounts exceeding the limit for deferred tax assets (DTAs), mortgage servicing rights (MSRs) and financials.
All dates are as of 1 January
--- transition periods

2.2.3.2.2. Introduction of Liquidity Standards in Global Regulation

The recent financial crisis highlighted the prominent importance of liquidity in banking activities since a number of major institutions had suffered from significant liquidity problems and required unprecedented government support to survive. Therefore, to protect taxpayers and reduce opportunity costs and moral hazard problems deriving from governments' bailouts, the Basel Committee on Banking Supervision introduced alongside with the capital requirements the liquidity standards. It was a major innovation since it is the first attempt to design specific norms at regulating liquidity in the global banking system. In fact, the Basel III Accord proposed two important liquidity ratios: The Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).

The LCR requires banks to maintain cash-like assets in short-term. This standard aims to force banks to maintain sufficient and adequate short-term liquid assets to survive stress scenarios or disruptions in the inter-bank and asset markets. With this standard, banks have to sufficiently maintain high quality liquid assets that can be easily and immediately converted into cash to meet its cash outflows for a 30-day period in case of a high stress scenario or a severe market downturn. Supervisors

should make sure that banks hold the required buffer to be self-sufficient to cover liquidity obligations for up to 30 days. They also have to provide guidance on the adequate usability of the liquidity cushion according to circumstances.

The liquidity coverage ratio is calculated as follows:

$$\text{LCR} = \frac{\text{Stock of Hight Quality Asset}}{\text{Net Cash Outflows over a 30 day time period}}$$

As shown in the table below, the implementation of the liquidity coverage ratio began on 1 January 2015 with a required minimum of 60%, which has to increase in equal annual steps of 10% to reach 100% on 1 January 2019.

Table 9: Basel III phase-in of Liquidity Requirements

	2015	2016	2017	2018	2019
Liquidity coverage ratio – Minimum requirement	60%	70%	80%	90%	100%

Source: Available on Bank of International Settlement website (http://www.basel-iii-accord.com/img/251.jpg)

The liquidity coverage ratio will promote the short-term resilience of an individual institution's liquidity risk profile and, at the same time improve the banking sector's ability to absorb shocks arising from financial and economic stress. Regulators also urge banks to develop their own stress test to assess the level of liquidity to maintain beyond the required minimum by simulating possible stress scenarios that could impede their specific activities.

Contrary to the short-term LCR, the NSFR is a one-year-horizon liquidity buffer. It requires institutions to maintain a stable funding profile in relation to their on-and off-balance sheet activities in a stress scenario. The required stable funding is built with capital, preferred stock, debt with maturities of more than one year, and deposits with maturities of shorter than a year. This standard has brought a substantive change in the banking-maturity transformation structure by promoting more medium and long-term funding for investment activities. In fact, financial institutions have to limit excess reliance on short-term resources to grant long-term loans. This will enhance funding quality by better matching bank liabilities to their assets. The net stable funding ratio is calculated as follows:

$$\text{NSFR} = \frac{\text{Available Amount of Stable Funding}}{\text{Required Amount of Stable Funding}}$$

The Basel Committee on Banking Supervision has required a minimum NSFR of 100%; that implies that the available amount of stable funding have to overcome the required amount of funding. The implementation of this standard will begin on 1 January 2018.

2.2.3.2.3. Specific Measures for Systemic Important Financial Institutions

The systemic important financial institutions were the major source of the recently experienced crisis since their distress had created significant disruption in the wider financial system and economic activity because of their size, complexity and systemic interconnectedness. They held a prominently amplifying role during the recent crisis and spread procyclicality effects as well. For instance, the collapse of the U.S. "Too Big to Fail" banks disrupted financial markets and ultimately had a severely damaging implication for the global economy. To prevent this from happening anew, the Basel Committee on Banking Supervision has conducted relevant discussions for designing specific provisions to better handle the regulation of specific important financial institutions. Through the Basel III Accord, the Committee released a consultative document in November 2011, which depicted a relevant assessment methodology to identify systemic important banks and proposed additional policy measures for such institutions in order to prevent their defaults or reduce the resulting severe economic impact (Brämer & Horst, 2013).

Indeed, the Basel Committee on Banking Supervision has developed an assessment methodology for systemic importance of financial institutions based on an indicator-based measurement approach. The proposed approach is built around twelve indicators of systemic importance, grouped into five categories that includes: size, interconnectedness, substitutability, complexity, and cross-jurisdictional activities (Basel Committee on Banking Supervision, 2011). The size of banks is measured through total exposures rather than using total assets. This is a way of controlling variations in national accounting standards. The interconnectedness is measured through a bank's intra financial system assets, intra financial system liabilities, and total securities outstanding. The substitutability depicts the lack or availability of substitutes for services the banks provide. It assesses the probability to replace these services if the bank were to collapse. It is measured through payments activity, assets under custody, and underwriting

activity. The complexity is measured through a bank's over the counter derivatives activities, trading and available-for sale assets, and holdings of less liquid assets. The cross-jurisdictional activity is measured through a bank's foreign claims and total cross-jurisdictional liabilities. The methodology affects an equal weight of 20% to each of the five indicators, which in turn is equally divided among the sub-indicators as presented below.

Table 10: Indicator-Based Measurement Approach

Category (and weighting)	Individual Indicators	Indicator Weighting
Cross-jurisdictional activity (20%)	Cross-jurisdictional claims	10%
	Cross-jurisdictional liabilities	10%
Size (20%)	Total exposures as defined for use in the Basel III leverage ratio	20%
Interconnectedness (20%)	Intra-financial system assets	6.67%
	Intra-financial system liabilities	6.67%
	Wholesale funding ratio	6.67%
Substitutability (20%)	Assets under custody	6.67%
	Payments cleared and settled through payment systems	6.67%
	Values of underwritten transactions in debt and equity markets	6.67%
Complexity (20%)	OTC derivatives notional value	6.67%
	Level 3 assets	6.67%
	Trading book value and Available for Sale value	6.67%

Source: Basel Committee on Banking Supervision (2011), available on http://www.bis.org/publ/bcbs207.htm

The systemic importance indicators aim to assess the threat to global financial stability of a large financial institution in a stress scenario. The selected indicators depict the main features that could generate negative externalities and make a bank critical for the stability of the financial system. For a more comprehensive assessment, the quantitative indicator-based approach can also be supplemented with qualitative information to capture information that cannot be easily quantified in the form of an indicator. For instance, the qualitative features may capture a major restructuring of a bank's operation (Basel Committee on Banking Supervision, 2011).

Furthermore, the Basel Committee on Banking Supervision designed additional regulatory requirements for specific important financial institutions in order to reduce the probability for them to fail and prevent systemic disruption of the financial system. To reflect their greater risks exposure, these institutions have to maintain loss-absorbing capacity beyond the minimum standards of the Basel III. The additional loss-absorbing capital is determined according to the systemic

importance of each institution. To this end, Basel III grouped banks into five different buckets (categories of systemic importance) and assign an additional loss absorbency with the magnitude of 1%, 1.5%, 2% and 2.5% and 3.5%, accordingly. The empty top back bucket of 3.5% of risk-weighted assets is intended to provide a disincentive for the banks to increase their systemic importance. It is also up to the national supervisory boards to impose higher loss absorbency requirements. Moreover, the systemically important financial institutions require intensive and effective supervision for a rigorously coordinated assessment of risks.

2.2.3.3. Drawbacks and Main Criticisms of the Basel III Accord

The Basel Committee designed the third Accord to improve the resilience of banks and global financial system. To this end, the new accord developed some innovative mechanisms, namely the liquidity regulatory provisions. The final text of Basel III Accord was released on 16 December 2010. Its implementation schedule is progressive from 2013 to 2019. At this point of its implementation, very few empirical investigations have been involved in assessing the true impact of the new provisions on banking stability. Moreover, the system has not yet faced a major challenge or macroeconomic shocks, which should had shed light on the effectiveness of the Basel III provisions. Hence, it seems to be too early to draw accurate conclusions on its relevancy or precisely identify its drawbacks.

Nevertheless, Admati (2016) comes up with constructive criticisms by labelling the Basel III Accord as a "missed opportunity to effectively address the deficiencies of capital regulation". She argues that the Basel III approaches of capital regulation are based on flawed analyses of the relevant tradeoffs, which, in turn, may result in a breakdown of governance and a lack of accountability to the public. As a starter, she questions the very low level of regulatory capital though bankers and policymakers claim that Basel III capital requirements are much improved. Despite the fact that the Basel III Accord multiplies the level of regulatory capital compared to Basel II provisions, Admati (2016) argues that the requirements are actually very modest in absolute terms since multiplying a small number such as 2 per cent equity to risk weighted assets in Basel II by a factor of 2, 3 or even more does not result in a large number. She also rebukes the outrageously low leverage ratio set at 3 per cent of equity to total value. She suggests setting equity requirements at 30 per cent

of total assets with a possible threshold of 20 per cent. This should help maintaining a conservation buffer between 20 and 30 per cent. She supports this proposition by recalling the historical equity level in banking industry in the 19th and at early of the 20th century. She also emphasized that such level of equity is considered minimal for healthy companies outside banking. Moreover, increasing equity requirements should reduce liquidity problems, runs and all forms of contagion, increase loss absorption capacity, and ultimately prevent financial crisis and its disastrous externalities.

Second, Admati (2016) criticizes the complex and problematic system of risk weights approach by recalling key distortions it has brought in the calculation of risk-weighted assets as well as the leading role it held in the recent crisis. In fact, the Basel III Accord maintained the risk-weighted assets method developed under Basel II. Not surprisingly, Lyngen (2012) argues that Basel III largely relied on the same risk-weighted assets method to determine capital requirements, but with significant adjustments to the risk weights of certain securities.

Third, Admati (2016) reveals that the existing capital regulations rely on poor equity substitutes built with debt securities. This alternative mechanism to convert into equity contributed to creating what is termed as loss absorbing capital to prevent at the same time bankruptcy and government bailouts. In the recent past, Tier 2 capital included only debt-like securities and even Tier 1 capital allowed many non-equity claims that were held by investors expecting specific returns. However, this strategy failed to yield the expected benefits since holders of such claims did not suffer losses even when banks ran into troubles. They have even received government bailouts for compensation.

It is worthwhile to notice that although Admati (2016) raises relevant criticisms towards the Basel II, she did not really propose alternative measures to those developed in the Basel provisions. Hence, despite these criticisms, the Basel III Accord remains the only relevant framework for global regulation in banking industry. Its provisions have brought real improvements to overcome the drawbacks and shortcoming of previous Basel provisions. The Basel III Accord also includes forward-looking devices to anticipate macroeconomic shocks and provides opportunity for national regulators to develop additional regulatory provisions to better account for country-specificities.

2.3. IMPLEMENTATION OF THE BASEL ACCORDS WORLDWIDE AND THE SPECIFIC CASE OF TURKEY AND WAEMU

For almost three decades, the global banking regulations have significantly evolved through the development of the Basel Accords, which reached its third iteration in 2010 following the recent financial crisis. By analogy with the efficient market hypothesis, Basel I Accord appears as the weak form of banking regulation; Basel II Accord as the semi-strong form; and Basel III Accord as the strong form though, discussions are still under way to improve and render banking regulatory system as effective and resilient as possible. The Basel Accords has become the international benchmark for banking regulation and supervision since the resulting provisions are adopted not only in member countries of the Basel Committee on Banking Supervision but also in non-member countries (Lyngen, 2012). Yet, the Basel Accords are not uniformly implemented in the various banking systems around the world. Even in the BCBS member-countries there are significant discrepancies in implementing the Basel provisions in their regulatory frameworks. In fact, each country usually adapts the Basel Accords to its local context and specific needs. To gain better understanding of the various uses and many applications of the Basel Accords, this section describes and illustrates the implementation of the Basel Accords. To that end, we first discuss the legal nature and implementation of the Basel Accords in the global banking industry. Then, we examine the specific situations of banking regulation and supervision in Turkey and WAEMU by highlighting their levels of compliance to the Basel Accords.

2.3.1. Legal Nature and Global Implementation of the Basel Accords

In this section, we first question the legality and legitimacy of the Basel Accords. Then, we examine the effectiveness of their implementation in the member countries. Finally, we discuss the incentives for non-member countries to comply with or include the Basel provisions in their national banking regulatory systems.

2.3.1.1. The Legality and Legitimacy of the Basel Accords

In the light of International Law, it is widely argued that the international financial standards are based on neither an international treaty nor international customary

law. Though described “soft law”, they do not have any legal force on their own since their grounding institutions have no legislative power. Yet, national authorities can voluntary implement the international financial standards. In this case, the target standards have to be incorporated into domestic legislations, regulations, and administrative practices by the relevant national authorities of each jurisdiction (Giovanoli, 2009).

Similarly, the Basel Accords have no legal force in national jurisdictions since they fall under the scope of the international financial standards. In fact, the Basel Committee on Banking Supervision operates without legal status and lacks legal personality. It does not possess any formal supranational authority and its decisions have no legal force over the national banking regulatory systems. The Committee only develops supervisory standards and guidelines and expects national authorities to implement them. To this end, Jablecki (2009) stresses that the Basel Committee acts as an advisory body, which produces recommendations of concordats and accords, rather than laws *sensu stricto,* to achieve harmonization in member countries’ regulatory standards.

However, the Basel Accords have gained the necessary degree of legitimacy in global banking regulation framework even beyond member-countries. They became undoubtedly the benchmark in banking regulation and supervision all over the world. With just twelve (12) countries at its early stage, the Basel Committee on Banking Supervision have reached twenty-seven (27) members since 2009. There are also some observing members, which will perhaps become fully-fledged members in the coming years. Most of the countries, whether members or non-members, have adjusted their national regulatory framework to reflect the designed provisions in the Basel Accords and comply with its requirements. Yet, the Basel Accords are not a panacea for overcoming all the risks and threats facing the global banking industry. The recent crisis has proved that the global banking regulatory framework can fail at any time, when unpredicted risks appear. Therefore, the Basel Accord must continue to improve and adjust according to the changing international financial environment that brings about new threats.

2.3.1.2. Implementation of the Basel Accords in Global Banking System

The Basel Accords are designed primarily to promote best practices in banking regulation and supervision in the most industrialized countries in the world. To this end, the regulatory provisions developed in this scope are primarily addressed to regulate banks operating in the member countries of Basel Committee on Banking Supervision, which currently includes representatives from 28 jurisdictions including the European Union. The implementation of the Basel Accords usually begins about a transitory period, during which the designed provisions are tested in the framework of member countries and necessary amendments are made to overcome the loopholes and improve the resilience of global banking regulation. By the end of the transitory period, member-countries would have enacted the Basel provisions in their national laws, regulations, or guidance in order to comply with the requirements of the Basel Accords. From Basel I to Basel III, the implementation of the global regulatory provisions has not met the same level of success.

The Basel I Accord lasted for more than one decade and its implementation was quite successful in member countries. By the end of the transitory period, all the G-10 countries had already enacted the capital regulatory requirements in their national provisions. The average capital ratio significantly increased in the G-10 banking industry, exceeding the threshold of 11% (Jablecki, 2009), which is higher than the minimum required level. In addition, the G-10 banking industry experienced no major problem with the exception of Japan. In fact, Japan failed to fully enforce the capital adequacy requirements and therefore experienced severe banking crisis resulting from weakened and insolvent position.

The Basel II Accord was not as successful as it was expected. In contrast to the Basel I, which needed less than four years for full implementation the Basel II underwent seven years of deliberation during which member countries failed to adopt a uniform enforcing date. For instance, countries from European Union wanted to comply with the new Basel rules from January 2007 while US banking regulators decided to delay adoption at least until January 2009. Furthermore, there was lack of consensus on how the provisions would be applied. In fact, European Union countries wanted the Accord to apply to all banks, while the U.S., Canada, and Great Britain wanted it to apply only to large international banks. To this end,

U.S. policymakers did not enforce the Basel II provisions for the whole banking industry. They only required large banks (institution having at least USD 250 Billion consolidated assets) to comply with Basel II while allowing other U.S. banks to continue operating under the existing domestic regulations (Herring, 2007). The U.S. banking supervisors considered that Advance Internal Rating Based (AIRB) and Advanced Measurement Approach (AMA) for credit and operational risk are very complex for small and middle size banks (Hussain, et al., 2012). These discrepancies raised competitive issues in banking regulatory practices and ultimately paved the way to the recent financial crisis.

As for the Basel III Accord, it seems to be too early to make adequate comments on the effectiveness of its implementation. Indeed, the third iteration of the Basel Accords was released in 2010 with a quite long transitory period ending in 2019. That is, member-countries have to fully comply with the requirements by 2019.

2.3.1.3. Incentives for Implementing the Basel Accords in Non-Member Countries

Although the Basel Accords are primarily designed to regulate the banking industry of the most industrialized countries as depicted by the composition of its members from the outset, non-members have introduced the Basel provisions in their regulatory frameworks to comply with the global regulatory requirements. To this end, Ho (2002) argues that Basel I and II were widely adopted by member countries of the Basel Committee, as well as by many non-member countries although they are not formally binding. For instance, the 2010 survey of the Financial Stability Institute (FSI) reported that 112 countries have implemented or are currently planning to implement Basel II (FSI, 2010). These statistics do not include the various countries, which are still bound to the Basel I Accord. Several reasons may explain the increasing interest of non-member countries to adopt the Basel provisions in their national regulatory frameworks.

First, the Basel Accord is the single international model of prudential regulation in banking industry. Therefore, the non-member countries are left with no choice but to refer to the Basel Accords to build their national banking regulatory provisions. Since there is no constraint for them to fully implement the Basel Accords, they can rather adjust the provisions to their specific contexts and risks profile in order to

design their own variants with less complex framework and requirements. In this regard, Mrak (2003) proposes four alternatives for emerging countries to implement the Basel Accord. They can choose to fully implement the Accord as proposed by the Basel Committee; partly modify it in accordance with their needs and implement the modified version; design other rules, consistent with their specific needs; or refrain from implementing any new capital adequacy rules and devote resources to improving the enforcement of the existing ones.

Second, the implementation of the Basel Accords in a banking system may ease access to funding from international financial institutions such as World Bank and IMF, which usually require developing countries to comply with international regulatory benchmarks. This requirement aims to improve their financial environment and increase resilience of banking industry because developing countries are deemed to experience greater macroeconomic volatility, greater volatility of external flows, greater vulnerability to external shocks, poorer-quality loan portfolios, greater uncertainty, riskier economic climate, etc. Furthermore, high-income countries authorize banks branches from developing countries to operate in their financial environment only if their home country supervision meets Basel standards (Ward, 2002).

Third, a non-member country may comply with the Basel Accords without external pressure, but just because it wants to revive its international image and prove that its banks are subject to the same stringent capital requirements as the banks from the most industrialized countries. The Basel Accord become then a strategic device that a country may use to ensure the best practices and supervisory expertise as they are implemented in leading international financial system. It may help to upgrade domestic practices and create a competitive domestic banking system. Thus, the credit rating agencies may grant the country with higher rating scores and enhance its creditworthiness. This improves the reputation of the domestic banking sector and ultimately reduce external borrowing costs for the country's financial industry.

However, the Basel Accords may not always adequately respond to the regulatory needs of non-member countries since they have little chance to influence the Accord or propose policy orientations that account for their risk profiles: they are just decision-takers rather than decision-makers. The designed provisions may then appear too complex or irrelevant to specificities of their financial environment since

financial activities in non-member countries are usually focused on traditional commercial banking rather than emerging financial products and services. To this end, Gottschalt & Griffith-Jones (2006) argue that Basel II causes problems for developing countries because it is more difficult for them to reach the high technical standards. For instance, the lack of skilled supervisors and sophisticated market participants makes it difficult for these countries to implement pillars 2 and 3 of the Basel II Accord (Mrak, 2003).

2.3.2. Banking System in Turkey and the Basel Accords

This section discusses the main developments in Turkey's banking industry and examines the compliance of its regulatory and supervisory system with the Basel Accords.

2.3.2.1. Main Evolutions in Turkish Banking System

The history of Turkish banking can be traced back to the activities of the money-changers and the Galata bankers in the early 1800s during the Ottoman Empire. In the wake of these activities, *Istanbul Bankası* was established as the first bank in 1847; though it was only run for a short period till 1852. A few years later, the banking system was rebuilt with *Osmanli Bankası* founded in 1856 and operated as the Empire's Central Bank[10] until the 1930's although its headquarters was located in London. In 1888, *Ziraat Bankası* was also established. It is also worthwhile recalling that several foreign banks provided funding at high interest rates to the Ottoman Empire, especially during the periods of financial distress. Following the Ottoman Empire era, the banking system seriously evolved from the foundation of the Turkish Republic on 29 October 1923. As pointed out by The Banks Association of Turkey (2009), the development of the Turkish banking industry has followed several stages, including national banks period (1923-1932), state-owned banks period (1933-1944), private banks period (1945-1960), planned period (1960-1980), financial liberalization and opening period (1981-2001), and

[10] The Central Bank of Turkey was founded on 11 June 1930. It was responsible for issuing banknotes, maintain stability for exchange rate between Turkish Lira and foreign currencies, and contribute to the regulation of banking system and credit.

restructuring period (2002-2007), which is still the case with the adjustment to international regulatory standards.

Throughout its stages of development, the Turkish banking industry experienced several dysfunctions and shocks, the most important of which occurred in the early 2000. In the late 1990, Turkish banking sector was dominated by state-owned banks operating in an inefficient context full of uncertainties and instabilities. The banks were operating with inadequate capital base combined with weak asset quality. The regulatory and supervisory arrangements were non-existent and the banking internal control systems lacked transparency. The massive corruption prevailing in the banking industry in Turkey (Gonenc & Aybar, 2006) is a striking example to illustrate the severity of a failed regulatory and supervisory system. From the late 1990s to the early 2000s, the country also experienced political and macroeconomic instabilities, which resulted in severe dysfunctions such as chronic inflation, excessive domestic debt, high interest rates, sharp exchange rate depreciation, etc. Such weaknesses contributed to the collapse of the Turkish banking industry with significant losses and disastrous effects on economy at large. The number of banks, branches and personnel decreased considerably with no less than 12.6% of asset size falling and 29% of loans contraction since several banks went either bankrupt or merger (Conkar, Keskin, & Kayahan, 2009). The banking regulatory authorities were embarked in vast reforms, which ultimately led Turkey to join the BCBS in 2009.

2.3.2.2. From Banking Reforms to the Implementation of the Basel Accords in Turkish Banking Regulation and Supervision

Following the chronic crises, the Banking Regulation and Supervision Agency (BRSA)[11] established in 2000 has engaged a comprehensive multi-year reform for a more resilient banking sector in Turkey. After no less than nine transitional regulatory provisions, the regulatory authorities issued a New Banks Act on 11 November 2005. Within this framework, the regulatory authorities enacted legal and institutional provisions to improve supervisory and audit systems and enhance corporate methods and infrastructures for more efficient risk takings and risk-

[11] The BRSA is responsible to deliver licenses for the establishment of banks and non-bank credit institutions as well as regulating their activities and carry out adequate supervisory actions.

managements. The Law significantly restricts the concentration of risks by preventing the accumulation of banks' resources only in hand of certain groups. Banks are prevented to hold more than 15 percent of the shareholders' equity of non-financial institutions and the total sum of the entire participations should be limited to 60 percent.

The prudential regulatory authorities considerably converged the banking law and regulations with both European Union directives and the Basel Accords. To this end, accounting standards applicable to banks for prudential reporting and financial disclosure purposes, capital adequacy, and internal risk management procedures have been adjusted to the regulatory and supervisory requirements in line with international standards and best practices. In July 2012, Turkey adopted the full Basel II Accord though it has begun complying with its related Capital Adequacy requirements since 2007. From January 2014, Turkey began to progressively introduce the Basel III requirements into its banking regulatory system. All these reforms have strengthened the Turkish banking system to the extent that it was less affected by the 2008 global economic crisis. From 2002 to 2015 the average level of risk-based Capital Adequacy in Turkish banking industry is about 21%. Though the level has decreased during the stated period, the risk-based capital ratios stand above the minimum level required by Basel III as depicted in the Figure 4 below.

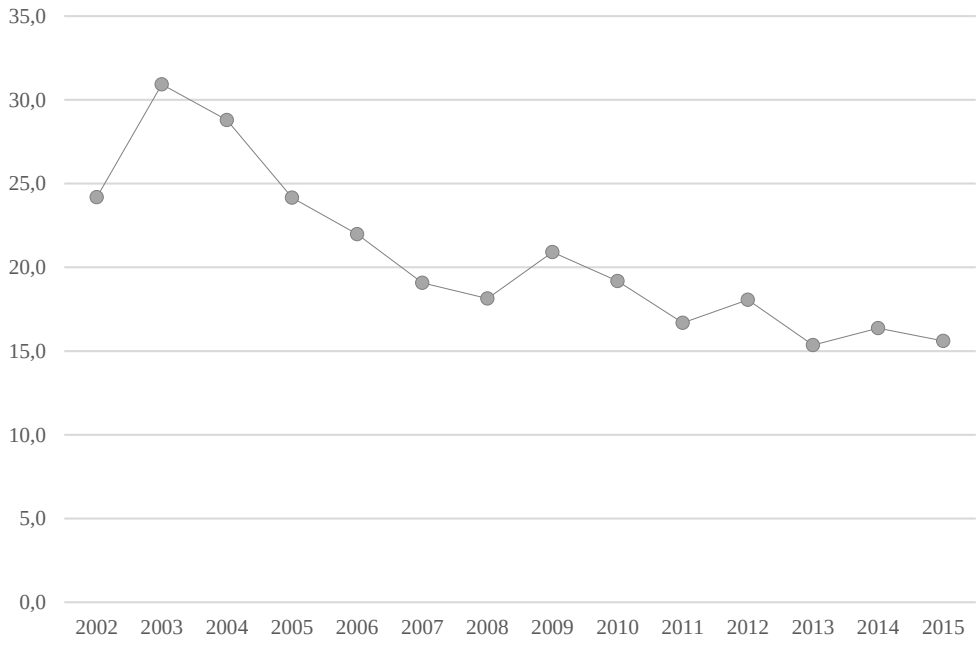

Figure 2: Evolution of Risk-Based Capital Ratios in Turkey
Source: By the Author based on data from selected ratios report of The Banks Association of Turkey

2.3.3. The WAEMU's Banking System and the Basel Accords

In this section, we first examine the main evolutions of the banking system in WAEMU. We, then, discuss the regulatory and supervisory system in the light of the Basel Accords.

2.3.3.1. Main Evolutions in the WAEMU Banking System

The West African Monetary Union (WAMU) was created on 12 May 1962 to bring together seven countries of former French colonies (Benin, Burkina Faso, Côte d'Ivoire, le Mali1, Niger, Senegal and Togo) around a single monetary and currency system–the FCFA[12], which is pegged to euro (1 Euro = 655.957 F CFA) since 1 January 1999. From 10 January 1994, the WAMU member countries decided to establish economic cooperation by transforming it into the West African Economic and Monetary Union (WAEMU). Guinea Bissau, a former Portuguese colony, formally joined the WAEMU 02 May 1997. The WAEMU actually includes 8 countries covering a total land area of 3.466.290 sq. km with a population of around 113.463.945 in 2015. All of the WAEMU member-States are located in sub-Saharan Africa in the western region (See Geographical Location and main features of WAEMU in the Table 33 in appendix).

The origin of WAEMU banking system can be traced back to the French colonial period in West Africa ranging from the late 18th century until the mid-19th century. The WAEMU banking industry was built in 1960 upon the remains of the former colonial banks at the time of independence of most of its member-States, except for Guinea-Bissau, a former Portuguese colony, which gained independence on 24 November 1973. In addition to the colonial commercial banks oriented to foreign projects, some national and development banks were established to fund priority sectors and activities of WAEMU members-States. In the 1960s and 1970s, the

[12] The FCFA franc was set up as the Franc of the French Colonies of Africa on 26 December 1945, the same day France ratified the Bretton Woods Agreement and declared the first time its parity to the International Monetary Fund (IMF). At the time of independence in 1960, it became the Franc of Financial Community in West Africa and the Franc of African Financial Cooperation in Central Africa. It was pegged to French Franc (FF) and underwent some depreciations overtimes before reaching the currently fixed exchange rate system with euro. In fact, the exchange rate was 1 FCFA = 1,70 FF at its early stage, 1 FCFA = 2 FF from October 1948, 1 FCFA = 0,02 FF from 1 January 1960, and 1 FCFA = 0,01 FF from 12 January 1994 to 31 December 1998 (http://www.bceao.int/Histoire-du-Franc-CFA-55.html).

Central Bank of West African States (CBWAS), which is the central bank of the WAEMU zone, developed a low interest rates policy in order to promote economic development investments and improve the marginal efficiency of capital. The monetary authorities even developed a selective credit policy to provide funding to face adverse effects related to the downturn of international market in the late 1970s. Furthermore, WAEMU banking industry lacked regulatory framework and prudential supervision while governments of member countries held a prominent role in the banking policy development.

These disruptions combined with mismanagement and adverse macroeconomic environment brought significant biases in economic criteria for lending, which impeded optimal allocation of loans. By the end of the 1980s, the WAEMU banking system collapsed due to the increase in non-performing loans amounting to 50-80% of credit portfolios (Angora & Tarazi, 2011). 30 out of 79 banks operating in the WAEMU zone went bankrupt with the extreme case occurring in Benin—where the entire banking sector swept away. The crisis resulted in huge economic and social costs for the WAEMU member countries.

After this dark period in the history of the WAEMU, a series of important reforms were carried out to liberalize the banking system. Insolvent banks were liquidated; others were recapitalized; and several new private banks emerged. The participation of the Member-States in the bank capital were drastically reduced. Selective credit policies were abolished and banks were required to grant loans only on the basis of bank selection criteria, which would ensure an optimal credit allocation system. The legal and regulatory supervisory framework were strengthened with the establishment of the Banking Commission, which has become a supranational supervisory body of the WAEMU banking system. The reform also led to the creation on 17 December 1993 of a regional stock exchange market known as *Bourse Régionale des Valeurs Mobilières* (BRVM) and which actually started operating from 16 September 1998. This profound reorganization of the financial system in the WAEMU zone enabled the block to build an efficient banking industry operating with market mechanisms. To be sure, the WAEMU banking system is still running through this new trend of economic liberalism.

2.3.3.2. Banking Regulation and the Basel Accords in the WAEMU

A range of legal provisions govern the banking system in the WAEMU zone. The banking Act N°2008-26 of 28 July 2008, which repealed the prior Law 90-06 of 26 June 1990, appears as the most important legal framework for banking activities in WAEMU. The Law No.98-33 of 17 April 1998 amending Law No. 81-25 of 25 was devoted to control interest rates and repress usurious transactions in the WAEMU banking system. The establishment procedures of banks and financial institutions are organized in accordance with the Instruction N° 01 / RB of 31 December 1998 and its appendix related to information and constituent documents. Apart from these laws, various other legal and regulatory provisions address specific issues in the WAEMU banking system. Furthermore, the Banking Commission of WAEMU is responsible for ensuring an effective implementation of this legal arsenal.

Indeed, the Banking Commission of WAEMU was established on 24 April 1990, in the wake of the banking crisis, as a supranational body to supersede the existing national supervisory structures, which failed to efficiently perform its regulatory and monitoring missions. The Banking Commission of WAEMU mainly aims to organize and supervise activities of credit institutions and ensure their compliance with banking regulations. It has discretion in granting license to carry out banking activities in the WAEMU zone. In case of non-compliance with the regulatory standards, it may take disciplinary actions and impose sanctions, including withdrawal of accreditation/license to continue pursuing banking activities in WAEMU. It usually performs its supervisory mission through two main actions, namely off-site and on-site inspections. The former is achieved based on only inspecting documents transmitted by banks, while the later requires physical displacement of the Commission's members to carry out audits at the targeted bank's offices.

Since the end of the banking crisis in the early 1990, the WAEMU banking regulatory framework has improved significantly. In fact, the regulatory provisions have evolved to meet international banking and financial requirements. In June 1999, the WAEMU's Council of Finance Ministers adopted new prudential rules, which are being implemented since 1 January 2000 in order to strengthen the banking system solvency and stability. This reform strengthened the existing framework with new devices to align the WAEMU provisions to international

requirements for banking regulation and supervision. At this stage, the Basel I Cooke ratio was introduced for the first time in the WAEMU banking regulatory framework. Two important measures to control liquidity were developed though the Basel Committee in Banking Supervision was yet to introduce liquidity regulation. Furthermore, the Banking Commission has already signaled its intention to update the WAEMU banking regulatory framework to include the requirements of Basel II and Basel III accords despite the fact that its member countries are far away from gaining the BCBS's membership. Up to date, the WAEMU banking regulatory framework has been built with eight (08) main standards, which we presented in the Table 11 by adding comments in the light of the Basel Accords. Furthermore, the Figure 4 displays the percentage of banks complying with the regulatory standards from 2005 to 2015.

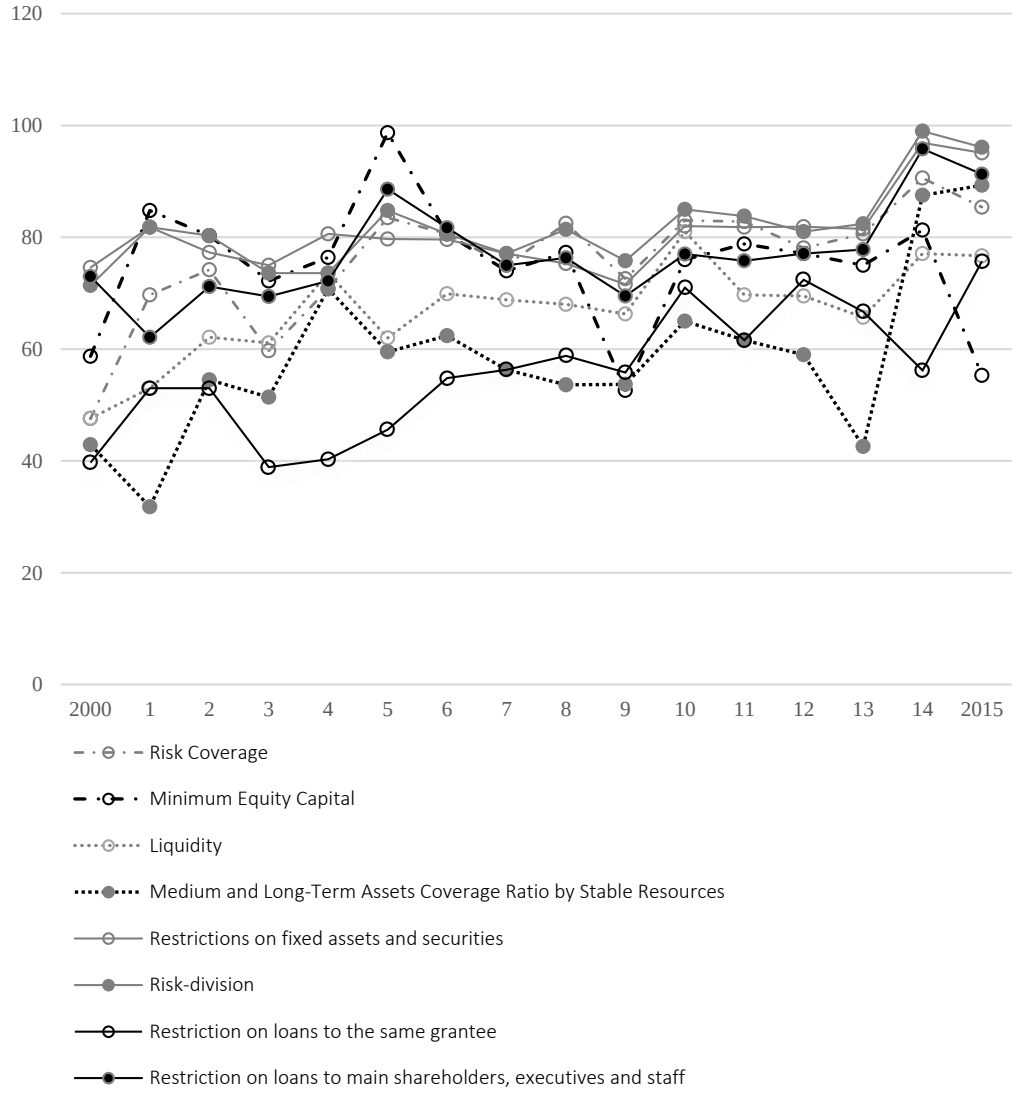

Figure 3: Compliance of Banks in WAEMU to Regulatory Standards
Source: By the Author based on data from WAEMU Banking Commission reports

This figures reveals that there are banks that fail to comply with the regulatory standards. In essence, there is no year where 100% of banks operating in WAEMU's have succeeded to comply with the required standards. However, it is worthwhile to notice that the risk coverage ratios are always above the required minimum level (8%) as presented in the Figure 3.

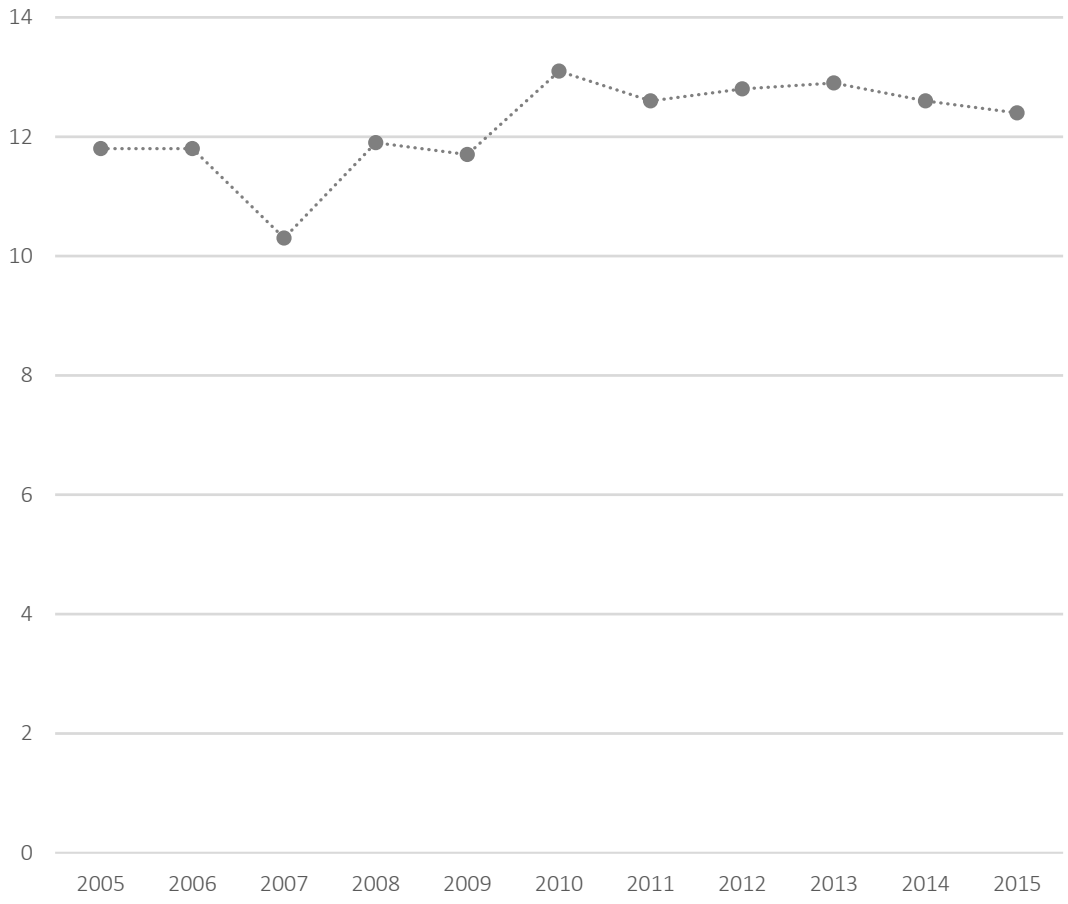

Figure 4: Evolution of the Risk Coverage Ratio in WAEMU
Source: By the Author based on data from WAEMU Banking Commission reports

Table 11: Main Regulatory Standards in WAEMU Banking System in the Light of the Basel Accords

No.	Standards	Description	Comments in the light of the Basel Accords
1.	**Risk Coverage**	Since 1 January 2000, the capital adequacy ratio became the main benchmark risk coverage standard in the WAEMU banking system. In fact, the WAEMU banks are required to maintain a minimum of 8% of effective equity. $\text{Ratio} = \frac{\text{Effective Equity}}{\text{Credit Risk Weighted Assets}} \geq 8\%$	The risk coverage standard is an implementation of the Basel I Accord to the WAEMU banking system. Yet, this standard focuses quite exclusively on credit risk. The non-consideration of market risk may be associated with the near non-involvement in market products combined with the primary stage of the stock exchange development in the WAEMU[13].
2.	**Minimum Shareholders' Equity Capital**	This standard set a minimum amount of shareholder equity for banks operating in the WAEMU. The current floor equity capital required has amounted to 15.25 million euro since 1 July 2015.	The three Basel Accords set minimum capital requirement as proportion for risk-weighted assets. The Basel III Accord added a risk free leverage ratio. In fact, no Basel Accord has defined a minimum amount of equity capital contrary to the minimum shareholder equity requirement in WAEMU.
3.	**Liquidity**	The standard sets a minimum requirement of short-term liquid assets to cope with short-term liabilities. $\text{Ratio} = \frac{\text{Short Term Liquid Asset over a 3 month - period}}{\text{Short Term Liabilities over a 3 month - period}} \geq 75\%$	The WAEMU liquidity ratio is close to the liquidity coverage ratio of Basel III, except that it is set over a longer period; 3 months instead of 1 month for the Basel III. The standard requires a minimum coverage of 75% contrary to the 100% of the Basel III Accord.
4.	**Medium and Long-Term Assets Coverage Ratio by Stable Resources**	This standard aims to ensure the funding of medium and long-term assets with stable resources. In WAEMU, a minimum residual term of two (2) years is associated with medium- and long-term assets or liabilities. $\text{Ratio} = \frac{\text{Stable Resources}}{\text{Medium and Long Term Assets}} \geq 50\%$	This standard is close to the Net Stable Funding Ratio developed in the Basel III standard, except that it is set over a longer period; 2 years instead of 1 year for the Basel III. It requires a minimum coverage of 50% contrary to the 100% of the Basel III Accord.
5.	**Restrictions on fixed assets and securities**	This standard requires banks and financial institutions to fund fixed assets with only equity capital. Furthermore, a bank's total non-operating fixed assets and securities owned in real estate companies is limited to a maximum of 15% of their core equity capital.	No Basel Accord has developed these restrictions
6.	**Risk-division**	Under this standard, credit institutions, including banks, are required to limit the total loans for grantees holding individually a minimum 25% of effective equity capital to eight (8) times the effective equity capital of the targeted institution.	
7.	**Restriction on loans to the same grantee**	This standard limits to 75% of the effective equity capital of a bank the total amount of loans granted the same borrower.	
8.	**Restriction on loans to major shareholders, executives and staff**	Credit institutions, including banks, are required to limit to 20% of their effective equity the total amount of credits granted to shareholders, management team and staff.	

Source: Author's summary based on the revised version of WAEMU banking prudential provisions (available on http://www.bceao.int/IMG/pdf/dispositif_prudentiel_revu_vf-pdf.pdf) and the Banking Commission report of 2015.

[13] Up to February 2017, only 9 WAEMU banks are listed on the BRVM stock exchange. Based on the data provided in the 2015 Banking Commission report, the market capitalization of the WAEMU stock exchange represented only the third of bank total assets.

CHAPTER 3: CAPITAL REQUIREMENTS AND BANKS RISKS: A CONTROVERSIAL RELATIONSHIP IN BANKING REGULATION

In their seminal paper, Modigliani and Miller (1958) advocate for the neutrality of the financial structure in a perfect market[14], where the source of funding of a firm is irrelevant to its value and its risk-taking behavior. Berger, Herring, & Szegö (1995) go further to suggest that this framework should be the starting point for all modern research on capital structure. Yet, markets are imperfect in the real world and the decisions on capital may affect the value of the firm as well as their financial risks. In event of information asymmetry, the capital structure is a relevant benchmark in providing useful private information not only on management efficiency but also on firm solvency. Indeed, Ross (1977) and Leland & Pyle (1977) emphasize that the issuing of new debt may provide relevant information on a firm's ability to repay the principal and interest on loans. Equally, in the agency theory, as (Jensen & Meckling, 1976) argue, the capital structure may help controlling asset substitution problems[15], efficiency in investment decision-making[16], and financial discipline for free cash flow[17]. The relevance of the capital structure was also discussed through the pecking order theory whereby Myers (1984) argues on a hierarchy of financing sources to build an optimal capital structure. To this end, internal financing should be preferred over debt issuing, and equity capital as last resort—when there is no other possibility to issue additional debts. In order to avoid underestimating values resulting from investors' beliefs that managers (insiders) may take advantage by over-valuating newly issued equity, equity becomes a less preferred means to raise capital.

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[14] In a perfect market, there are no taxes, agency problems, transaction or bankruptcy costs, or information asymmetry. These are the main features of the frictionless world of Modigliani and Miller (1958).

15 As leverage increases, managers may have incentives to invest in riskier assets since they usually benefit from successful projects while debtors experience the downside in the event of failure.

16 Managers may also have incentives to reject positive net present value projects if the resulting gains will likely accrue to debt holders rather than shareholders.

17 Because of self-interest behavior, managers may have incentives to use free cash flow just to increase firm size, even though such investments can destroy firm value.

In the banking system, the capital structure becomes a very sensitive issue since it is built with a large share of tiny deposits. Consequently, leverage can no longer be used as a relevant corporate governance device because depositors lack power or do not have necessary incentives to monitor insiders' behaviors. In such a context, bank managers can take advantage by developing asset substitution strategies, which usually increase the probability of banking failures with potential major crises and severe adverse impacts on the economy. To prevent or reduce these excessive risk-taking behaviors, regulatory authorities have designed various mechanisms, the most important of which is the capital adequacy requirements. In this regard, Jokipii & Milne (2011) emphasize that capital requirements have become one of the key instruments of modern day banking regulation. However, theoretical and empirical investigations on capital-risk relationship in banking industry have not always converged to the intended outcome.

This chapter reviews the literature on the relationship between capital requirements and risks in the banking system. In the first section, we discuss the theoretical framework of the relationship between capital adequacy requirements and bank risk-taking behaviors. The second section examines the findings of prior empirical investigations and sheds light on the dominant trend in the BCBS member countries in one hand, and in the second hand, the general nature of this relationship in the BCBS non-member countries. The chapter ends by highlighting the limits of the extant literature and argues that there is a need for further empirical investigations.

3.1. RELATIONSHIP BETWEEN CAPITAL REGULATION AND BANK RISK-TAKING: A THEORETICAL FRAMEWORK

For almost four decades of investigations, the theoretical foundations of the relationship between capital adequacy requirements and banks risk remain fuzzy. Some theorists argue that there is a positive capital-risk relationship in banking industry while others reveal a negative association. In this section, we investigate these debates in the light of the major finance and corporate governance theories.

3.1.1. Theoretical Foundations of Unintended Effects of Capital Requirements on Bank Risks

The proponents of a positive relationship between capital requirements and bank risks have built their arguments using asset substitution moral hazards, monitoring-based incentives of bank insiders, information asymmetry and self-interest-behaviors in the framework of agency problems.

3.1.1.1. Bank Capital-Risk Relationship in the Light of Asset Substitution Moral Hazards

The early investigations of the capital-risk relationship in the banking industry were built using the theoretical foundations of the two-parameter modern portfolio theory[18]. In fact, the proponents of this approach developed mean-variance based-models to theoretically examine the effects of bank capital regulation on the assets and the risks of bankruptcy. This strand of the literature usually claims a positive association of capital requirements and bank risks: more stringent capital regulation is likely to increase asset risk and lead to bankruptcy. This is consistent with the theoretical findings of Koehn & Santomero (1980), which reveals that tighter capital requirements leads banks to reshuffle their portfolio by investing in more risky assets contrary to the main objectives of prudential regulation. These scholars also emphasized that the degree of risk aversion amplifies this risk-taking behavior of banks. Indeed, highly risk-averse banks usually reshuffle their asset portfolios to reduce the likelihood of bankruptcy. They shift their investments to less risky assets following an increase in capital requirements. In contrast, the risk loving institutions adjust their investments to risky assets and ultimately expand their likelihood of failure to the entire industry due to the systemic risk mechanism. The risk loving banks behave in this way to offset the heavy costs related to raising additional capital since riskier assets are associated with higher expected returns but also with a high variance. To mitigate this unintended effect of capital requirements on bank risk-taking behaviors, Koehn & Santomero (1980) suggest a combination of capital regulation with asset restrictions in order to avoid perverse behaviors of risk loving

[18] The modern portfolio theory is a mathematical framework developed by Markowitz (1952) using a mean-variance combination to build for a risk-averse investor, an optimal portfolio, which maximize expected return based on a given level of market risk.

institutions. In addition to that, regulatory authorities have to closely watch risk loving banks.

To address the above-mentioned shortcomings, Kim & Santomero, (1988) develop a more comprehensive mean-variance analysis. They theoretically examined the effects of both flat rate and risk-based capital requirements on bank risk-taking behaviors. Based on the traditional uniform capital ratio regulation, they reached a similar conclusion as that of Koehn & Santomero (1980). Their findings support the view that stringent capital regulation through a simple capital to asset ratio increases banks' incentives to direct their investments toward riskier assets, which increases the probability of bankruptcy. Furthermore, they argue that the flat capital ratio fails to consider asset quality and ignores the individual banks' different preference structures. Consequently, they concluded that the traditional uniform capital ratio regulation is an ineffective way to control risk taking-behaviors as it fails to curb banks' incentives for risk-taking. Contrary to the intended aim, it exposes banks to higher probability of default, which ultimately deteriorates the safety and soundness of the banking system.

As for the risk-based capital regulation, Kim & Santomero, (1988) argue that it is more effective to control the composition of the asset portfolio as well as off-balance sheet risk exposure. Indeed, the risk-based capital requirements enable the adjustment of capital adequacy to the individual bank's unique risk profile. As such, banks with high risk-taking behavior would be required to keep more capital. More specifically, risk loving banks would use more capital to finance their investments in risky projects as well as off-balance-sheet activities. Therefore, regulatory authorities should require the minimum capital levels depending on the quality of banks' asset portfolios. This proposition is in line with the earlier position by Kahane (1977), which suggested that the effectiveness of bank regulation depends on the combination of minimum capital requirement and asset portfolio mix constraints. In fact, neither minimum capital requirements nor restriction policies on asset portfolio composition, alone, can effectively prevent the likelihood of banking failures. Therefore, the minimum capital requirements cannot reduce bank risk-taking behaviors unless the asset portfolio composition is also subject to regulatory constraints.

Moreover, Kim & Santomero, (1988) determine the "theoretically correct" risk weights for the risk-based capital regulation. They report that the optimal risk weights depend only on three factors, including the expected returns on assets and deposit costs, the variance-covariance structure, and the upper bound on the allowable insolvency risk set by regulatory authorities. They argue, furthermore, that the correct risk weights are independent of the individual banks' preferences. Therefore, the risk-related capital is an efficient regulatory mechanism to monitor bank risk-taking behavior and, ultimately, maintain safety and stability of the banking industry.

Despite its undeniable benefits over the uniform ratio requirement, the risk-based capital regulation is a hindrance to the optimal portfolio choice of banking institutions since it forces them to be more cautious in their investment decision-making process. Due to the high costs related to additional equity capital raising, even risk loving banks may hesitate to extend credit to riskier projects. In this vein, Kim & Santomero, (1988) emphasize that the implementation of the risk-based capital regulation may seriously restrict banks' activities and product pricing that may bring significant structural change in the entire financial system. Yet, this reasoning does not always match with banking practices since bankers usually circumvent the regulatory provisions or find ways to get around regulations and established rules as it was the case in the recent subprime crisis.

By using an investment decision modelling risks through an option-pricing framework and by assuming that bank managers are maximizers of market value of equity capital, Gennotte & Pyle (1991) also reveal that there is a positive relationship between capital requirements and bank-risks. In their model, banks' investment opportunities are built with a set of loan portfolios. The model accounts for the key importance of transaction costs (information gathering and contracting costs) in lending process. Using this model, Gennotte & Pyle (1991) consider a setting in which banks raise a fixed amount of deposits and choose among a set of loan portfolios with differing net present values and risks and extend loans with non-zero net present values. In fact, banks issue loans in order to increase the size and risk of their asset portfolio until the negative value of the marginal loan exactly offsets the marginal increase in the subsidy from deposit insurance. Regulatory authorities then introduce a minimum capital requirement to address the distorting effects of the deposit–insurance subsidy. Due to deposit guarantees, a bank may

still engage in inefficient investments that would result in an increase in capital requirements and a decrease in the level of investment and in the probability of default. Therefore, minimum capital requirements cannot replace regulatory monitoring and control of bank risk-taking behaviors.

Furthermore, Rochet (1992) extends the modern portfolio approach by analyzing risk-taking behaviors in banking institutions from two different perspectives, including value maximizing and utility maximizing models. Under the value maximizing assumption, Rochet (1992) confirms that the minimum capital requirement policy is a very poor regulatory instrument for monitoring bank risk-taking behaviors. In sharp contrast to the expected result, it gives incentives for investing in very specialized and risky portfolios, which increases the risk of bankruptcies. In such a context, the actuarial pricing of risk-based deposit insurance is the relevant instrument to control risk-taking behaviors in banking institutions. On the other hand, the risk-based capital regulation may be an effective device to control risk-taking behaviors if bank managers favor portfolio management (utility maximizing banks). In this case, risk weights have to be calculated proportionally to the systematic risks of the assets measured by their market betas contrary to the Cooke ratio tied to credit risk alone. Rochet (1992) advises to impose a minimum capital level as an additional regulation for insufficiently capitalized banks, which may exhibit risk-loving behaviors.

Through the modern portfolio mean-variance approach, the asset substitution moral hazard is the main rationale in explaining the unintended effect of minimum capital requirements on bank risk-taking. Nevertheless, this analytical method fails to account for the potential distorting factors, which may be responsible of deviating bank insiders from efficient behaviors. Further theoretical investigations have been performed to account for monitoring-based incentives, information asymmetry and self-interest behaviors to clarify the positive capital-risk relationship in the banking system.

3.1.1.2. Bank Capital-Risk Relationship and Monitoring-Based Incentives

By using monitoring-based incentives in the framework of the Jensen and Meckling (1976)'s agency problems involving insiders and outside investors, Besanko and Kanatas (1996) propose an alternative approach to explain bank risk-taking

behaviors following an increase of capital requirements. In adopting both accounting and market-value-based standards in an assumed imperfect information environment, Besanko and Kanatas (1996) reveal that regulatory capital standards may not have their expected effects in promoting bank safety in the event of agency problem between insiders and outside investors. In fact, the compliance with a capital requirement may induce to raise more equity from new outsider shareholders, which may dilute the ownership of bank insiders and reduce their incentives to efficiently monitor loans on behalf of the bank's stockholders. This may worsen the net-present-value of loans, reduce the equity market value and increase the probability of bankruptcy. Furthermore, Besanko and Kanatas (1996) emphasize that these perverse effects may occur even in the event where minimum capital requirements reduce bank risk-taking behaviors in term of less risky composition of loan portfolios. In such a context, regulatory authorities have to engage in costly actions to increase insiders' monitoring incentives.

3.1.1.3. Bank Capital-Risk Relationship in the Light of Self-Interest Behavior in the Framework of Agency Theory

Bris & Cantale (2004) have focused on other agency problems, including asymmetry of information and self-interest behaviors to examine the nature of the relationship between minimum capital requirements and bank risk-taking. Indeed, they referred to a setting combining the standard moral hazard regulator-bank owners' problem and the conflict between bank owners and managers. In a banking system with only conflict of interest between outsiders (bank regulators) and insiders (a bank, as a whole, wherein interests of shareholders and bank managers are perfectly aligned), Bris & Cantale (2004) reveal that capital requirements contribute in reducing excess risk-taking behaviors created by deposit insurance. Yet, the separation of ownership and control combined with internal agency problem[19] induce suboptimal risk-taking behaviors through underinvestment strategies adopted by banks managers, which is contrary to what should have happened in an ideal framework with no conflict of interest between managers and shareholders. This behavior of bank managers is not linked to excessive risk-taking. Rather, Bris & Cantale (2004) emphasize a suboptimal risk-taking since bank

[19] In event of an internal agency problem, bank's managers are driven by self-interest, rather than maximizing shareholders value.

managers will prefer to invest only on safe loans, and the risk level in the economy will be too low with respect to what would be socially desirable. These findings reveal that minimum capital requirements can be counterproductive when a banking institution is subject to the internal agency problem.

3.1.2. The Rebuttal of the Mean-Variance Based Models

In the regulatory hypothesis, capital adequacy is mainly designed to control risk-taking behavior and maintains stability in banking systems. Yet, the proponents of the unintended effect of minimum capital requirements challenge this traditional purpose by revealing the existence of a positive capital-risk relationship in banking institutions. However, another strand in the literature exposes the inconsistencies of this thesis and developed new rationales to support a negative relationship between capital regulation and risk-taking behaviors in the banking systems (Keeley & Furlong, 1990; Furlong & Keeley, 1989).

Indeed, Furlong & Keeley (1989) and Keeley & Furlong (1990) discuss the theoretical foundations of the mean-variance framework used to explain the asset substitution moral hazard hypothesis in bank risk-taking behavior resulting from minimum capital requirements. They reveal that the mean-variance framework is irrelevant because it ignores the value of put option related to deposit-insurance. In the event of insolvency, returns are not normally distributed. Keeley & Furlong (1990) argue that the mean–variance analysis to gage the effects of capital requirements on the probability of failure becomes problematic when a bank's option value of deposit insurance is taken into account. In fact, the option value of deposit insurance renders non-linear the relationship between returns and effects of changes in the leverage ratio on risk. Therefore, the variance of returns will no longer be an adequate measure of risk. Using the option value framework, Furlong & Keeley (1989) and Keeley & Furlong (1990) show that an increase in bank capital reduces the incentives for a bank to increase asset risk. As soon as regulatory authorities maintain efforts to limit asset risk and size, a more stringent capital regulation will prevent a value-maximizing bank to develop excess risk taking behavior through assets substitution strategies. With the put option framework of deposit-insurance, Flannery (1989) also demonstrates that the risk exposure of loan portfolio declines under capital regulation since it induces banks to diversify their

asset portfolio less than it would be if unregulated. These conclusions completely shake the very relevancy of the unintended effects of capital requirements developed by Koehn & Santomero (1980) using the Markowitz two-parameter portfolio model.

3.1.3. Intertemporal Effect in Bank Capital-Risk Relationship

Most of the theoretical models developed to analyze the effect of minimum capital requirements of bank risk-taking behavior were built using a static setting. However, Blum (1999) introduces a dynamic analysis claiming an intertemporal effect on the relationship between capital requirements and risk-taking behaviors in banking institutions. He develops a dynamic model with three-time period (t = 0, 1, 2). At time t = 0; he hypothesizes a bank investing its available funds[20] in a portfolio with safe and risky assets. At time t = 1, one period later, this bank records returns on the initial investment and can undertake another if not defaulted. At time t = 2, the bank earns the finals returns and compensates all parties since the game is over. He also assumes bank's managers to be risk neutral and perfectly driven by equity value maximization for shareholders.

Blum (1999) compares optimal choices of equity value maximization for both a regulated and an unregulated bank. The model reveals that an unregulated bank tends to take excessive risks because of limited liability. For the regulated bank, three scenarios were examined. Scenario 1: the bank faces a binding capital rule only in the first period; scenario 2: capital requirements are implemented only in the second period; scenario 3: the bank faces capital rule in both periods. The model reveals a decrease of bank risk in the first case while it increases in the second scenario due to excessive risk taking-behavior in the first period subject to no binding capital rule. In the third scenario, risks will decrease if capital requirements go decrescendo, i.e. more stringent capital requirements in the first period.

From these findings, Blum (1999) reveals that capital adequacy requirements may actually increase risks since tighter capital tends to lower future profits of banks. A low level of profits reduces bank incentives to avoid default because it will have less to lose in the event of bankruptcy. He also emphasizes the leverage effect of

[20] It is assumed that the bank is financed by both equity capital and debts fully ensured with deposit-insurance.

capital rules, which tends to raise the equity value. An additional unit of equity leads to an additional investment larger than one unit in the risky asset. A bank facing tighter capital requirements may have higher incentives to increase equity. However, raising equity may be excessively costly, and the only possible way to raise equity value tomorrow is to increase risk today (Blum, 1999). Therefore, regulatory authorities should account for intertemporal effects of capital requirements on risk-taking behavior to design capital adequacy rules for banking systems.

3.1.4. The U-Shaped Approach: Effects of ex-ante Capital Levels on Bank Capital-Risk Relationship

Calem & Rafael (1999) develop a dynamic portfolio model whereby banks operate in a multi-period setting with the objective of maximizing the discounted value of their profits. The model mainly aims to gage the differential effect of capital-based regulations on bank's risk-taking behavior. In essence, it accounts for heterogeneity regarding differences in banks current capital positions to show how banks adjust their portfolio choices accordingly. The model assumes that portfolio choice in each period is built by combining risky and safe investments funded with deposits, ex-ante capital position and expected return on loans, the latter is a random variable. For simplicity, the model also assumes that banks can only choose their portfolio composition but not its size. To this end, bank size is held constant and normalized at 1.

The implementation of this model implies a U-shaped relationship between a bank's current capital position and its risk-taking behavior as shown in the Figure 7 below. This figure implies that a bank risk level first decreases as its capital position increases. Nonetheless, it will develop again high risk-taking behavior when it becomes well-capitalized. It means that both severely undercapitalized and well-capitalized banks engage in highly risky activities while banks with modestly capital positions develop conservative strategy with low risk-taking behaviors to avoid insolvency or further erosions of capital. Thus, the amount of risk a bank undertakes depends on its current capital position. However, Calem & Rafael (1999) emphasize that undercapitalized banks and well-capitalized have different incentives to develop excessive risk-taking behaviors.

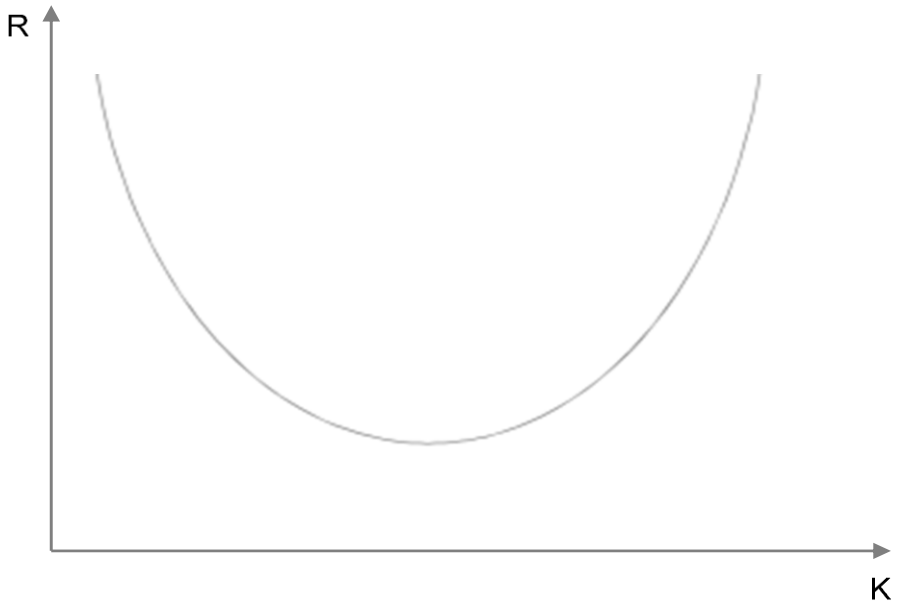

Figure 5: Capital-Risk U-Shaped Relationship
Source: Drawn by the Author following descriptions of Calem & Rafael (1999)

The undercapitalized banks take on excessive risk for three main reasons. First, they engage in risky investments in order to improve their capital position, even if the risky asset provides a lower expected return than the safe asset. Second, they are already near to insolvency and do not care anymore for developing moral hazard behaviors. Third, they can shift bankruptcy costs to deposit-insurance institutions through a put option mechanism. Since a premium surcharge imposed on undercapitalized banks worsens the moral hazard problem, Calem & Rafael (1999) suggest that supervisory authorities should take prompt corrective actions as their capital declines.

As for well-capitalized banks, they tend to take on more risk because of their expectation of higher return on risky investments. They also believe that their actual sound capital position will preserve them from bankruptcy even in case of substantial loan losses. Since they have low probability of bankruptcy, ex-ante well-capitalized banks will increase the risky investments in their asset portfolios as they add capital to comply with additional capital requirements.

Overall, the model developed by Calem & Rafael (1999) has brought a conciliatory position to the contradictory theses of the two main strands in the literature defending a positive and a negative capital-risk relationship in banking institutions. It also dispels confusion between moral hazard problems and bank risk-taking behavior. In fact, a moral hazard problem arises when an undercapitalized bank

exploit the risk-shifting benefits of deposit insurance while risk-taking of a well-capitalized bank occurs with very low probability of insolvency since it holds an ex-ante sound capital position. Furthermore, the model accounts for temporal effect of capital regulation since it stresses on heterogeneity and dynamic implication of capital position on risk-taking behaviors in banking institutions.

3.2. REVIEW OF EMPIRICAL STUDIES ON CAPITAL-RISK RELATIONSHIP IN BANKING

Beside the theoretical literature, several empirical investigations have been carried out to examine the capital-risk relationship in banking institutions. However, none of them have yet compared the general trend of this relationship between BCBS member- and non-member banking systems. In this section, we delve into this issue by relying on the findings from previous empirical investigations. In so doing, we consider the BCBS member or non-membership according to the status of each country related to the investigated period[21].

3.2.1. Empirical Evidence of Capital-Risk Relationship from BCBS Member-Countries

The research carried out by Shrieves & Dahl (1992) appears as one of the prominent studies pioneering empirical investigations to examine the relationship between capital regulation and bank risk-taking behavior. This research gauged the impact of changes in capital on bank risks in order to determine which of the two competing theoretical arguments (positive versus negative relationship) is relevant in real settings. The analysis relies on a sample built with nearly 1,800 FDIC[22]-insured independent and holding company affiliated commercial banks whose assets exceeded $100 million as of December 1984 and over a time period ranging between December 1983 and December 1987. This period is prior to the

[21] Spain joined the Basel Committee in 2001 while 14 other countries got the BCBS membership status in 2009. When using empirical evidence of any one of these countries, membership will be considered accordingly.

[22] FDIC stands for Federal Deposit Insurance Corporation, which is the U.S. deposit-insurance institution created as an independent government corporation created in the wake of Banking Act of 1933. It is responsible for insuring bank deposits in eligible banks against loss in the event of a bank failure in order to promote public confidence in the U.S. financial system and provide stability to the economy.

implementation of the first Basel Accord. Back then, U.S. banks were required to comply with a minimum capital ratio of 7%.

From this empirical investigation, Shrieves & Dahl (1992) reveal a positive association between changes in risk and capital. Indeed, the findings evidence that changes in capital levels and risk exposure are simultaneously related to the extent that banks mitigate the effects of increase in capital levels by increasing asset risk posture, and vice versa. The existence of this positive relationship, even in well-capitalized banks, proves that adjustments of risk-taking behavior depend not only on regulatory influence, but also reflect bank owners' and/or managers' private incentives (Shrieves & Dahl, 1992). This is in line with the findings of Saunders, Strock, & Travlos (1990) who argue that stockholder controlled banks exhibit significantly higher risk taking behavior than managerially controlled banks although statistical outputs of this study display no significant relationship between leverage flat-rate capital requirements and bank risks. In essence, bank loan portfolios are less risky when insiders own a sufficient fraction of the bank's equity and riskier when banks are controlled by outside stockholders. These findings support the theoretical arguments developed by Koehn & Santomero (1980) on the assets substitution moral hazard problem as well as the managerial risk aversion issues in bank risk-taking behaviors. In contrast to these findings, however, capital requirements in U.K. banking system do not open the way to assets substitution moral hazard problems. Rather, regulatory capital adequacy provides banks with incentives to strengthen their capital positions without distorting banks' lending choices. In that regard, capital requirements appear as an attractive regulatory instrument to reinforce the stability of the U.K. banking system (Ediz, Michael, & Perraudin, 1998).

Using U.S. banks from 1982 to 1989, Avery & Berger (1991) examine the efficacy of the risk-based capital ratio developed under the framework of Basel I Accord. Based on regression analysis, the statistical outputs show that risk-based capital ratio better predicts future bank performance problems in term of portfolio losses and bank failures. The risk-based capital ratio renders more stringent the capital regulation compared to the flat rate capital requirement. In line with this conclusion, Jacques & Nigro (1997) adopt a three-stage least squares (3SLS) approach in the framework of simultaneous equations derived from a modified version of the empirical model developed by Shrieves & Dahl (1992). They empirically gauged

the impact of risk-based capital standards on bank capital and portfolio risk using a sample of 2570 FDIC affiliated commercial banks with assets in excess of $100 million in the period ranging from 1990 to 1991. This investigation also reveals the effectiveness of the risk-based capital standard since it enhances capital ratios and reduces portfolio risk in commercial banks. Yet, Hogan (2015) reaches a more nuanced position with a recent empirical investigation on a sample of U.S. commercial banks from 1999 to 2010. Using the standard deviation of stock returns and the Z-scores (indicator of bank solvency), Hogan (2015) shows that flat-rate and risk-based capital requirements are statistically significant predictors of both measures of risk. However, the findings reveal that the flat rate capital ratio is consistently a better predictor of risk than the risk-based capital, especially in the aftermath of the recent financial crisis.

Another strand of the empirical investigations reveals that the efficacy of capital adequacy on bank risk-taking behavior depends rather on sanctions and disciplinary actions available in supervisory agenda. Following the Federal Deposit Insurance Corporation Improvement Act (FDICIA)[23] in December 1991, for instance, Aggarwal & Jacques (1998; 2001) examine the impact of the Prompt Corrective Action (PCA) policy on adjustments of both bank capital ratios and portfolio risk levels. To this end, they applied the two-stage least squares procedure in the simultaneous equations model as developed by Shrieves & Dahl (1992), and later modified by Jacques & Nigro (1997) on a sample of 2,552 FDIC-insured commercial banks holding at least USD 100 million of assets in the period ranging from 1990 to 1993. Depending on the risk measure used, the empirical findings reveal two opposite trends on the relationship between capital adjustments and bank risks. Indeed, the relationship appears to be negative when using the ratio of non-performing loans to total assets as risk measure while it becomes positive when the risks is measured with the ratio of risk-weighted assets. Moreover, Aggarwal & Jacques (1998) report that both undercapitalized banks and adequately capitalized ones increase their capital ratios while reducing their risk-weighted assets levels

[23] In December 1991, the U.S. Congress passed the Federal Deposit Insurance Corporation Improvement Act (FDICIA) containing two key provisions designed to reduce the cost and frequency of failed banks. The first key provision enforces bank regulators to close early failing institutions at a positive level of capital. The second key provision refers to the prompt corrective action (PCA) policy, which allow bank supervisors to intervene early in banks facing troubles. In essence, supervisors have to impose a rescue plan (recapitalization requirements, interest rate restriction on deposits, etc.) on undercapitalized bank institutions in an effort to save them from becoming insolvent (Aggarwal & Jacques, 2001; Aggarwal & Jacques, 1998).

following regulatory pressure. On the contrary, both undercapitalized banks and adequately capitalized display high risk-weighted assets prior to the introduction of the FDICIA in U.S. banking system. Overall, it appears that banks with delicate capital position are ever more fearful about disciplinary actions from regulators.

In line with these results, Aggarwal & Jacques (2001) came to a similar conclusion using a three-stage least squares estimations in a simultaneous equations model on a sample built with 1685 FDIC-insured commercial banks with assets of USD 100 million or more in existence from year-end 1990 to year-end 1997. Indeed, their findings show that both adequately capitalized and undercapitalized banks increased their capital ratios while reducing their level of credit risk in response to PCA, during both the announcement period, 1992, and the years after the standards went into effect, 1993-1996.

Yet, the timing and magnitude of the adjustments of capital and risk levels appear somewhat different. Indeed, undercapitalized banks adjusted their capital ratios at much faster rates than their well-capitalized counterparts because the former would have faced regulatory sanctions and severe restrictions on their activities when they failed to adequately increase their capital ratios by the time the PCA standards went into effect in December 1992 (Aggarwal & Jacques, 2001; Aggarwal & Jacques, 1998). As such, solely applying capital requirements cannot efficiently constrain risk-taking behaviors in banking institutions. Hence, regulatory sanctions through PCA of bank supervisors appear to hold a prominent role. Not surprisingly, Aggarwal & Jacques (1998) argue that the PCA policy was successful since its introduction improved the safety and soundness of the U.S. banking system. It led, for instance, to noticeable declines of bank failures while strengthening capital positions, which increased from 6.75 percent to 8.01 percent from year-end 1991 to year-end 1993. In a similar line, Bouheni, Ameur, Cheffou, & Jawad (2014), in their empirical investigation on European banks over the period 2005-2011, argue that strengthening regulations and boosting supervisory powers reduce risk-taking and promote banking stability.

Furthermore, Jokipii & Milne (2011) reveal that the capital-risk relationship depends on the degree of bank capitalization. In fact, they examine the relationship between short-term capital buffer and portfolio risk adjustments using an unbalanced panel of a sample of 8000 U.S. bank holding companies and

commercial banks using balance-sheet data from 1986 to 2008. Their findings show that the relationship between adjustments in capital and risk is negative for banks with capital buffers approaching the minimum requirement. They report that low buffer banks (banks approaching the regulatory required level) either increase their buffers by reducing their risk or gamble for resurrection by taking more risk as a means to rebuild the buffer. In contrast, well-capitalized banks display a positive relationship between capital and risk adjustments. That is, well-capitalized banks maintain their target level of capital by increasing (decreasing) risk when capital increases (decreases). These findings are consistent with the results of the empirical investigation of Heid, Porath, & Stolz (2004) on a set of 570 local German savings banks over the period 1993-2000. They adopted a modified version of the model developed by Shrieves & Dahl (1992) and found that the relationship between capital and risk adjustments depends on the amount of capital the bank holds in excess of the regulatory minimum (the "capital buffer"). In essence, banks with low capital buffers try to rebuild an appropriate capital buffer by raising capital while simultaneously lowering risk. In contrast, banks with high capital buffers try to maintain their capital buffer by increasing risk when capital increases.

Using a three-stage least squares estimations in the simultaneous equations similar to the model developed by Shrieves & Dahl (1992), Rime (2001) examines the adjustments in bank risk-taking behavior to capital requirements based on a sample of 154 Swiss banks on a period ranging from 1989 to 1995. The author found that, while regulatory pressure leads to an increase of risk-weighted capital ratio of undercapitalized banks, it exerts no effect on risk levels. In contrast, regulation pressure exerts no effect on both capital and risk levels of adequately capitalized banks. However, Bichsel & Blum (2004) reveal that higher levels of capital are associated with higher levels of risk in Swiss banks. In fact, their regression analysis on a panel data of 19 Swiss banks on a period ranging from 1990 to 1999 display a positive correlation between changes in capital and changes in risk. Despite this positive correlation, the findings do not reveal a significant relationship between the capital ratio and the probability of default.

Investigating the reasons of excessive risk-taking of Japanese banks, which increased their investments in declining real estate sector during the 1990s, Iwatsubo (2007) reveals that franchise value has significant bearings on banks' risk-taking decisions. Indeed, the capital-risk relationship in banking can change from

positive to negative as franchise value falls. In fact, banks with low capital-to-asset ratios and low franchise values choose high-risk assets at the expense of the deposit insurance system by developing what he refers to as the "gambling for resurrection" behavior. Iwatsubo (2007) also provides empirical evidence to the fact that a prospective capital requirement increases bank risk-taking behavior since capital is more expensive in the future binding period so that banks have an incentive to take on risk to increase capital in the current period. In contrast, prospective capital injections by government should decreases risk-taking behavior in the current period.

Altunbas, Carbo, Gardener, & Molyneux (2007) examine the relationship between capital, risk and efficiency using data on banks operating in 15 European countries between 1992 and 2000. They performed simultaneous equations estimations using Zellner's (1962) Seemingly Unrelated Regression approach, which is deemed to fix contemporaneous cross-equation error correlation. Though broadly supporting a positive capital-risk relationship for the whole sample, the findings reveal some relevant specificities of European banking system regarding efficiency. First, inefficient banks in European countries hold more capital and take on less risk contrary to the empirical evidence on risk-taking behaviors of U.S. banks. Second, the financial strength of the corporate sector has a positive influence in reducing bank risk-taking and capital levels. Third, there are no major differences as for the relationships between capital, risk and efficiency for commercial and savings banks while capital levels and risks are inversely related in co-operative banks. Yet, Altunbas, Carbo, Gardener, & Molyneux (2007) relate these emerging specificities of European banks to methodological differences, time periods covered, and mostly contrasting features of U.S. banking system, including shareholder maximization pressure and higher levels of deposit insurance structure.

3.2.2. Empirical Evidence of Capital-Risk Relationship from BCBS Non-Member Countries

Although empirical investigations on bank capital-risk relationship have usually focused on BCBS member-countries, that is developed economies, there is a recently growing body of research that seeks to provide evidence from non-member countries. For instance, Floquet & Biekpe (2008) carry out a study to examine the

nature of the relationship between capital structure and risk-taking on a sample of 2940 banks across 44 emerging markets[24] for the period of 1995 to 2003. Using a three-stage least squares method on a modified version of the simultaneous equations modelling developed by Shrieves and Dahl (1992) and the efficiency model of Kwan and Eisenbeis (1997), the findings show no significant relationship between changes in capital and changes in risk. This means that current movements in capital (risk) of banks in emerging markets do not reflect the adjustments made to risk (capital) contrary to the positive relationship evidenced in developed markets. Furthermore, descriptive statistics also reveal higher and significantly volatile loan losses in emerging market banks compared to developed markets, indicating the difficulties facing emerging market banks in trying to align capital and risk in a positive way over the short term. In this regard, Floquet & Biekpe (2008) argue that the less developed capital markets in many emerging markets could inhibit a bank's ability to make short-term equity adjustments while the greater risk associated with emerging market advances makes the control and anticipation of risk exposures more intricate. In contrast, the statistical outputs display a positive relationship between the absolute levels of capital and risk, suggesting that banks are able to match capital and risk in a positive way over the longer term, reducing the frictions associated with the misalignment of capital and risk.

Based on both theoretical and empirical analysis, Zhang, Jun, & Liu (2008) examine the effects of capital adequacy requirement on bank's risk-taking behaviors in Chinese banking system. The theoretical model reveals that the optimal ratio of risk assets decreases while the capital ratio increases, showing that an increase in capital-to-asset ratio would reduce the risk-taking behavior. In fact, a compulsory regulation of the capital adequacy should force banks with low capital to adjust their capital level to the required minimum level while curbing their incentives to risk-taking. Meanwhile, the empirical investigation on the 12 main Chinese commercial banks over the period ranging from year 2004 to 2006[25] shows that changes in

[24] The sample comprised countries from Africa, Eastern Europe, East Asia & Pacific Rim, South America, Central America & the Caribbean, South Asia, and Southern Europe & Central Asia. There were all BCBS' non-member countries in the investigation period. Yet, some of these countries got full BCBS' membership from 2009.

[25] This covered the period after implementing Regulation Governing Capital Adequacy in Chinese Commercial Banks.

capital is negatively and significantly associated with the changes in risk, implying that increasing capital ratio would be effective in reducing portfolio risk.

Mongid, Tahir, & Haron (2012) investigate the relationship between inefficiency, risk and capital for a large set of panel data of 668 individual commercial banks operating in eight ASEAN[26] countries for the period ranging from 2003 to 2008, using a three-stage least squares in the simultaneous equations modelling. The statistical outputs of the first equation reveals that capital and size are negatively related to inefficiency while risk display no significant coefficient. In the second equation, capital and inefficiency are negatively related to risk. On the third equation, capital is negatively related to risk but not with inefficiency. The inverse relationship between risk and capital position implies that banks with higher capital levels tend to curb their incentives to risk-taking.

Dannon & Lobez (2014) gauge the impact of banking capital regulation on the default risk on a panel of 48 WAEMU's banks over the period 2000-2010. They refer to both risk-weighted capital ratio and unweighted capital ratio. The findings reveal a positive and significant relationship between the set of weighted and unweighted capital ratios and Z-scores. In fact, banks with higher capital ratios have a lower probability of default, implying that capital regulation in WAEMU tends to reduce the default risk in the WAEMU banking system. In contrast, the regulatory Tier 2 ratio is negatively and significantly related to the Z-scores, indicating that a higher level of subordinated debts is associated with a higher probability of default. By referring to subordinated debts for their funding, bankers may have incentives to invest in more-risky and profitable assets in order to offset the extra cost of this source of funding. Moreover, Dannon & Lobez (2014) report that the default risk may amplify with agency problems between shareholders and managers or if regulators require riskier banks to hold higher capital positions.

Applying the Two-Step System Generalized Method of Moments to a dynamic panel of 23 Turkish commercial banks over the period 2003 to 2011, Ayaydin & Karakaya (2014) investigate the impact of capital position on bank risk-taking and profitability. Regarding the capital-risk relationship in the Turkish banking system,

[26] The relied on banks operating in member-countries of the Association of South East Nations (ASEAN), including Indonesia, Malaysia, Thailand, the Philippines, Singapore, Cambodia, Brunei and Vietnam.

the empirical results show that capital ratio (equity to total asset) is positively and significantly related to loan loss reserve rate and variance of return on assets while it is negatively associated with variance of return on equity. Hence, higher capital positions in Turkish banks increase risks in terms of high levels of loan loss reserve building and variability of return on assets while it decreases the risk associated to return on equity. These findings support the regulatory hypothesis and moral hazard hypothesis for capital risk-relationship in the Turkish banking system.

Using a simultaneous equations framework on a sample comprising the largest banks in Tunisia over the period 2000-2013, Bouheni & Rachdi (2015) examine the effect of regulatory pressure in terms of capital requirements on risk decisions. This investigation reveals four main findings. First, interaction between capitalization and risk level is negative, implying that an increase in capital is followed by a decrease in banking risk-taking. Second, the study shows that Tunisian banks have a weak institutional and regulatory level. Third, it indicated that largest banks manage risks better since they have more experience in handling risk issues through diversification. Fourth and finally, the statistical outputs display a negative relationship between size and bank capitalization, indicating that larger banks have less incentives to risk-taking.

Two recent empirical investigations shed light on the capital-risk relationship in banking sector of Pakistan. Applying the three-stage least squares estimation to data set of annual figures of 35 Pakistani banks over the period 2005-2014, Javed (2016) examines the inter-temporal relationship between risk position, level of capitalization and efficiency. The empirical findings show a positive association between Z-scores and capital level of Pakistani banks, revealing that high level of capital position reduces the default risk since banking firms with high equity positions are capable of absorbing more risk. Ashraf, Arshad, & Hu (2016) reached a similar result by examining the impact of risk-based capital requirements on bank risk-taking behavior. They performed their empirical investigation on a panel dataset of 21 listed commercial banks of Pakistan over the period 2005-2012 using the GMM panel estimation method. The findings reveal that stringent risk-based capital requirements force banks to reduce assets portfolio risks.

3.3. SYNTHESIS AND LIMITS OF THE EXTANT LITERATURE

3.3.1. Summary of the of the Extant Literature

In the theoretical literature, the banking capital-risk relationship is explained with somewhat contradictory evidence. In one strand of the literature stand the proponents of the positive relationship, which argue that more stringent capital regulation increases incentives for higher risk-taking behaviors. They roughly converged to agency problems (asset substitution moral hazards, monitoring-based incentives, information asymmetry, moral hazard or self-interest behavior) as the main rationales of why capital regulations may lead to unintended effects of risk-taking behaviors.

In the asset substitution moral hazards hypothesis, Koehn & Santomero (1980) show that tighter capital requirements lead banks to reshuffle their portfolio by investing in more risky assets. They emphasize that the degree of risk aversion amplifies these risk-taking behaviors. In fact, the risk loving institutions increase their incentives for riskier investments while the risk-averse banks adjust their portfolios to reduce the likelihood of bankruptcy. Kim & Santomero, (1988) also reveal that stringent capital regulation through a flat and uniform rate increases banks' incentives for risk-taking since it fails to account for individual institution risk profiles. In a similar vein, Rochet (1992) confirms that the minimum capital requirement policy is a very poor regulatory instrument for value maximizing banks while the risk-based capital regulation may be an effective device to control risk-taking behaviors for utility maximizing banks. Hence, the risk-based capital requirements appear to be more effective of controlling asset substitution moral hazard problems (Kim & Santomero, 1988; Koehn & Santomero, 1980). As such, the regulatory hypothesis posits that banks with high-risk profile should maintain higher capital position. This is consistent with the early results of Kahane (1977), who argues that the effectiveness of bank regulation depends on the combination of minimum capital requirement and asset portfolio mix constraints.

Besanko and Kanatas (1996) show that regulatory capital requirements may increase risk-taking behaviors owing to the lack of monitoring-based incentives in the event of agency problem between insiders and outside investors. They argue that the dilution of ownership following the compliance with a capital requirement

may hamper bank insiders' incentives to efficiently monitor loans on behalf of the bank's stockholders. Besanko and Kanatas (1996) emphasize that these perverse effects may occur even in the event where minimum capital requirements reduce bank risk-taking behaviors in term of less risky composition of loan portfolios. Furthermore, Bris & Cantale (2004) reveal that the separation of ownership and control combined with internal agency problem induce suboptimal risk-taking behaviors through underinvestment strategies. Furthermore, Blum (1999) analyzes an intertemporal effect and concludes that capital adequacy requirements may actually increase risks since tighter capital tends to lower future profits of the banks.

However, Furlong & Keeley (1989) and Keeley & Furlong (1990) show that a more stringent capital regulation will prevent a value-maximizing bank to develop excess risk taking behaviors. They argue that the assets substitution moral hazard hypothesis is irrelevant since it ignores the value of put option related to deposit-insurance, in which, returns are no longer normally distributed. In the same vein, Flannery (1989) also demonstrates that the risk exposure of loan portfolio declines under capital regulation since it induces banks to diversify their asset portfolio less than it would be if unregulated. Hence, the option value hypothesis supports a negative relationship between capital regulation and risk-taking behaviors in the banking systems.

Between these two extremes lies an emerging U-shaped relationship whereby a bank risk level first decreases as its capital position increases and then increase when it becomes well-capitalized. The bank capital-risk U-shaped relationship implies that both severely undercapitalized and well-capitalized banks engage in highly risky activities while banks with modestly capital positions develop conservative strategy with low risk-taking behaviors to avoid insolvency or further erosions of capital. Yet, well-capitalized banks tend to take on more risk because of their expectation of higher return on risky investments. They also believe that their actual sound capital position will preserve them from bankruptcy even in case of substantial loan losses. On the contrary, undercapitalized banks take on excessive risk for three main reasons: 1. They seek to improve their current capital position; 2. They are already near to insolvency and do not care anymore for developing moral hazard behaviors; 3. They can shift bankruptcy costs to deposit-insurance institutions through a put option mechanism.

Overall, the theoretical foundations of bank capital-risk relationship can be summarized as follows:

Table 12: Main Theoretical Foundations of Bank Capital-Risk Relationship

Type of Relationship	Theoretical Rationales
Positive relationship	- Asset-substitution moral hazards - Monitoring-based incentives - Information asymmetry and self-interest behaviors - Intertemporal effects
Negative relationship	Put option framework of deposit-insurance
U-shaped relationship	Combination of positive and negative relationship depending on bank current capital position.

Source: By the author based on the extant literature

The empirical investigations on banks operated in BCBS member-countries have roughly converged on a positive relationship between capital and risk except in U.K. where the findings reveal that capital requirements do not open the way to assets substitution moral hazard problems. To this end, Ediz, Michael, & Perraudin (1998) argue that capital requirements appear as an attractive regulatory instrument to reinforce the stability of the U.K. banking system. Shrieves & Dahl (1992) argue that adjustments of risk-taking behavior depend not only on regulatory influence, but also reflect bank owners' and/or managers' private incentives. Jokipii & Milne (2011) reveal that the capital-risk relationship depends on the degree of bank capitalization. Another strand of the empirical investigations reveals that the efficacy of capital adequacy on bank risk-taking behavior depends rather on sanctions and disciplinary actions available in supervisory agenda Aggarwal & Jacques (1998; 2001). This is in line with the findings of Bouheni, Ameur, Cheffou, & Jawad (2014), who report that strengthening regulations combined with stepping up supervisory powers reduces risk-taking and promotes banking stability.

However, in the BCBS non-member countries, the empirical investigations reveal either no significant or negative relationship between changes in capital and changes in risk. For instance, Floquet & Biekpe (2008) show that change in capital (risk) of emerging market banks do not reflect the adjustments made to risk (capital) contrary to the positive relationship evidenced in developed markets. In contrast,

other empirical findings show a negative association between capital regulation and risk-taking behaviors in emerging or developing economies. That is, an increase in capital-to-asset ratio reduces bank risk-taking behaviors (Ashraf, Arshad, & Hu, 2016; Javed, 2016; Bouheni & Rachdi, 2015; Dannon & Lobez, 2014; Mongid, Tahir, & Haron, 2012; Zhang, Jun, & Liu, 2008; Floquet & Biekpe, 2008). As for the study on Turkish banks, Ayaydin & Karakaya (2014) come out with mixed evidence, supporting both the regulatory hypothesis and moral hazard hypothesis.

3.3.2 Limits of the Extant Literature and the Need for Further Empirical Evidence

The empirical studies yield mixed evidence on the relationship between capital adequacy requirements and banks risk, confirming the controversial theoretical foundations highlighted by Ashraf, Arshad & Hu. This controversy was portrayed in some previous investigations. For instance, Shrieves and Dahl (1992) report that investigations on the relationship between bank risk and capital has generated contradictory conclusions. Bitchsel and Blum (2004) also notice that both theories and empirical evidence on the relationship between leverage and the riskiness of banks do not provide conclusive answers. In a similar line, Altunbas, Carbo, Gardener & Molyneux (2007) argue that the existing theoretical literature and studies examining the relationship between a bank's capital and risk positions often yield conflicting predictions.

Yet, the empirical investigations were usually developed regardless of the nature of connection to the Basel Accords. It is worthwhile to notice that the Basel Accords have become the worldwide benchmark for capital adequacy in banking systems. Since the implementation constraints of capital requirements may widely vary between BCBS member- and non-member BCBS countries, we review the extant empirical literature to investigate the general trend of the capital-risk relationship in each of these banking regulatory frameworks. Hence, it appears that capital-risk relationship is positive in BCBS banking system while it is negative for banks operating in non-member countries. For more a more relevant conclusion, it will be worthwhile to carry out an empirical investigation to make a straightforward comparison on capital-risk relationship between BCBS member- and non-member BCBS countries.

Furthermore, no empirical study has yet investigated the effect of change in BCBS membership status on capital-risk relationship. In fact, a wave of emerging countries got BCBS full membership from 2009. This change may have affected the capital-risk relationship in those countries. Perhaps, Ayaydin & Karakaya (2014) reached a mixed evidence because they do not account for regulatory changes in Turkish banking system. It seems then to be relevant to account for increasing pressure on regulatory capital requirements when investigating capital-risk relationship. For this purpose, the following chapter is devoted for an empirical investigation on capital-risk relationship in Turkish banking industry by accounting for changes in regulatory standards on capital adequacy while using WAEMU banking system as a control sample since the later has not experienced any major regulatory change since it has begun using Basel Accords.

CHAPTER 4: CAPITAL ADEQUACY AND RISK: AN EMPIRICAL EVIDENCE FROM TURKISH AND WAEMU BANKING SYSTEMS

In this chapter, we empirically investigate the capital-risk relationship using a comparative framework of the Turkish and WAEMU banking systems. The first section of the chapter presents the research objectives as well as the methodological framework. The second section deals with the main findings derived from the simultaneous equations modelling (SEM) estimations performed using the statistical software package known as STATA, more specifically STATA 13. The last section discusses the findings and highlights the main limitations of the investigation.

4.1. RESEARCH DESIGN, DATA AND METHODOLOGY

This section examines the relevance of the empirical investigation and posits the research objectives as well as the related hypotheses. It also reviews prior methods used to empirically investigate the capital-risk relationship in the banking industry in order to support the relevancy of the econometric model chosen for this study. The section ends by describing the variables used to build the econometric model while equally disclosing the data sources.

4.1.1. Relevancy of the Study, Research Objectives and Hypotheses

4.1.1.1. Relevancy of the Study and Research questions

The Turkish and WAEMU banking systems began to refer to the Basel standards in the same time period, that is in the very early of 2000s, both as Basel non-member countries. During that period, Basel I Accord was the benchmark and banking capital was regulated using the Cooke ratio. Since then, the global banking regulation has greatly evolved with the development of new Accords, including the Basel II and the Basel III. Despite these changes, the banking capital in WAEMU is still regulated with the Cooke ratio developed under the scope of Basel I Accord. However, this is not the case for the Turkish banking system. In fact, the regulation

of capital adequacy in the Turkish banking system has greatly evolved to converge towards more stringent rules as issued under Basel II and Basel III Accords.

From 2007, for instance, Turkey started introducing the Basel II capital adequacy requirements in its national regulatory standards. In 2009, the country became a full BCBS member. In July 2012, the country adopted the Basel II Accord and has begun, from January 2014, to progressively comply with the Basel III requirements. Meanwhile, WAEMU banking system has maintained the Basel I Accord capital adequacy requirement with its status of a BCBS non-member country. Hence, it appears that banking capital regulation has undergone major changes in the Turkish banking industry while it has remained quite stable in WAEMU. This offers a relevant framework to look at how changes in capital standards may affect capital-risk relationship in the banking industry. For this purpose, this study will discuss the following questions:

- Does the capital-risk relationship of banks regulated with the Cooke ratio differ from that of banks submitted to more stringent capital requirements as developed under Basel II or Basel III Accords?
- Can changes in capital regulation standards—the transition from Cooke ratio to more stringent capital requirements—affect the capital/risk relationship in the same banking industry?

4.1.1.2. Research Objectives

In answering the above-mentioned research questions, the study aims to examine the capital-risk relationship in both Turkey and WAEMU banking systems through a comparative analysis. More specifically, the empirical investigation mainly aims to:

- Compare the trend of the capital-risk relationship in the Turkish banking industry to that of WAEMU.
- Compare the trend of capital-risk relationship in the Turkish banking industry before and after the introduction of Basel II capital adequacy requirements in 2007.

- Compare the trend of capital-risk relationship in Turkish banking industry before and after becoming a full member of the BCBS in 2009.

In short, this research examines the impact of changes in capital regulation standards on capital-risk relationship in the Turkish banking system. In such an analytical framework, WAEMU is considered as a kind of control sample since its capital regulation system has remained quite stable. Furthermore, Turkey and WAEMU display significant dissimilarities with regard to their economic, demographical, and socio-cultural features. Another important discrepancy is related to the level of stock markets development. Indeed, stock market is well organized, increasingly active, and provides more investment opportunities in Turkey compared to WAEMU. Theses compelling features show that the banking systems of Turkey and WAEMU provide an adequate framework to perform the empirical investigations and achieve relevant conclusions for this research. Moreover, the development gap between Turkey and WAEMU is relevant to perform robustness tests using macroeconomic variables.

4.1.1.3. Research Hypotheses

The theoretical foundations of bank capital-risk relationship suggest three main type of associations, including positive, negative, and U-shaped relationship. A positive capital-risk relationship implies that more stringent capital requirements lead to higher incentives for risk taking. Inversely, the negative association suggests that higher capital requirements reduce bank risk-taking behavior. The U-shaped relationship combines both positive and negative associations depending on bank current capital position. The findings from the empirical literature roughly support a positive trend in capital-risk relationship in BCBS member-countries while the association is globally negative in non-member countries. Applying this extant framework to the objectives of the ongoing study, we posit a range of hypotheses to be empirically tested.

H_1: Under the Cooke ratio, Turkish and WAEMU's banks display a similar trend in capital-risk relationship.

H_2: When regulated with different capital adequacy standards (Cooke ratio for WAEMU versus Basel II capital regulatory standards for Turkey), Turkish and WAEMU's banks show a divergent capital-risk relationship.

H_3: The compliance with more stringent capital adequacy requirements affects the capital-risk relationship in the Turkish banking system.

H_4: The change of BCBS membership status affects the capital-risk relationship in the Turkish banking system.

4.1.2. Review of Prior Methods

Most empirical investigations have referred to the Simultaneous Equations Modelling as the regression model to examine the relationship between capital and risk in the banking system. To our knowledge, Shrieves & Dahl (1992) are the first to introduce this approach in analyzing bank capital-risk relationship. Indeed, they utilized simultaneous equations estimations assuming that changes in both capital and risk have endogenous (discretionary) and exogenous components. Shrieves & Dahl (1992) express this assumption as illustrated in the following textbox:

$$\begin{cases} \Delta CAP_{j,t} = \Delta CAP^{M}_{j,t} + \tilde{E}_{j,t} \\ \Delta RISK_{j,t} = \Delta RISK^{M}_{j,t} + \tilde{U}_{j,t} \end{cases}$$

Where $\Delta CAP_{j,t}$ stands for the total change in the capital level for bank j during period t, $\Delta CAP^{M}_{j,t}$ is the endogenously determined adjustment, and $E_{j,t}$ is the exogenously determined random shock. Similarly, changes in risk follow the same scheme.

Modelling the behavior of banks in a partial adjustment framework, Shrieves & Dahl (1992) assume that the endogenous component of the change in capital (risk) is proportional to the difference between a bank's target capital ratio (risk level) and the capital ratio (risk level) at the beginning of the period. These proportional relationships are described as follows:

$$\begin{cases} \Delta CAP_{j,t} = \alpha[CAP^{*}_{j,t} - CAP_{j,t-1}] + \tilde{E}_{j,t} \\ \Delta RISK_{j,t} = \beta[RISK^{*}_{j,t} - RISK_{j,t-1}] + \tilde{U}_{j,t} \end{cases}$$

Where $\Delta CAP_{j,t-1}$ refers to the bank's capital ratio at the beginning of the period and $CAP^{*}_{j,t}$ the target capital ratio for the bank j. The same scheme works for the risk equation.

Box 1: Mathematical Description of Endogenous and Exogenous Components of capital and Risk

Source: Adapted from Shrieves & Dahl (1992)

It also worthwhile emphasizing that Shrieves & Dahl (1992) develop their econometric model using the ratio of equity capital to total assets as capital ratio,

and proxy risk-taking behavior with two measures, including risk weighted assets ratio (RISK) and non-performing loans ratio (NON). In addition, Shrieves & Dahl (1992) introduce three other independent variables such as: SIZE, measured as the natural log of total assets; a dummy variable BHC defined as unity for banks that are members of multibank holding company organizations and zero otherwise; and a binary variable REG assessing the regulatory pressure whereby REG take a value of 1 for banks with total capital ratios below 7 percent[27], zero otherwise. Using these variables, Shrieves & Dahl (1992) develop the SEM as presented in the Box 2. They ran the model by referring to the two-stage least squares methods.

$$\Delta \tilde{CAP}_{j,t} = a_0 + a_1 LNSIZE_{j,t} + a_2 BHC_{j,t} + a_3 REG_{j,t} + a_4 \Delta \tilde{NON}_{j,t} + a_5 \Delta \tilde{RISK}_{j,t} - (\alpha_0 + \alpha_1 REG_{j,t}) CAP_{j,t-1} + \tilde{E}_{j,t}, \quad (1)$$

$$\Delta \tilde{NON}_{j,t} = b_0 + b_1 LNSIZE_{j,t} + b_2 BHC_{j,t} + b_3 REG_{j,t} + b_4 \Delta \tilde{CAP}_{j,t} + b_5 \Delta \tilde{RISK}_{j,t} - \beta_1 NON_{j,t-1} + \tilde{U}_{1,j,t} \quad (2)$$

$$\Delta \tilde{RISK}_{j,t} = c_0 + c_1 LNSIZE_{j,t} + c_2 BHC_{j,t} + c_3 REG_{j,t} + c_4 \Delta \tilde{CAP}_{j,t} + c_5 \Delta \tilde{NON}_{j,t} - \beta_2 RISK_{j,t-1} + \tilde{U}_{2,j,t} \quad (3)$$

Box 2: Simultaneous Equations Model as developed by Shrieves & Dahl (1992)

This econometric model has become the benchmark in several subsequent studies to empirically investigate the adjustments of bank risk levels with respect to observed changes in capital requirements. These studies usually implemented the SEM developed by Shrieves & Dahl (1992) with some methodological adjustments. They either introduced additional exogenous variables and/or modify the measurement methods of the main variables. The Table 13 shows the main methodological features of prior investigations. Some of these studies referred to the three-stage least squares method to run the SEM instead of the two-stage least squares used in the initial work. However, we have encountered in the literature some studies that have referred to the traditional regression estimation to examine the capital-risk relationship in the banking system. In that respect, we can notice the investigations carried out by Dannon & Lobez (2014) though the traditional regression estimation fails to cope with the simultaneous endogenous and exogenous issues in capital and risk in order to test the reciprocal interaction between them.

[27] The required minimum capital in U.S. banking industry was 7% during the period of investigation.

Table 13: Summary of Prior Empirical Investigations on Bank Capital-Risk

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
1.	Shrieves & Dahl (1992)	The relationship between risk and capital in commercial banks	To examine bank behavior with respect to observed changes in capital and risk.	SEM estimated using the two-stage least squares method.	- Capital ratio (CAP) measured as the ratio of equity capital to total assets; - Bank risk measured with risk weighted assets ratio (RISK) and non-performing loans ratio (NON).	- Bank size (SIZE) measured as the natural log of total assets; - Membership of multibank holding company organizations (BHC): a dummy variable; - Regulatory pressure (REG): a dummy variable.	U.S. banks for three-year period from 1984 to 1986	Changes in risk and capital are positively related, revealing that banks mitigate the effects of increases in capital levels by increasing asset risk posture, and vice versa. In fact, banks will tend to offset regulatory induced capital increases with increases in asset risk unless constrained from doing so by the regulatory apparatus.
2.	Jacques and Nigro (1997)	Risk-Based Capital, Portfolio Risk, and Bank Capital: A Simultaneous Equations Approach	To examine the impact of the risk-based capital standards on bank capital and portfolio risk.	Modified version of the SEM proposed by the Shrieves and Dahl (1992) and estimated using the three-stage least squares method.	- Capital ratio (CAP) measured as the ratio as the ratio of total capital (Tier 1 + Tier 2) to risk-weighted assets; - Bank risk (RISK) measured as the ratio of risk-weighted assets to total assets.	- Bank size (SIZE) measured as the natural log of total assets; - Membership of multibank holding company status (BHC): a dummy variable; - Income (INC); - Bank's leverage ratio (LEVD); - Regulatory pressure measured by two dummy variables (RPG for over capitalized bank and RPL for low capitalized bank).	U.S. banks for two-year period from 1990 to 1991	The risk-based capital standards effectively increase capital ratios and reduce portfolio risk in commercial banks.
3.	Aggarwal & Jacques (1998)	Assessing the Impact of Prompt Corrective Action on Bank Capital and Risk	To examine the impact of the prompt corrective action (PCA) standards on bank portfolios following the passage of FDICIA in 1991.	Modified version of the SEM proposed by the Shrieves and Dahl (1992) and estimated using the two-stage least squares method.	- Capital ratio (CAP) measured as the ratio of equity capital to total assets; - Bank risk measured with risk weighted assets ratio (RISK) and non-performing loans ratio (NON).	- Bank size (SIZE) measured as the natural log of total assets; - Membership of multibank holding company status (BHC): a dummy variable; - Income (INC) is measured as the ratio of net income to total assets; - Regulatory pressure measured by two dummy variables (PCAA for adequately capitalized bank and PCAU for low capitalized bank).	U.S. banks for four-year period from 1990 to 1993	Both adequately capitalized and undercapitalized banks increased their capital ratios while reducing their portfolio risk in response to prompt corrective action (PCA). These results suggest that the PCA was an effective measure to control bank risk-taking behavior.

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
4.	Aggarwal & Jacques (2001)	The Impact of FDICIA and Prompt Corrective Action on Bank Risk: Estimates using a Simultaneous Equations Model	To examine the simultaneous impact of Prompt Corrective Action on both Capital and Risk.	Modified version of the SEM proposed by the Shrieves and Dahl (1992) and estimated using the three-stage least squares method.	- Capital ratio (CAP) measured as the ratio of equity capital to total assets; - Bank risk measured with risk weighted assets ratio (RISK) and non-performing loans ratio (NON).	- Bank size (SIZE) measured as the natural log of total assets; - Membership of multibank holding company status (BHC): a dummy variable; - Income (INC) is measured as the ratio of net income to total assets; - Ratio of government securities to total assets (SEC); - Cash position of a bank measured as the ratio of cash to total assets (CASH); - Loan loss provisions as a percentage of total assets (LLPROV); - Metropolitan versus rural banks (MSA): a dummy variable - Regulatory pressure measured by two dummy variables (PCAA for adequately capitalized bank and PCAU for low capitalized bank).	U.S. banks for four-year period from 1990 to 1997	Both adequately capitalized and undercapitalized banks increased their capital ratios while reducing their portfolio risk in response to prompt corrective action (PCA) during the announcement period, 1992, and the years after the standards went into effect, 1993-1996.
5.	Bitchsel and Blum (2004)	The Relationship between Risk and Capital in Swiss Commercial Banks: A Panel Study	To investigate the relationship between changes in risk and changes in leverage.	Two-step feasible generalized least squares (FGLS).	Bank risk measured with risk two variables, including - the volatility per unit of market value of assets (σ_A); - the likelihood of bank failure (Z-scores).	- Capital ratio (C) measured as the ratio of equity capital to total assets; - Volatility of Swiss bank stock index (σ_{BSI});	Swiss banks for ten-year period from 1990 to 1999	Positive correlation between levels of capitalization and banks' risks, implying that a higher level of capital is associated with a higher level of risk. No significant relationship between changes in the capital ratio and the likelihood of bank failure.

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
6.	Altunbas, Carbo, Gardener & Molyneux (2007)	Examining the Relationships between Capital, Risk and Efficiency for European Banks	To analyze the relationship among capital, risk and efficiency.	SEM estimated using Zellner's (1962) Seemingly Unrelated Regression (SUR) approach.	- Bank risk measured with loan-loss reserves (LLRL); - Equity to assets ratio (ETA); - Cost inefficiency (INEFF)	- Net loans to total assets (NLTA); - Natural log of total assets (LNTA); - Return-on-assets (ROA); - Liquid assets to customer and short-term deposits (LAODEP); - Interest rate spreads over 3-year government bonds (INSBOC); - Current assets to current liabilities (SOLVENCY); - Banking system liquid assets to total assets (LAOAC); - Banking system return on capital (ROCC); - Banking system cost to income ratios (COIRC); - Banking system operating expenses to total assets (OEPOAC); - Banking system loan-loss provisions to total loans (LLPOAC); - Yearly dummy variables (YEAR).	European banks for nine-year period from 1992 to 2000	Positive relationship between inefficiency and bank risk-taking. Inefficient European banks appear to hold more capital and take on less risk. Regulators' preference for capital appears as a mean of restricting risk-taking activities
7.	Floquet & Biekpe (2008)	The relationship between Capital Structure and Risk in Emerging Market Banks	To examine the relationship between capital structure and levels of risk in emerging market banks.	Modified version of the SEM proposed by the Shrieves and Dahl (1992) and estimated using the three-stage least squares method.	- Capital ratio (CAPR) measured as the ratio of equity capital to total assets; - Bank risk measured with the non-performing loans ratio (RISK).	- Bank size (SIZE) measured as the natural log of total assets; - Bank earnings (ROAA) measured as the return on average assets; - Bank loan growth (GROW); - Cost of debt (COD); - Inflation (CPI); - Bank liquidity; - Regulatory stringency.	2 940 banks across 44 emerging market countries for the period of 1995 to 2003.	Contrary to the positive relationship presented by developed market empirical evidence, no significant relationship exists between changes in capital and changes in risk.

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
8.	Laeven, Luc, and Ross Levine (2009)	Bank Governance, Regulation and Risk-Taking	To investigate the relationship among banks' risk-taking, ownership structures, and national bank regulations.	Regression estimations using ordinary least squares method.	- Bank risk mainly measured with the z-scores of bank.	- Bank level control variables (equity volatility, earnings volatility, ownership structure, Revenue growth; size, liquidity ratio, etc.); - Cash flow rights of bank in a country; - Country level of bank regulation.	270 listed banks from 48 countries on the period 1996-2001	Banks with powerful owners tend to take greater risks. The impact of bank regulations on bank risk depends critically on each bank's ownership structure. The effect of the regulation on a bank's risk taking can be positive or negative depending on the bank's ownership structure.
9.	Mongid, Tahir, and Haron (2012)	The relationship between inefficiency, risk and capital: Evidence from commercial banks in ASEAN	To examine the relationship between inefficiency, risk and capital in ASEAN banking.	SEM estimated using the three-stage least squares method.	- Inefficiency (INEFF) measured with total banking cost to total income; - Bank risk (RISK) measured with loans to total assets; - Capital ratio (CAPR) measured as the ratio of equity capital to total assets.	- Net loans to total assets (NLTA); - Bank size (SIZE) measured as the natural log of total assets; - Profitability measured with Return on Assets (ROA); - Total interest revenue to total assets (IRC); - Off-balance sheet items to total assets (OBSTA).	Banks from 8 ASEAN countries on the period 2003-2008	Capitalization and size are negatively related to inefficiency. Capitalization and inefficiency are negatively related with risk. There is a negative relationship between capitalization and risk but not with inefficiency.
10.	Dannon & Lobez (2014)	La Régulation Bancaire dans l'Union Economique et Monétaire Ouest-Africaine est-elle Efficace?	To assess the impact of capital ratios (risk-weighted capital ratio and flat capital ratio) on the default risk.	Ordinary least squares method.	- Default risk measured with the z-scores of bank;	- Capitalization measured with the Cooke ratio, Tier 1, Tier 2, and the ratio of equity capital to total assets; - Bank level control variables (Net loans to total assets, Deposits to total assets, salaries and wages expenses to total assets, size); - Ownership structure; - Macroeconomic control variables (GDP, Inflation, money supply to GDP ratio).	Banks from WAEMU's countries on the period 2000-2010	Positive association between capital ratios and Z-scores, meaning that banks with higher capital positions have a lower probability of default.

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
11.	Bouheni, Ameur, Cheffou & Jawadi (2014)	The Effects of Regulation and Supervision on European Banking Profitability and Risk: A Panel Data Investigation	To investigate the effects of regulatory and supervisory policies on profitability and risk-taking for European banks.	Generalized Method of Moments (GMM).	Performance (PERF) measured through 5 proxies: return on assets (ROA) and return on equities (ROE) as proxies of bank profitability; the volatility of the return on assets (VOL_ROA), the volatility of the return on equities (VOL_ROE) and the distance from insolvency (Z_scores) as proxies of bank stability.	- Restrictions on banking activities (RESTRICT); - Deposit insurance (DEPO_INSR); - Capital adequacy (CAP_ADQ) measured by total equity/total assets; - Supervisory power (SRP); - Independence of supervisory authority (ISA); - Bank size (BS); - Bank capital to assets ratio (CAR); - Loan loss reserve/Gross loans (LLGL); - Net loans/total assets (NLTA) - Bank nonperforming loans to total gross loan (NPL) - Institutional quality indicators (INSQ); - Financial development factors (FD); - Inflation measured by Consumer Price Index (CPI); - Gross domestic product (GDP).	European banks over the period 2005 to 2011	Strengthening regulations and supervision improves profitability and boosts the stability of European banking systems. Positive correlation between capital adequacy, deposit insurance systems, and banks' profitability. Stepping up supervisors' powers reduces risk-taking and promotes banking stability.
12.	Hogan (2015)	Capital and Risk in Commercial Banking: A Comparison of Capital and Risk-Based Capital Ratios	To examine the relationship between the capital ratios (risk-based capital ratio and standard capital ratio) on bank risks.	Ordinary Least Squares (OLS) regressions.	Risk measured by standard deviation of stock returns and banks' Z-scores.	- Capital ratio measured by risk-based capital and flat capital; - Real estate loans (REAL); - MBS (MBS), - Other loans (LOANS); - Treasury securities (TS); - cash (CASH).	U.S. banks for twelve-year period from 1999 to 2010	Flat-rate and risk-based capital are statistically significant predictors of risk. Flat rate capital ratio is consistently a better predictor of risk than the risk-based capital, especially in the aftermath of the recent financial crisis.
13.	Bouheni & Rachdi (2015)	Bank Capital Adequacy Requirements and Risk-Taking	To investigate the reactions of Tunisian commercial banks to	SEM estimated using the two-stage least squares	- Capital ratio (Cap) measured as the ratio of equity capital to total assets;	- Bank size (Size) measured as the natural log of total assets; - Liquidity (Liq) measured by the ratio of Net Loans over Total assets	11 Tunisian banks for 14-year period ranging	Interaction between capitalization and risk level is negative, implying that an increase in capital is followed by a decrease

N°	Authors	Titles	Main Objective	Analysis Model	Dependent variables	Independent Variables	Samples	Main Conclusions
		Behavior In Tunisia: A Simultaneous Equations Framework	regulatory pressure in terms of capital and risk decisions.	method.	- Bank risk (Risk) measured with the ratio of risk weighted-assets to total assets.	- Profitability measured with Return on Assets (ROA) and with Return on Equity (ROE); - Regulatory pressure (Pres) measured with a Dummy variable (1 if the bank's capital ratio is within one standard deviation of the minimum capital requirement, and 0 otherwise).	from 2000 to 2013	in banking risk-taking. Largest banks better manage risks since they have more experience in handling risk issues through diversification.
14.	Mosko & Bozdo (2016)	Modeling the Relationship between Bank Efficiency, Capital and Risk in Albanian Banking System	To examine the interactions between efficiency, capital and risk-taking in the case of Albanian banking system.	SEM estimated using the two-stage least squares method.	- Cost efficiency (EFF); - Capital ratio measured as the ratio of equity to total assets (ETA); - Bank risk measured with the ratio of Loan to total asset (LTA).	- Bank size measured as the natural log of total assets (LASSET); - Loan deposit ratio (LDR); - Loan losses provision to total loan (RISK); - Personnel exp. to total expenses (PERSTEX); - Fixed asset to total asset ratio (FIXTAS); - Cost to income ratio (CIR); - Off-balance sheet activities to total asset (OBSA); - Return on Assets (ROA) - Deposit to total asset (DEPTA) - Annual economic growth (EGRW); - Corruption index (CORRUPT); - Economic freedom index (FREE).	Albanian commercial banks for 13-year period ranging from 2002 to 2014	The relationship between risk and capital is found to be positive and simultaneous. The level of bank efficiency is very important in determining both capital and risk. Capital regulation and risk-taking behavior influence efficiency. They can either increase or decrease efficiency.
15	Javed (2016)	An Empirical Investigation on Relationship between Risk, Capital and Efficiency in Banking Sector of Pakistan	To explore inter-temporal relationship between risk position, level of capitalization and efficiency in banking sector of Pakistan.	SEM estimated using the three-stage least squares method.	- Capital ratio (CAP); - Bank risk assessed with four measures, including loan loss provisions to total asset (LLPTA), Z-scores, volatility of ROA and volatility of ROE.	- Technical efficiency - Bank specifics (off-balance sheet activities to total assets, return on assets, size); - Industry variables (Banking sector development, concentration of market, liquidity, level of productivity, taxation); - Macroeconomic variables (GDP growth, Inflation rate, stock market development).	35 Pakistani banks for 10-year period ranging from 2005 to 2014	Positive association between Z-scores and capital level of Pakistani banks, revealing that high level of capital position reduces the default risk.

Source: Created by the Author

4.1.3. Econometric Model Specification and Data Sources

In this sub-section, we first set up the suitable econometric model to analyze capital adequacy and bank risks in the Turkish and WAEMU banking industries. Then, we describe the variables used to build this model. Finally, we delineate the data to be used for statistical estimations.

4.1.3.1. Econometric Model Specification and Method of Analysis

The extant empirical literature brought to light the Simultaneous Equation Modelling (SEM) as the suitable method in investigating the adjustments to regulatory capital requirements and their interrelationship with risk levels of banks. As above-mentioned, most of the prior studies developed their econometric models in line with the simultaneous equations framework, initially built by Shrieves & Dahl (1992), to analyze the interrelation between bank capital and risk decisions. In fact, the SEM enables those studies to capture the interdependency among variables and deal with correlation problems between explanatory variables and error terms in the regression analysis. Since capital and risk are assumed to be simultaneously determined and interrelated (Shrieves & Dahl, 1992; Marcus & Shaked, 1984; Hart & Jaffee, 1974), the Ordinary Least Squares (OLS) method can no longer be applied. The SEM also contributes to drop out simultaneous bias and inconsistencies in the estimates (Bouheni & Rachdi, 2015; Mongid, Tahir, & Haron, 2012). Therefore, the SEM appears to be the relevant approach to investigate the relationship between bank capital and risk, which are jointly determined and interrelated variables.

Following these rationales and in line with previous empirical studies, we investigate the capital-risk relationship in the Turkish and WAEMU banking industries using a modified version of the SEM proposed by Shrieves & Dahl (1992). Beyond capital (CAP) and risk ratios, we introduce bank specifics and macroeconomic variables as truly independent variables. Bank specific variables include size (SIZE), return on assets (ROA), liquidity (LIQ), and off-balance sheet activities (OBSA) while we control macroeconomic effects with the inflation rate (INF) and the gross domestic product growth (GDPG). Furthermore, the model includes two components of risk such as the risk-taking behavior (RISK) and the

likelihood of bank failure (Z-scores). By combining the above-mentioned variables in a system of equations, we build up a first model as follows:

$$\begin{cases} \Delta CAP_{it} = \alpha_0 + \alpha_1 \Delta RISK_{it} + \alpha_2 \Delta Z_{it} + \alpha_3 CAP_{it-1} + \alpha_4 Size_{it} + \alpha_5 ROA_{it} + \alpha_6 LIQ_{it} + \alpha_7 OBSA_{it} + \alpha_8 INF_{it} + \alpha_9 GDP_{it} + \varepsilon_{1it} & (1) \\ \Delta RISK_{it} = \beta_0 + \beta_1 \Delta CAP_{it} + \beta_2 \Delta Z_{it} + \beta_3 RISK_{it-1} + \beta_4 Size_{it} + \beta_5 ROA_{it} + \beta_6 LIQ_{it} + \beta_7 OBSA_{it} + \beta_8 INF_{it} + \beta_9 GDP_{it} + \varepsilon_{2it} & (2) \\ \Delta Z_{it} = \lambda_0 + \lambda_1 \Delta CAP_{it} + \lambda_2 \Delta RISK_{it} + \lambda_3 Z_{it-1} + \lambda_4 Size_{it} + \lambda_5 ROA_{it} + \lambda_6 LIQ_{it} + \lambda_7 OBSA_{it} + \lambda_8 INF_{it} + \lambda_9 GDP_{it} + \varepsilon_{3it} & (3) \end{cases}$$

Where i stands for the ith bank or the cross-section identifier, t refers to the time index or the time identifier, and ε the exogenous random shocks.

Our econometric model, though derived from the SEM coined by Shrieves & Dahl (1992) to examine the interaction between capital and risk in banking sector, displays two main specific features. First, it includes two measures to assess two different aspects of risk, including the risk-taking behaviors and the likelihood of bank failure. While Shrieves & Dahl (1992) also referred to two risk measures, both express banks' risk-taking behaviors. Second, we include more control variables in our model to account for both banks' specificities and countries' macroeconomics features. For instance, bank size is usually used to assess the effects of economies of scale (Boyd & Runkle, 1993). Large size creates diversification opportunities that provides cost efficiency, reduces risks, and allows banks to operate with lower capital and less-stable funding (Laeven, Ratnovski, & Tong, 2014). We refer to ROA to account for bank profitability. We use liquidity as a critical factor, which could severely affect banking industry when it is mismanaged. Since the 2007 financial crisis, it has received a sharp rise of interest in the banking industry and has been a key amendment in the international banking regulation which led to Basel III standards (Dietrich, Hess, & Wanzenried, 2014; Avadanei, 2013). As emphasized by Mongid, Tahir, & Haron (2012), OBSA ratio is also introduced to capture moral hazard issues. Alongside with bank specific factors, we refer to GDP growth and inflation rate to account for macroeconomic discrepancies between Turkey and WAEMU. It is also worthwhile to notice that all these factors have been used in previous studies as highlighted in the Table 13. However, our model does not encompass all the variables in the SEM developed by Shrieves & Dahl (1992).

For instance, it does not include the variables related to the banks' affiliation to holding company (BHC).

Beside the original model assuming a linear relationship between capital adjustments and bank risks, we develop another model using the log-transformation of the variables as follows:

$$\begin{cases} \mathbf{Ln(CAP_{it}) = \alpha_0' + \alpha_1'Ln(RISK_{it}) + \alpha_2'Ln(Z_{it}) + \alpha_3'Ln(CAP_{it-1}) + \alpha_4'Size_{it} + \alpha_5'Ln(ROA_{it}) + \alpha_6'Ln(LIQ_{it}) + \alpha_7'Ln(OBSA_{it}) + \alpha_8'Ln(INF_{it}) + \alpha_9'Ln(GDP_{it}) + \varepsilon'_{1it}} & \mathbf{(1')} \\ \mathbf{Ln(RISK_{it}) = \beta_0' + \beta_1'Ln(CAP_{it}) + \beta_2'Ln(Z_{it}) + \beta_3'Ln(RISK_{it-1}) + \beta_4'Size_{it} + \beta_5'Ln(ROA_{it}) + \beta_6'Ln(LIQ_{it}) + \beta_7'Ln(OBSA_{it}) + \beta_8'Ln(INF_{it}) + \beta_9'Ln(GDP_{it}) + \varepsilon_{2it}} & \mathbf{(2')} \\ \mathbf{Ln(Z_{it}) = \lambda_0' + \lambda_1'Ln(CAP_{it}) + \lambda_2'Ln(RISK_{it}) + \lambda_3'Ln(Z_{it-1}) + \lambda_4'Size_{it} + \lambda_5'Ln(ROA_{it}) + \lambda_6'Ln(LIQ_{it}) + \lambda_7'Ln(OBSA_{it}) + \lambda_8'Ln(INF_{it}) + \lambda_9'Ln(GDP_{it}) + \varepsilon_{3it}} & \mathbf{(3')} \end{cases}$$

Where Ln refers to the symbol of natural logarithm. Since SIZE was initially computed as the natural logarithm of total assets, it does not follow a second process of log-transformation.

As reported by Vogelvang (2005), the log-transformation is relevant for several purposes. First, it dispels out the challenges related to differences of units of the variables. Second, it enables us to solve the possible non-linearity issues in the relationship between the dependent and independent variables. Third, the estimated parameters can easily be interpreted as elasticities. In the capital-risk relationship in a SEM, the elasticity coefficient will express responsiveness or adjustments of the bank risk-taking behavior following a change in capital position, and vice versa. This is exactly what Shrieves & Dahl (1992) wanted to capture by introducing changes in capital and risk in their benchmark model.

Furthermore, we refer to 2007 and 2009 as two benchmark dates for comparison based-purposes. As mentioned-above, 2007 refers to the date when Turkey began to comply with the Basel II capital adequacy requirements while it became a full member of the BCBS in 2009. Hence, we introduce a dummy variable (REG) to capture the changes in capital regulatory rules and related risks in the Turkish banking industry, which moved from the Basel I Cooke ratio to successively Basel II and Basel III capital requirements standards. To this end, the dummy variable

REG is introduced in the model to account for changes in each regressand on the two-split period. For instance, when the slope coefficient of the dummy variable REG in the equation, i.e. capital equation, is significant, it will imply that capital level in the time span 2002-2006 is statistically different from the level in the period 2007-2015. Regarding the first equation, cross-products made with the dummy variable REG and the main regressors (REGxRISK and REGxZ) are also introduced to check differences in related slope coefficients in order to assess changes in the trends of capital-risk relationship on the two periods. As posited by Gujarati (2004), a differential slope coefficient also termed as slope drifter report by how much the slope coefficient of the period 2002-2006 differs from that of the 2007-2015 time span. Similar transformations are also made for the risk equation and Z-scores equation. The model with REG-dummy variable is stated as follows.

$$\begin{cases} \Delta CAP_{it} = \alpha_0'' + \alpha_1''\Delta RISK_{it} + \alpha_2''\Delta Z_{it} + \alpha_3''CAP_{it-1} + \alpha_4''Size_{it} + \alpha_5''ROA_{it} + \\ \quad \alpha_6''LIQ_{it} + \alpha_7''OBSA_{it} + \alpha_8''INF_{it} + \alpha_9''GDP_{it} + \alpha_{10}''REG_t + \\ \quad \alpha_{11}''REG_t \times \Delta RISK_{it} + \alpha_{12}''REG_t \times \Delta Z_{it} + \varepsilon''_{1it} \end{cases} \quad (1)$$

$$\begin{cases} \Delta RISK_{it} = \beta_0'' + \beta_1''\Delta CAP_{it} + \beta_2''\Delta Z_{it} + \beta_3''RISK_{it-1} + \beta_4''Size_{it} + \beta_5''ROA_{it} + \\ \quad \beta_6''LIQ_{it} + \beta_7''OBSA_{it} + \beta_8''INF_{it} + \beta_9''GDP_{it} + \beta_{10}''REG_t + \\ \quad \beta_{11}''REG_t \times \Delta CAP_{it} + \beta_{12}''REG_t \times \Delta Z_{it} + \varepsilon''_{2it} \end{cases} \quad (2)$$

$$\begin{cases} \Delta Z_{it} = \lambda_0'' + \lambda_1''\Delta CAP_{it} + \lambda_2''\Delta RISK_{it} + \lambda_3''Z_{it-1} + \lambda_4''Size_{it} + \lambda_5''ROA_{it} + \\ \quad \lambda_6''LIQ_{it} + \lambda_7''OBSA_{it} + \lambda_8''INF_{it} + \lambda_9''GDP_{it} + \lambda_{10}''REG_t + \\ \quad \lambda_{11}''REG_t \times \Delta CAP_{it} + \lambda_{12}''REG_t \times \Delta RISK_{it} + \varepsilon_{3it} \end{cases} \quad (3)$$

Where REG is unity for period from 2007, and zero otherwise.

Also like the REG-dummy model, we also introduce another dummy variable labelled MEMB to capture the possible effect of BCBS membership status on capital-risk relationship in the Turkish banking system. MEMB is unity for time-period from 2009 while it is zero otherwise. Both the REG-dummy and the MEMB-dummy models will be run with the log transformation of the variables.

Contrary to the two-stage least squares (2SLS) method initially used by Shrieves & Dahl (1992), recent studies[28] increasingly shift to the three-stage least squares (3SLS) method to estimate the relationship between capital and risk for banks. Both

[28] For instance, Javed (2016), Mosko & Bozdo (2016), Bouheni & Rachdi (2015), Mongid, Tahir, & Haron (2012), and Floquet & Biekpe (2008) referred to the three-stage least squares (3SLS) to investigate capital risk-relationship.

2SLS and 3SLS enable them to capture endogeneity issues in interrelationship among variables as well as cope with cross correlation between the error terms. Yet, the 3SLS is generally more relevant to deal with cross correlations in the residuals of the equations and then provides more efficient estimates (Bouheni & Rachdi, 2015; Henningsen & Hamann, 2007; Belsley, 1988). The 3SLS is also known as the feasible generalized least squares (FGLS) version of the 2SLS estimation (Henningsen & Hamann, 2007). Following these rationales, we apply a 3SLS technique included in STATA 13.0 on panel data to investigate the capital-risk relationship in the Turkish and WAEMU banking industries.

4.1.3.2. Variables' Description

To examine the capital-risk interrelationship in Turkish and WAEMU, we build up an econometric model with nine (09) variables, including three (03) core variables banks and seven (06) control variables to account for banks' specificities and macroeconomic features of the countries. Table 14 summarizes all the variables used and their computation rules according to the literature.

The core variables include capital ratios and risk levels. Both flat rate capital ratio and risk-based capital ratios will be used. The statistical estimations will be first run using flat rate capital rate ratio and later, it will be replaced by the risk-based capital ratio in a second iteration. As for risks, both measures for bank risk-taking behaviors and likelihood of bank failure are used. The first is measured using the ratio of risk weighted-assets to total assets (RISK) while the likelihood of bank failure is assessed with the Z-scores (Z).

First developed by Roy (1952) and refined in subsequent studies (Boyd, Graham, & Hewitt, 1993; Hannan & Hanweck, 1988; Boyd & Graham, 1986), the Z-scores has become a popular measure to assess the likelihood of bank failure. Chiaramonte, Croci, & Poli (2015) emphasize on Z-scores as a widely used proxy of bank soundness. In fact, Z-scores expresses the inverse probability of insolvency of a bank. In essence, a higher value of Z-scores indicates a lower probability of insolvency risk and a greater bank stability (Chiaramonte, Croci, & Poli, 2015).

Table 14: Summary of Variables and Computation Rules

Variables		Symbols	Description/Computation Rules
Core Variables	Flat Capital Ratio	CAP	$CAP = \frac{Equity}{Total\ assets}$
	Risk-Based Capital Ratio	RBC	$CAP = \frac{Equity}{Risk\ \ weighted\ \ assets}$
	Risk-Taking	RISK	$RISK = \frac{Risk\ \ weighted\ \ assets}{Total\ \ assets}$
	Likelihood of Bank Failure (Z-scores)	Z	$Z = \frac{Mean(ROA) + Equity/(Total\ assets)}{\sigma(ROA)}$
Bank Specific Features	Size	SIZE	$Size = Log(Total\ assets)$
	Return on Assets	ROA	$ROA = \frac{Net\ profit}{Average\ \ total\ assets}$
	Liquidity	LIQ	$LIQ = \frac{Total\ liquid\ assets}{Total\ assets}$
	Off-Balance Sheet Activities	OBSA	$OBSA = \frac{Off\ \ -\ Balance\ \ Sheet\ \ Commitments}{Total\ \ assets}$
Macroeconomic Control	Inflation	INF	INF = Current period inflation rate
	GDP Growth	GDPG	GDPG = Annual real GDP growth
Dummies	Changes in Capital Regulatory Rules	REG	REG equals to zero for periods prior to 2007 (2002-2006), and unit otherwise.
	BCBS' Membership Status	MEMB	MEMB equals to zero for periods prior to 2009 (2002-2009), and unit otherwise.

Source: Created by the author

Fully accounting-based risk measure, the Z-score is derived from the probability that bank's losses exceed its capital. It is determined using capital ratio, ROA and its volatility. Yet, the computation rule of Z-scores largely varies, especially when it comes to choosing the appropriate time window for standard deviation. For instance, Laeven and Levine (2009) and Houston, Lin, Lin, & Ma (2010) compute Z-scores using equity-to-asset ratio, current period values of ROA, and standard deviation of ROA computed over the full sample. Contrary to this approach, there

are the proponents of the use of rolling mean and range-based standard deviation, who argue that bank's risk profile and risk measure should change over time. Using 3-, 4- or 5-year window in the computation of standard deviation of ROA combined with current period values of ROA and equity-to-asset ratio, Delis, Tran, & Tsionas (2012) reach similar results. Bertay, Demirgüç-Kunt, and Huizinga (2013) compute Z-scores using mean value of ROA and equity-to-asset ratio, and standard deviation of ROA for five consecutive 4-year periods during a 20-year sample.

In this investigation, we split the 14-year sample into three-time windows in order to capture risk profile for the pre-crisis (2002-2006), crisis (2007-2010), and post crisis (2011-2015). Hence, the Z-score is computed using the current period values of ROA and bank's leverage combined with the relevant period range-based volatility of ROA.

Furthermore, we capture the bank specificities with five measures, including size[29] (SIZE), return on Assets (ROA), liquidity (LIQ), and off-balance sheet activities (OBSA). We refer to inflation rate and GDP growth to control for macroeconomic effects. All of the variables we use are available in prior studies referring to SEM to empirically investigate capital-risk relation in banking industries (See table 13). We also refer to a dummy variable REG to highlight the effects of changes in capital regulatory standards in the Turkish banking system from 2007 onwards. Another dummy variable MEMB accounts for the possible impact of BCBS' membership versus non-member status of capital-risk relationship in the Turkish banking industry.

4.1.3.3. Samples and Data Sources

We build the empirical framework with Turkish and WAEMU banks. In comparison to one another, each of this population is quite internally homogeneous and externally heterogeneous. This is because each of them includes banks operating with complete dissimilarities in terms of economic and financial features. The sample includes banks created before 2002 and which operate until 2015. We have chosen 2002 as the starting point of the time series in order to dispel the distortions in banking financial statements induced by the severe financial crisis

[29] Bank size is usually measured as the natural log of total assets.

experienced by Turkey between November 2000 and February 2001. We consider 2015 as the end line of time series because data related to year 2016 are not yet available. We derived data from financial statements and statistical reports of the Central Bank of West African States (CBWAS)[30] and the Banks Association of Turkey[31]. We took the macroeconomic information from the World Bank's development indicators[32]. In order to bail out the currencies difference in the two banking systems (F CFA versus Turkish Lira), all the monetary figures have been expressed in Euro. We remove all banks with missing data in order to run the empirical analysis on a balanced panel.

For Turkey, the sample includes 21 banks representing 45% of the total number of banks, 89% in term of total assets, 95% in term of branch offices and 92% in term of the number of employees. As for WAEMU, we consider 37 banks[33] representing 30% of the total number of banks, 59% in term of total assets, 56% in term of branch offices and 56% in term of the number of employees. It is also worthwhile noticing that Turkish banking equates to 17 times the size of WAEMU banking industry in term of total assets while it represents only 45% of the total number of banks.

Overall the final sample includes 21 Turkish banks and 37 WAEMU banks through 14-year period (2002 to 2015). The main features of the samples and the related populations are summarized in the Table 15 as follows:

[30] The WAEMU's banking data are available on http://www.bceao.int/inc_rub_regulieres-105-60-fr-asc.html.

[31] The Turkish banking data are available on https://www.tbb.org.tr/en/banks-and-banking-sector-information/statistical-reports/20.

[32] The World Bank's development indicators available on http://data.worldbank.org/data-catalog/world-development-indicators

[33] From 2002 to 2015, the number of banks operating in the WAEMU almost doubled, increasing from 66 to 122 banks, i.e. 85% of expansion. The sample does not account for the new banks since it includes only banks created before 2002. Indeed, the sample represents 56% of the number of banks existing before 2002.

Table 15: Profile of the Sample

		Date of Establishment	Number of Banks	Total Assets (EUR Million)	Number of Branch Offices	Number of Employees
TURKEY	Sample	1863-1997	21	624.039,75	10.246	180.750
	Population	1863-2013	47	701.271,99	10.781	196.699
	%	-	45%	89%	95%	92%
WAEMU	Sample	1965-1999	37	25.083,72	1.356,00	14.444
	Population	1965-2015	122	42.491,02	2.430,00	25.597
	%	-	30%	59%	56%	56%
Comparison Turkish vs WAEMU		-	38,52%	16,50	4,44	7,68

Source: Created by the author using data from the statistical reports of The Bank Association of Turkey (https://www.tbb.org.tr/en/banks-and-banking-sector-information/statistical-reports/20) and The Banking Committee of WAEMU (http://www.bceao.int/-Periodiques-.html)

4.2. STATISTICAL ANALYSIS AND COMMENTS

This section examines the descriptive statistics and the correlation coefficients among variables. It also reports the estimates derived from the three-stage least squares (3sls) of the Simultaneous Equations Model (SEM) using STATA 13. It ends with comments on the outputs in order to confirm or rebut the posited hypotheses.

4.2.1. Descriptive Statistics and Correlation Coefficients

Compared to WAEMU, the Turkish banking industry displays a highly strong capital structure both in term of unweighted capital and risk-based capital. In fact, the average level of equity capital of banks in Turkey is 19,6% with a maximum value of 85,0% while it is only 10,7% for WAEMU's banks with a maximum value of 69,2%. The mean-value of risk-based capital for Turkish banks is 34,3% with a maximum value of 400, 74% against 10,7% for the WAEMU with a maximum value of 97,1%. The soundness of bank capital structure in Turkey surely derives from the regulatory reforms introduced to phase out the effects of the 2000-2001 crisis. Although changes in the equity capital remained quite weak, we observe a peak for the risk-based capital in the aftermath of actions taken to deal with the financial crisis experienced by Turkey between November 2000 and February 2001. Yet, the level of risk-based capital of the Turkish banking has decreased to reach a stable level somewhat in 2010 as highlighted in the Figure 8. It is also worthwhile

noticing that Turkish banks display higher variance in their capital structure compared to the WAEMU.

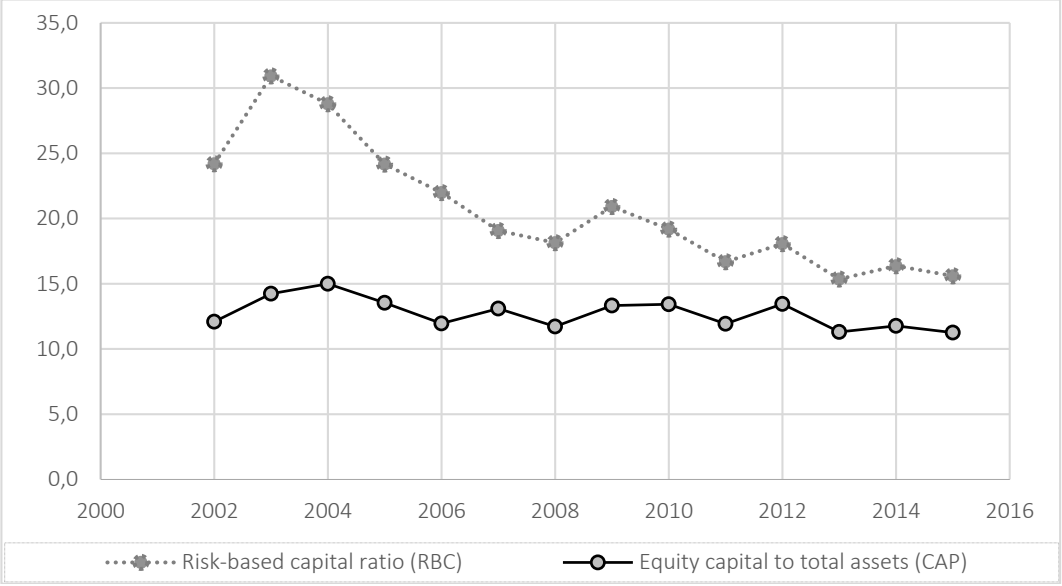

Figure 6: Evolution of Capital Structure in the Turkish Banking Industry

With a strong capital structure, the descriptive statistics reveal that Turkish banks display lower risk-taking behaviors compared to the WAEMU's banks. Indeed, the average ratio of risk-weighted assets to total assets is 68,3% for Turkish banks while it is 104,9% for the WAEMU one. Fairly logically, Turkish banks have a low likelihood of bankruptcy since they display a higher mean-value of Z-scores of 36,82 while it is 24.42 for the WAEMU. Nevertheless, Turkish banks perform more off-balance sheet activities than WAEMU's banks. In fact, the average value of the off-balance assets ratio in Turkey is 119,6% while it is only 19,8% in the WAEMU.

On average, banks are more profitable in Turkey than WAEMU. In fact, the mean-value of ROA is 12,3% in Turkey compared to 7,3% in the WAEMU. Furthermore, banks are more liquid in the Turkish banking industry (40,3% of liquidity ratio) than in the WAEMU (31,2%).

In terms of macroeconomic features, Turkey and WAEMU banks roughly display the same level of gross domestic growth in average (4,8% versus 4,3%). However, the inflation rate is higher in Turkey compared to WAEMU (12,4% versus 2,2%). The summary statistics of all variables are displayed in the Table 16 and Table 17, respectively for samples derived from Turkish and WAEMU's banks.

Table 16: Descriptive Statistics (Turkey)

	Variables	Obs.	Mean	Std. Dev.	Min	Max
Main variables	CAP	294	0.190	0.188	0.033	0.850
	ΔCAP	273	0.001	0.065	-0.462	0.416
	RBC	294	0.343	0.486	0.072	4.737
	ΔRBC	273	-0.008	0.239	-2.118	2.103
	RISK	294	0.683	0.256	0.103	2.072
	ΔRISK	273	0.013	0.186	-1.731	0.973
	Z	294	36.820	40.310	-0.805	349.196
	ΔZ	273	1.178	23.436	-164.748	272.639
Bank Specifics	SIZE	294	22.097	2.102	16.634	25.278
	ROA	294	0.018	0.054	-0.632	0.322
	ROE	294	0.123	0.162	-1.786	0.648
	LIQ	294	0.403	0.208	0.069	0.944
	OBSA	294	1.196	1.113	0.000	8.280
Macro	INF	294	0.124	0.101	0.063	0.450
	GDPG	294	0.048	0.037	-0.048	0.094

Note: CAP: Flat capital ratio; RBC: Risk-based capital ratio; RISK: risk-taking; Z: Z-scores; SIZE: Bank size; ROA: Return on assets; LIQ: Liquidity; OBSA: Off-balance sheet activities; INF: Inflation; GDPG: GDP Growth.

Table 17: Summary Statistics (WAEMU)

	Variable	Obs.	Mean	Std. Dev.	Min	Max
Main variables	CAP	518	0.107	0.072	-0.009	0.692
	ΔCAP	481	-0.001	0.038	-0.229	0.403
	RBC	518	0.107	0.088	-0.008	0.971
	ΔRBC	481	-0.001	0.050	-0.287	0.595
	RISK	518	1.049	0.260	0.501	4.414
	ΔRISK	481	0.002	0.250	-3.038	3.338
	Z	518	24.417	42.515	-2.192	451.307
	ΔZ	481	0.701	26.920	-285.830	413.919
Bank Specifics	SIZE	518	19.215	1.055	15.680	21.274
	ROA	518	0.010	0.037	-0.308	0.249
	ROE	518	0.073	0.707	-13.400	1.441
	LIQ	518	0.312	0.112	0.044	0.741
	OBSA	518	0.198	0.110	0.000	0.868
Macro	INF	518	0.022	0.027	-0.031	0.113
	GDPG	518	0.043	0.029	-0.044	0.118

Table 18 and Table 19 report the correlation coefficients for Turkey and WAEMU's banks, respectively. Except for the strong positive association (r=0.878) between risk-based capital and flat capital ratios for WAEMU's banks, the correlation matrix broadly displays very-low coefficients. These outputs assume that there are no major multi-collinearity hurdles among the variables.

Table 18: Correlation Matrix (Turkey)

	ΔRBC	ΔCAP	ΔRISK	ΔZ	SIZE	ROA	ROE	LIQ	OBSA	INF	GDPG
ΔRBC	1.000										
ΔCAP	0.160	1.000									
ΔRISK	-0.327	0.567	1.000								
ΔZ	0.005	0.168	0.128	1.000							
SIZE	-0.037	-0.091	-0.036	-0.049	1.000						
ROA	-0.326	0.004	0.087	0.019	0.081	1.000					
ROE	-0.126	0.057	0.049	0.019	0.265	0.641	1.000				
LIQ	0.042	0.057	-0.003	0.017	-0.591	0.060	-0.096	1.000			
OBSA	0.003	-0.086	-0.030	-0.153	-0.082	0.045	-0.071	-0.030	1.000		
INF	0.123	0.259	0.018	0.032	-0.139	0.034	0.057	0.081	-0.164	1.000	
GDPG	-0.024	-0.023	0.016	-0.055	-0.042	-0.061	-0.057	0.082	0.039	0.137	1.000

Table 19: Correlation (WAEMU)

	ΔRBC	ΔCAP	ΔRISK	ΔZ	SIZE	ROA	ROE	LIQ	OBSA	INF	GDPG
ΔRBC	1.000										
ΔCAP	0.878	1.000									
ΔRISK	-0.205	0.042	1.000								
ΔZ	0.070	0.053	-0.056	1.000							
SIZE	-0.022	-0.044	-0.014	-0.045	1.000						
ROA	0.259	0.326	0.019	0.023	0.341	1.000					
ROE	0.078	0.107	0.009	0.012	0.201	0.476	1.000				
LIQ	0.091	-0.001	-0.103	-0.014	0.134	0.099	0.061	1.000			
OBSA	-0.087	-0.024	0.121	-0.028	-0.057	0.114	0.068	-0.112	1.000		
INF	-0.052	-0.005	0.070	0.025	-0.046	-0.051	0.031	-0.103	-0.013	1.000	
GDPG	-0.061	-0.094	0.007	0.008	0.035	-0.031	-0.042	0.067	0.032	-0.071	1.000

4.2.2. Multicollinearity Test

In regression, the multicollinearity problem refers to the linear dependencies among explanatory variables, which contributes to inflate sampling variances and distort the accuracy of the parameter estimates. It is then relevant to detect possible multicollinearity issues and control for them before performing the regression. Though the extant literature provides several diagnostic tests to inspect multicollinearity, Gujarati (2011) warns the users about the lack of assurance to get satisfactory results. In simultaneous-equation models, Rhoads (1991) emphasizes two main diagnostic statistics to investigate the impact of multicollinearity, including the variance inflation factor (VIF) and condition indexes and associated regression coefficient variance decomposition. Yet, O'brien (2007) report that the VIF is the widely used measures to check the degree of multicollinearity in a regression model. The rule of thumb in the academic literature requires a level of

VIF ranging from 1 to 10 (Stine, 1995; Marquaridt, 1970), i.e. a minimum 10% of tolerance (VIF is a reciprocal measure of tolerance coefficient).

The statistical outputs of the VIF presented in the table 20 using the log-transformed variables look fine since they display very low values, in essence coefficients ranging between 1.01 and 2.80. These findings suggest that there is no significant multicollinearity symptom among the explanatory variables used in the econometrical model.

Table 20: Variance Inflation Factors

		TURKEY		**WAEMU**	
Equations	Variable	VIF	1/VIF	VIF	1/VIF
(1)	LnRISK	1.72	0.581977	1.48	0.675756
	LnZ	1.61	0.619414	1.34	0.745075
	LnOBSA	1.57	0.635390	1.28	0.783836
	LnLIQ	1.43	0.699286	1.27	0.790077
	SIZE	1.37	0.732080	1.24	0.807009
	LnROA	1.36	0.736287	1.23	0.811242
	LnINF	1.25	0.798763	1.02	0.981523
	LnGDPG	1.05	0.952061	1.01	0.990464
	Mean VIF	1.42		1.23	
(2)	LnCAP	2.73	0.366861	1.71	0.584486
	SIZE	2.11	0.474213	1.43	0.699611
	LnLIQ	1.67	0.599117	1.42	0.705869
	LnROA	1.66	0.602076	1.29	0.776211
	LnZ	1.53	0.654011	1.05	0.953888
	LnINF	1.24	0.803243	1.03	0.967094
	LnOBSA	1.09	0.913956	1.02	0.980647
	LnGDPG	1.05	0.956153	1.01	0.988730
	Mean VIF	1.63		1.63	
(3)	LnCAP	2.80	0.357668	1.48	0.676022
	SIZE	2.12	0.472407	1.27	0.787253
	LnRISK	1.67	0.599086	1.24	0.807667
	LnLIQ	1.66	0.601607	1.23	0.812164
	LnOBSA	1.43	0.701337	1.11	0.900163
	LnROA	1.33	0.753310	1.09	0.919524
	LnINF	1.25	0.798404	1.02	0.980202
	LnGDPG	1.05	0.952945	1.01	0.986483
	Mean VIF	1.24		1.18	

4.2.3. Heteroscedasticity Test

Homoscedasticity is one of the main assumptions of the linear regression model to ensure that the Ordinary Least squares (OLS) is a Best Linear Unbiased Estimator (BLUE). When the homoscedasticity assumption is met, it implies that the variance of the error term is constant, i.e. $V(\varepsilon j) = \sigma 2$ for all j. However, an unequal variance raises the heteroscedasticity issue impeding the parameter estimates to be BLUE. Gujarati (2011) points out the presence of outliers in the data, different measures of scales, mixing observations, incorrect transformation of data, or incorrect functional form of the regression model as the main causes of heteroscedasticity problems. Among the various methods available, we rely on Breusch-Pagan / Cook-Weisberg test to inspect heteroscedasticity which statistical outputs are presented in the Table 21 as follow.

Table 21: Statistical Outputs for Breusch-Pagan / Cook-Weisberg Test

		TURKEY			WAEMU		
Equations	Variables	chi2	df	P	chi2	df	P
(1)	LnRISK	15.75	1	0.0001	15.55	1	0.0001
	LnZ	28.98	1	0.0000	224.41	1	0.0000
	SIZE	29.43	1	0.0000	147.51	1	0.0000
	LnROA	25.55	1	0.0000	107.45	1	0.0000
	LnLIQ	7.92	1	0.0049	40.32	1	0.0000
	LnOBSA	0.23	1	0.6293	16.40	1	0.0001
	LnINF	17.72	1	0.0000	0.00	1	0.9456
	LnGDPG	0.00	1	0.9541	0.09	1	0.7670
	Simultaneous	67.67	8	0.0000	330.96	8	0.0000
(2)	LnCAP	14.32	1	0.0002	0.26	1	0.6132
	LnZ	60.81	1	0.0000	5.92	1	0.0150
	SIZE	9.89	1	0.0017	17.71	1	0.0000
	LnROA	31.31	1	0.0000	5.06	1	0.0245
	LnLIQ	2.15	1	0.1428	46.19	1	0.0000
	LnOBSA	7.99	1	0.0047	10.36	1	0.0013
	LnINF	46.87	1	0.0000	14.78	1	0.0001
	LnGDPG	0.26	1	0.6130	17.91	1	0.0000
	Simultaneous	151.64	8	0.0000	107.06	8	0.0000
(3)	LnCAP	11.23	1	0.0008	0.00	1	0.9795
	LnRISK	1.28	1	0.2581	0.20	1	0.6579
	SIZE	9.07	1	0.0026	13.38	1	0.0003
	LnROA	1.82	1	0.1775	0.00	1	0.9712
	LnLIQ	1.33	1	0.2495	5.41	1	0.0201
	LnOBSA	0.24	1	0.6221	8.51	1	0.0035
	LnINF	9.02	1	0.0027	1.28	1	0.2582
	LnGDPG	0.08	1	0.7801	0.19	1	0.6633
	Simultaneous	24.32	8	0.0020	28.44	8	0.0004

These results reveal the presence of heteroscedasticity in the three equations indicating that the OLS is not the appropriate method to regress the relationship between capital and risk, which are deemed to be interdependent in banking industry. Hence, estimation of bank capital-risk relationship may fit into the scope of simultaneous equation modelling as posited by Shrieves & Dahl (1992).

4.2.4. Simultaneous Regression Analysis and Hypotheses Testing

This section presents the regression outputs related to the three-stage least squares estimation to examine the capital-risk relationship in Turkey and WAEMU. We perform the regression for both the linear model and the log-model, consecutively, using the flat and risk-based ratios as the proxies of bank capital levels. The estimation first covers the time span 2002-2006 in order to investigate the bank capital-risk relationship in Turkey and WAEMU when they were all referring to the Cooke ratio to regulate banking capital. Then, we examine the capital-risk relationship for the period 2007-2015 as WAEMU continued to use the Cooke ratio while Turkey moved to more stringent capital standards available in Basel II and Basel III Accords. Finally, we successively introduce the dummy variables REG and MEMB to examine the effects of changes in capital regulatory rules and membership status in the Turkish banking industry, respectively.

4.2.4.1. Capital-Risk Relationship in Turkey and WAEMU during 2002-2006

Table 22 and Table 24 report the goodness fit statistics for the linear model while Table 23 and Table 25 present the estimates using the log-transformed variables.

Table 22: Goodness Fit Statistics of the Linear Model Using Flat Capital Ratio (2002-06)

	TURKEY			WAEMU		
Equations	Eq.1	Eq.2	Eq.3	Eq.1	Eq.2	Eq.3
Obs.	63	63	63	111	111	111
R-Sq.	0,166	0,258	-27,919	-0,917	-27,834	0,092
chi2	75,880	11,040	1,080	25,640	1,700	22,890
Sig. (P)	0,000	0,273	0,998	0,002	0,995	0,006

Table 23: Outputs of the Log-Model Using Flat Capital Ratio (2002-06)

Equations	TURKEY			WAEMU		
	Eq.1 Y= Ln(CAP)	Eq.2 Y= Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y= Ln(CAP)	Eq.2 Y= Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(CAP)	-	-0,068	-0,320**	-	-0,001	0,013
L.Ln(CAP)	0,708***	-	-	0,974***	-	-
Ln(RISK)	-0,220*	-	-0,343	-2,196**	-	-3,093
L.Ln(RISK)	-	0,632***	-	-	0,206***	-
Ln(Z)	-0,024	0,060*	-	-0,028	-0,005	-
L.Ln(Z)	-	-	0,919***	-	-	0,794***
SIZE	-0,047**	-0,003	-0,052	0,100**	0,022*	0,198**
Ln(ROA)	0,053	0,017	0,022	-0,014	0,004	-0,072***
Ln(LIQ)	0,091	-0,064	0,108	-0,386**	-0,156***	-0,480
Ln(OBSA)	0,036	0,108**	0,070	0,299*	0,132***	0,423
Ln(INF)	0,404***	0,099	0,342*	-0,004	0,000	-0,004
Ln(GDPG)	0,337	0,194	0,116	0,044	0,013*	0,027
Cons.	2,412***	0,330	1,783	-1,771**	-0,308	-3,341**
Obs.	84	84	84	148	148	148
R-Sq.	0,831	0,789	0,827	0,675	0,661	0,655
chi2	429,480	315,600	428,940	399,870	288,890	332,940
Sig. (P)	0,000	0,997	0,000	0,003	0,000	0,999

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table 24: Goodness Fit Statistics of the linear model using Risk-Based Capital Ratio (2002-06)

Equations	**TURKEY**			**WAEMU**		
	Eq.1	Eq.2	Eq.3	Eq.1	Eq.2	Eq.3
Obs.	63	63	63	111	111	111
R-Sq.	0,458	0,377	0,300	-2,768	-2,469	0,220
chi2	43,790	38,920	27,270	11,420	14,090	26,340
Sig. (P)	0,000	0,000	0,001	0,248	0,119	0,002

Table 25: Outputs of the Log-Model Using Risk-Based Capital ratio (2002-06)

Equations	TURKEY			WAEMU		
	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(RBC)	-	-0,064	-0,320**	-	-0,001	0,013
L.Ln(RBC)	0,767***	-	-	0,977***	-	-
Ln(RISK)	-0,024	-	-0,664**	1,549	-	-3,080
L.Ln(RISK)	-	0,591***	-	-	0,206***	-
Ln(Z)	-0,099**	0,056*	-	-0,007	-0,005	-
L.Ln(Z)	-	-	0,919***	-	-	0,794***
SIZE	-0,047**	-0,003	-0,052	-0,004	0,022*	0,198**
Ln(ROA)	0,037	0,016	0,022	-0,033**	0,004	-0,072***
Ln(LIQ)	0,176**	-0,060	0,108	0,354**	-0,156***	-0,480
Ln(OBSA)	-0,093	0,101**	0,070	-0,328**	0,132***	0,423
Ln(INF)	0,317**	0,093	0,342*	-0,005	0,000	-0,004
Ln(GDPG)	0,130	0,181	0,116	-0,019	0,013*	0,027
Cons.	2,212**	0,309	1,783	-0,313	-0,308	-3,341**
Obs.	84	84	84	148	148	148
R-Sq.	0,903	0,815	0,827	0,760	0,661	0,655
chi2	791,550	360,240	428,940	547,360	289,200	332,940
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

The goodness fit statistics are far better in the log-model than in the linear model. Indeed, the Chi2 coefficients in the log-model are all higher and significant at 1% level compared to the linear model where they display low value and sometimes non-significant values even at 10% level. Although the R-square is not a usable measure in the 3SLS estimation, we notice that it displays high and positive values in the log-model while it appears with negative values[34] in some of the equations of the linear model. Hence, the model with log-transformation variables appears to be more relevant to depict the interaction between capital and risk in the Turkey and WAEMU banks. This implies that bank capital-risk relationship is not systematically linear as depicted in prior studies.

The estimates, derived from the log-model, reveal that bank risk (RISK) is negatively associated with flat capital ratio (CAP) in both Turkey and WAEMU, meaning that banks with low risk-taking behaviors have higher capital positions. **This result supports the hypothesis H_1.** However, the association between risk-taking behaviors and risk-based capital is not statistically significant for neither banks. This result indicates that the capital regulation with the Basel I Cooke ratio

[34] The R-squared in the 2SLS and 3SLS can yield negative value since the residual sum of squares are calculated over a different set of regressors from those used to fit the model.

did not interact with risk-taking behaviors of banks operating in Turkey and WAEMU during the time span 2002-2006. It is worthwhile mentioning that this was the beginning of implementation of the Basel I Accord in these two banking systems and the new capital regulated standard may not yet have reached the critical control point to affect banks' risk-taking behaviors.

The flat capital ratio (CAP) and the risk-based capital ratio (RBC) are negatively associated with Z-scores in Turkey implying that an increase in capital position increases the likelihood of bankruptcy in Turkey. In contrast, neither the flat capital ratio (CAP) nor the risk-based capital ratio (RBC) displays statistically significant relationship with Z-scores.

Z-scores positively affect risk-taking behaviors for banks in Turkey while there is no such significant relationship in WAEMU. This finding shows that banks with low probability of default display high risk-taking behavior. In contrast, risk-taking behaviors negatively affect Z-scores for banks operating in Turkey while outputs show no significant association for these variables regarding banks in WAEMU. This finding implies that banks with high risk-taking behaviors in Turkey display high likelihood of bankruptcy.

Both in Turkey and in WAEMU, the first lag of each endogenous variable is positively and significantly associated with its related level variable. For instance, the lag value of capital is positively and significantly linked to capital, meaning that banks with high capital positions in the prior period tend to strengthen their capital positions for the following period.

Regarding banks' specific features, size is negatively associated with flat capital in Turkey while liquidity is positively linked to risk-based capital. This means that large banks in Turkey have low flat capital level while displaying high risk-based capital. Off-balance sheet activities are positively related to risk-taking behaviors meaning that off-balance sheet activities induce banks in Turkey to get involved in investing in high risky assets. As for macroeconomic indicators, only inflation rate is positively associated with capital and Z-scores. This implies that banks in Turkey strengthen their capital positions and their solvency also increases in the period of high inflation.

In WAEMU, size is positively associated with bank capital positions, risk-taking

behaviors and Z-scores. This indicates that large banks hold higher capital positions, develop risky investments but display better levels of solvency. Return on assets is negatively associated with capital positions and Z-scores, implying that more profitable banks in WAEMU display low level of capital and are more exposed to likelihood of bankruptcy. Liquidity is negatively associated with capital positions and risk-taking behaviors while off-balance sheet activities are positively associated with them. GDP growth is positively associated with risk-taking, indicating that banks in WAEMU involve in risky investment during periods of economic growth.

4.2.4.2. Capital-Risk Relationship in Turkey and WAEMU during 2007-2015

Table 26 and Table 28 report the goodness fit statistics for the linear model while Table 27 and Table 29 present the estimates using the log transformation of the variables. Similar to the previous findings, the log-model provides better statistics for goodness fit in term of Chi2 coefficients and R-squared values. Contrary to the log model, two equations in the linear model are not significant. Following these drawbacks in the linear model, we still grant preference to the outputs derived from the log-model meaning the capital-risk relationship for Turkey and WAEMU's banks does not follow a linear trend during the time span 2007-2015.

Table 26: Goodness Fit Statistics of the linear model using Flat Capital Ratio (2007-15)

	TURKEY			WAEMU		
Equations	Eq.1	Eq.2	Eq.3	Eq.1	Eq.2	Eq.3
Obs.	168	168	168	296	296	296
R-Sq.	0,635	0,298	0,161	0,267	0,322	0,259
chi2	142,010	88,130	43,360	107,000	142,280	100,510
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Table 27: Outputs of the Log-Model Using Flat Capital Ratio (2007-15)

	TURKEY			WAEMU		
Equations	Eq.1 Y=Ln(CAP)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y=Ln(CAP)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(CAP)	-	-0,038	-0,271***	-	0,007	-0,329**
L.Ln(CAP)	0,777***	-	-	0,497***	-	-
Ln(RISK)	-0,052	-	0,208	-0,006	-	0,314
L.Ln(RISK)	-	0,623***	-	-	0,514***	-
Ln(Z)	0,012	0,039	-	0,072**	0,004	-
L.Ln(Z)	-	-	0,885***	-	-	0,818***
SIZE	-0,035***	-0,007	-0,032*	-0,173***	0,018	-0,185***
Ln(ROA)	0,036***	-0,007	0,032	-0,036	-0,004	-0,217***
Ln(LIQ)	0,058	-0,006	0,136*	-0,033	-0,088***	-0,054
Ln(OBSA)	-0,005	0,045	-0,117***	0,022	0,032**	0,049
Ln(INF)	0,431**	0,125	-0,100	-0,039**	0,000	-0,043*
Ln(GDPG)	0,044**	0,015	0,006	-0,024	-0,017*	0,045
Cons.	1,708***	0,139	0,719	1,642***	-0,435**	2,476***
Obs.	168	168	168	296	296	296
R-Sq.	0,900	0,515	0,808	0,499	0,426	0,784
chi2	1514,270	179,120	723,330	279,220	220,660	1138,070
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Table 28: Goodness Fit Statistics of the linear model using Risk-Based Capital Ratio (2007-15)

	TURKEY			WAEMU		
Equations	Eq.1	Eq.2	Eq.3	Eq.1	Eq.2	Eq.3
Obs.	168	168	168	296	296	296
R-Sq.	0,403	-4,601	-9,362	0,279	0,330	0,259
chi2	49,210	11,200	3,660	107,700	144,070	101,000
Sig. (P)	0,000	0,262	0,932	0,000	0,000	0,000

Statistically, the findings reveal no significant relationship between flat capital ratio and the indicator of bank risk-taking neither in Turkey nor in WAEMU. This result contravenes the negative association obtained for the period 2002-2006 for the two banking industries. On the contrary, the estimates indicate a positive relationship between risk-taking level and risk-based capital ratio for Turkey banks while the association is not statistically significant for WAEMU banks. It follows that the interaction between risk-based capital and risk-taking level does not follow the same trend in Turkey and WAEMU. Therefore, **the hypothesis H_2 is supported**. Furthermore, the statistical outputs display a negative relationship between the capital ratios (CAP and RBC) and Z-scores, for both Turkish and WAEMU banks. This implies that an increase in capital positions decreases bank solvency as

measured by banks' Z-scores. Similar to the findings for the time span 2002-2006, the first lag of each endogenous variable is positively and significantly associated with its related level variable.

Table 29: Outputs of the Log-Model Using Risk-Based capital ratio (2007-15)

	TURKEY			WAEMU		
Equations	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(RBC)	-	-0,036	-0,271***	-	0,007	-0,330**
L.Ln(RBC)	0,815***	-	-	0,492***	-	-
Ln(RISK)	0,254***	-	-0,063	-0,047	-	-0,015
L.Ln(RISK)	-	0,600***	-	-	0,518***	-
Ln(Z)	-0,038	0,037	-	0,068**	0,004	-
L.Ln(Z)	-	-	0,885***	-	-	0,818***
SIZE	-0,027**	-0,007	-0,032*	-0,189***	0,018	-0,185***
Ln(ROA)	0,047***	-0,007	0,032	-0,031	-0,005	-0,217***
Ln(LIQ)	0,069	-0,006	0,136*	0,051	-0,089***	-0,054
Ln(OBSA)	-0,064***	0,044**	-0,117***	-0,008	0,033**	0,050
Ln(INF)	0,290*	0,120	-0,100	-0,039**	0,000	-0,043*
Ln(GDPG)	0,027	0,014	0,006	-0,008	-0,017*	0,045
Cons.	1,609***	0,134	0,719	2,048***	-0,438**	2,477***
Obs.	168	168	168	296	296	296
R-Sq.	0,900	0,550	0,808	0,470	0,418	0,784
chi2	1568,090	192,860	723,330	245,560	217,440	1137,310
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

As for bank specific features, banks' size is negatively associated with capital ratios (CAP and RBC) and Z-scores for both Turkish and WAEMU's banks. This implies that large banks hold less capital and are more exposed to bankruptcy. Return on assets is positively associated to bank capital ratios (CAP and RBC) in Turkey while it is negatively related to Z-scores in WAEMU. This implies that more profitable banks in Turkey hold strong capital positions. Though it seems to conflict with the common sense, profitable banks in WAEMU appear to display higher likelihood of bankruptcy. The liquidity ratio is positively linked to Z-scores for Turkish banks while it is negatively associated with risk-taking ratio in WAEMU. These findings indicate that more liquid banks display high probability of solvency in Turkey while they tend to invest in less risky-assets in WAEMU. For Turkish banks, off-balance sheet activities are negatively associated with risk-based capital ratio and Z-scores while they are positively linked to risk-taking levels as it is also the case for WAEMU's banks.

In terms of macroeconomic characteristics, inflation rate is positively related to capital ratios (CAP and RBC) in Turkey. It implies that banks strengthen their capital positions following the rise of inflation rates in Turkey. In WAEMU, however, the inflation level is negatively associated with bank capital ratios (CAP and RBC) and Z-scores. These findings indicate that high level of inflation leads to a decrease in bank capital positions and an increase in bankruptcy risks.

For Turkish banks, the statistical estimates also indicate a positive association between GDP growth and flat capital ratio, implying that they strengthen their capital position in growth period. For banks operating in the WAEMU zone, GDP growth is negatively associated with the level of risk-taking, indicating that WAEMU's banks invest in less-risky assets in growth periods. This, however, seems to be contradictory with the common practice in banking industry.

4.2.4.3. Capital-Risk Interrelations and Changes in Regulatory Standards

The findings in the preceding section also show that the interaction between capital and risk in the Turkish banking industry differs from the period 2002-2006 (when capital was regulated with the Cooke ratio) to the period 2007-2015 (when capital regulation shifted to more stringent rules as proposed under the Basel II and Basel III Accords). To consolidate this result, we introduce the dummy variable (REG) to differentiate the two periods under scrutiny. The outputs derived from the regression with the dummy variable REG analysis is reported in the Table 30. The findings reveal that the coefficients are statistically significant for the dummy variable REG and other composite variables, including REGxLn(CAP) and REGxLn(RISK). It follows that both capital ratio and risk level have changed from the period 2002-2006 to the period 2007-2015 and the capital-risk relationship has also varied. Therefore, **the hypothesis 3 is also supported**.

Table 30: Estimates with the Dummy Variable REG for Turkey (2002-15)

Equations	Estimates with CAP			Estimates with RBC		
	Eq.1 Y=Ln(CAP)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(CAP)	-	0,024	-0,029	-	-	-
L.Ln(CAP)	0,781***	-	-	-	-	-
Ln(RBC)	-	-	-	-	-0,093*	-0,159
L.Ln(RBC)	-	-	-	0,859***	-	-
Ln(RISK)	-0,176**	-	0,075	0,215*	-	-0,188
L.Ln(RISK)	-	0,621***	-	-	0,569***	-
Ln(Z)	-0,019	0,048	-	-0,102***	0,050	-
L.Ln(Z)	-	-	0,740***	-	-	0,726***
SIZE	-0,040***	0,010	-0,023	-0,021**	-0,018*	-0,026
Ln(ROA)	0,045***	-0,008	-0,045*	0,030**	0,016	-0,042
Ln(LIQ)	0,054	-0,072*	-0,020	0,061	0,004	-0,015
Ln(OBSA)	-0,018	0,055***	-0,144***	-0,063***	0,050***	-0,132***
Ln(INF)	0,309***	0,032	0,280**	0,307***	0,034	0,275**
Ln(GDPG)	0,033**	0,003	0,041	0,030*	0,005	0,040
REG	0,360***	0,278**	0,369	-0,016	0,071	0,706**
REGxLn(CAP)	-	0,102*	-0,029	-	-	-
REGxLn(RBC)	-	-	-	-	0,009	0,111
REGxLn(RISK)	0,327***	-	0,141	0,018	-	0,358
REGxLn(Z)	0,003	-0,014	-	0,056	0,004	-
Cons.	1,333***	-0,515**	1,684***	1,542***	0,058	1,488***
Obs.	273	273	273	273	273	273
R-Sq.	0,888	0,698	0,762	0,879	0,707	0,756
chi2	2254,750	617,990	862,040	2204,450	620,190	839,380
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

4.2.4.4. Capital-Risk Relationship and Change in BCBS membership Status

Table 31 reports the regression outputs with the dummy variable MEMB used to capture Turkey as BCBC member-country from 2009 and non-member before that benchmark date. The estimates reveal that change in membership status has reduced risk-taking level for Turkish banks while it does not affect capital positions. In fact, the shift from non-member to BCBS member-country enables Turkish banks to reduce their risk-taking behavior. Furthermore, the change in membership status has also increased the interaction between flat capital ratio and risk taking-level of Turkish banks. Hence, **the hypothesis 4 is supported.**

Table 31: Estimation with the Dummy Variable MEMB for Turkey (2002-15)

Equations	Estimates with CAP			Estimates with RBC		
	Eq.1 Y=Ln(CAP)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)	Eq.1 Y=Ln(RBC)	Eq.2 Y=Ln(RISK)	Eq.3 Y=Ln(Z)
Ln(CAP)	-	0,042	-0,077	-	-	-
L.Ln(CAP)	0,799***	-	-	-	-	-
Ln(RBC)	-	-	-	-	-0,054	-0,132
L.Ln(RBC)	-	-	-	0,831***	-	-
Ln(RISK)	-0,142548*	-	0,043	0,169*	-	-0,087
L.Ln(RISK)	-	0,633***	-	-	0,612***	-
Ln(Z)	-0,037767	0,036	-	-0,082**	0,030	-
L.Ln(Z)	-	-	0,752***	-	-	0,748***
SIZE	-0,039***	0,004	-0,032	-0,030***	-0,014	-0,040*
Ln(ROA)	0,035**	-0,010	-0,048*	0,035**	0,005	-0,041
Ln(LIQ)	0,028	-0,049	-0,025	0,055	-0,003	-0,007
Ln(OBSA)	-0,007	0,064***	-0,119***	-0,073***	0,054***	-0,123***
Ln(INF)	0,144**	-0,079	-0,063	0,271***	-0,086*	-0,069
Ln(GDPG)	-0,004	-0,001	-0,014	0,001	0,003	-0,016
MEMB	0,068	-0,150	-0,004	0,154	-0,235*	0,032
MEMBxLn(CAP)	-	0,012	-0,041	-	-	-
MEMBxLn(RBC)	-	-	-	-	-0,029	-0,033
MEMBxLn(RISK)	0,189**	-	0,120	0,010	-	0,120
MEMBxLn(Z)	0,023	0,027	-	0,005	0,037	-
Cons.	1,007***	-0,502**	0,993**	1,476***	-0,169	1,094**
Obs.	273	273	273	273	273	273
R-Sq.	0,859	0,692	0,735	0,888	0,700	0,730
chi2	1689,650	570,980	740,680	2309,090	609,250	734,520
Sig. (P)	0,000	0,000	0,000	0,000	0,000	0,000

Note: *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

4.3. DISCUSSIONS OF THE FINDINGS AND LIMITATIONS

In this section, we critically discuss the findings in the light of the theoretical and empirical literature. To this end, we argue on the functional form of the equations used to regress the capital-risk relationship in Turkey and WAEMU compared to prior findings. We also emphasize the effects of bank specific features and macroeconomic variables. Finally, we highlight the main limitations of the investigation.

4.3.1. Discussions

4.3.1.1. Regression Functional Form of the Bank Capital-Risk Relationship

The regression functional form, generally used to examine capital-risk interaction in banking industry, originates from the simultaneous equations modelling as initially developed by Shrieves & Dahl (1992). This model is built on a linear relationship between the endogenous and exogenous variables. However, this study reveals that a model with log-transformation of the variables is more robust to depict the interaction between capital and risk for Turkey and WAEMU's banks. In fact, the log-model provides better statistics for goodness fit in term of R-squared, Chi2 coefficients and p-values related to the significance of equations in the SEM model. Prior empirical studies, however, usually fail to provide further information on the goodness fit statistics of the structural model they used to examine capital-risk relationship in banking industry. Indeed, they provided no statistics related to Chi2 coefficients and p-values, which should have shed light on the significance of equations in the SEM model. Instead, they usually focus on the statistical significance of the regressors' coefficients to draw conclusions regarding the linear model. Yet, it is worthwhile to emphasized that the structure of the SEM model as developed by Shrieves & Dahl (1992) has been maintained for this study despite the introduction of more regressors and the log-transformation of the variables.

Even though the statistical outputs of the linear model in this investigation display significant coefficients for the regressors, we rely on the log-model since it displays more robust capability to capture capital-risk relationship. Therefore, it worthwhile emphasizing that the capital-risk relationship in banking should no longer be

depicted through only linear models. The interaction between capital and risk in banking may also fit with non-linear functional trend. Though the model with the log transformation of variables appears to be linear in term of coefficients, it hides a non-linear relationship between the original variables as described below (See full description in Textbox 3 in Appendix).

$$Ln(Y) = \alpha + \beta_1 Ln(X_1) + \beta_2 Ln(X_2) + \ldots + \beta_p Ln(X_p) \quad \leftrightarrow \quad Y = \lambda \prod_{i=1}^{p} X_i^{\beta_i}$$

Beyond the log-model, it is possible that the capital-risk relationship in banking better fits in more complex functional form. Usually, conclusions are drawn based of statistical outputs derived from the linear model. For instance, the finding in this scope may statistically reveal no linear relationship though significant interactions may exist through different functional forms. The biggest challenge lies on our ability to find out the most relevant functional form to fit the true trend of the relationship. Though we must keep in mind the search for simplicity in model building, we should not ignore the necessity to fit the functional form with the true nature of the phenomenon under investigation.

4.3.1.2. Prior Studies and Capital-Risk Interactions in Turkey and WAEMU

Whether for Turkey or WAEMU, bank risk is negatively associated with flat capital ratio (CAP) for the time span 2002-2006, implying that banks investing in low risky assets hold high equity capital positions. This result fits the theoretical position of Furlong & Keeley (1989) and Keeley & Furlong (1990) whereby an increase in bank capital reduces the incentives for a bank to increase asset risk. In fact, a more stringent regulatory capital prevents a value-maximizing bank to reshuffle their portfolio composition with riskier investments contrary to the assets substitution moral hazard problems as developed by Koehn & Santomero (1980). The finding is also in line with the general trend of the BCBS non-member countries where empirical investigations usually reveal a negative capital-risk relationship (Ashraf, Arshad, & Hu, 2016; Javed, 2016; Bouheni & Rachdi, 2015; Dannon & Lobez, 2014; Mongid, Tahir, & Haron, 2012; Zhang, Jun, & Liu, 2008; Floquet & Biekpe, The Relationship between Capital Structure and Risk in Emerging Market Banks, 2008).

Contrary to our expectation, the statistical outputs reveal that the risk-based capital ratio is irrelevant to risk-taking behaviors for banks in Turkey and WAEMU regarding the period 2002-2006. This is consistent with the conclusions of Rime (2001) who report that regulatory pressure leads to an increase of risk-weighted capital ratio of undercapitalized banks while exerting no effect on risk levels. In essence, the implementation of the Cooke ratio in banking industries in Turkey and WAEMU from the early 2000s does not yield the expected effects on regulating risk-takings. This finding also conveys the prominence of flat capital ratio on risk-based capital ratio as posited by Hogan (2015), who argues that the flat rate capital ratio is consistently a better predictor of risk than the risk-based capital. Nonetheless, since this result concerns the very early time span following the introduction of Basel I Accord in Turkish and WAEMU banking regulatory standards, it is possible to assume that Cooke ratio did not yet reach optimal level to have the expected impacts on bank risk-taking behaviors.

The statistical outputs also reveal that high level of capital ratios (risk-based capital ratio and unweighted capital ratio) increases the likelihood of bankruptcy for Turkish banks. This result seems to contradict with the negative capital-risk relationship for Turkish banks in the time span 2002-2006. Furthermore, the findings indicate that banks with low probability of insolvency develop high level of risk-taking behaviors. Inversely, banks with excessive risk-taking behavior display high level of bankruptcy.

In the period 2007-2015, the unweighted capital ratio was irrelevant to explain risk-behaviors for both Turkish and WAEMU's banks. In contrast, the risk-based capital ratio became a relevant indicator for risk profile of Turkish banks. In fact, the findings reveal a positive relationship between risk-based capital ratio and risk-taking behavior, indicating that banks with higher level of risky investments hold higher capital positions. It is also possible to associate this positive capital-risk relationship to the tremendous development of Turkish financial market enabling banks to access more investment opportunities, especially, the boom in derivative products.

Yet, it is important to emphasize that the findings do not support the two-way relationship, that is the interaction between capital and risk. In the time span 2007-2015, the statistical outputs only reveal the impact of risk-taking behaviors on bank

capital positions while reporting no significant impact of capitalization on risk. From this perspective, the one-way positive relationship between risk-taking behaviors and bank capital position for Turkish banks during the time span 2007-2015 does not lend support to the asset substitution moral hazards hypothesis as posited by Koehn & Santomero (1980). It merely implies that banks involving in risky investments following the introduction of more stringent capital requiements in Turkey through the implementation of Basel II regulatory capital rules from 2007 and Basel III standards from 2014 are forced to raise their capital positions. Furthermore, it contrasts the findings of Avery & Berger (1991) who argue that the risk-based capital ratio better predicts future bank performance problems in term of portfolio losses and bank failures. It also contradicts the findings of Jacques & Nigro (1997), who indicate that the risk-based capital standard strengthens bank capital positions and reduces portfolio risk.

Changes in regulatory standards in Turkey have also affected capital-risk relationship. In fact, Turkish banks display negative capital-risk relationship during the time span 2002-2006, which is the period they complied with the Cooke ratio for capital regulation. From 2007, they shifted to more stringent capital regulatory standards and the trend of capital-risk interaction changed. In fact, the unweighted capital ratio became irrelevant for controlling bank risk-taking behaviors while the risk-based capital ratio tends to increase portfolio risks. Furthermore, Turkey put aside the non-member status and become a BCBS full member from 2009. This change does not affect its capital positions but the findings indicate a decrease in risk-taking behaviors.

4.3.1.3. The Effects on Bank Specifics and Macroeconomic Variables

The results lent support to the relevancy of introducing bank specific features and macroeconomic indicators as control variables when modelling capital-risk relationship in banking industry. To this end, the findings highlight some noteworthy points regarding the effects of bank specific features and macroeconomic variables. For instance, the statistical outputs indicate that large banks in Turkey maintain low equity capital positions. They are more exposed to the likelihood of bankruptcy in the period 2007-2015. Turkish banks with high liquidity positions get involved in risky investments during the time span 2002-

2006 while in the period 2007-2015, they maintain less risky portfolio combined with low probability of insolvency. During the period 2002-2006, banks involving in off-balance sheet activities in Turkey hold riskier assets portfolio, indicating the high-risk level associated with such activities. Profitability also holds a prominent role in bank capital positions since the findings reveal that profitable bank display higher capital levels. As for the macroeconomic impacts, the findings reveal that Turkish banks strengthen their capital positions and consequently reduce risk of insolvency in high inflation periods. They also strengthen their capital positions in growth periods.

During the time span 2002-2006, large banks in WAEMU hold higher capital positions, develop risky investments, but display low probability of bankruptcy. However, their equity capital decreased in the period 2007-2015. The banks with high liquidity positions in WAEMU display weak capital level and are therefore exposed to higher insolvency risk during the period 2002-2006. They hold less risky portfolio assets during the time span 2007-2015. Although it may seem counterintuitive, profitable banks in WAEMU hold low capital positions and are more exposed to bankruptcy. During growth periods (2007-2015), banks in WAEMU get involved in less risky assets contrary to the trend in the time span 2002-2006. Regarding inflation impacts, capital positions decrease and banks become more exposed to high risk of insolvency in the period of high inflation.

4.3.2. Main Limitations of the Findings

As usually with all human endeavors, this research has some shortcomings, which may impede the generalizability of the findings. In this investigation, we identify two main limitations, all inherent to the chosen methodological orientation. The first is related to the limited number of variables used compared to what is available in the literature. The second derives from the sampling scope to which we perform the empirical analysis.

In the empirical investigation, we refer to two different measures of risk. The first is designed to assess the risk-taking behavior of a bank. This variable is calculated as the ratio of risk-weighted assets to total assets. The second risk indicator refers to the likelihood of bankruptcy measured in term of Z-scores. Yet, the extant literature provides various alternative instruments to assess bank risk. For instance,

the ratio of non-performing loans to total assets is often used as a relevant measure of bank risk-taking behaviors (Floquet & Biekpe, 2008; Aggarwal & Jacques, 2001; Aggarwal & Jacques, 1998; Shrieves & Dahl, 1992). The ratio of loans to total assets is also an alternative to measure bank risk-taking behaviors (Mosko & Bozdo, 2016; Mongid, Tahir, & Haron, 2012). Furthermore, the ratio of loan loss provisions to total assets and the volatility of stock returns are also available measures of banking risks (Javed, 2016; Hogan, 2015; Bouheni, Ameur, Cheffou, & Jawadi, 2014; Altunbas, Carbo, Gardener, & Molyneux, 2007; Bichsel & Blum, 2004). However, it is quite impossible to refer to some of these indicators in the scope of this investigation since the related data are not publicly disclosed as it is the case for the non-performing loans in financial reports of banks operating in the WAEMU.

Since the targeted sample of this investigation is built with only banks operating in Turkey and WAMEU, the generalizability of the findings may be put on discussion. In fact, banks in Turkey alone are not sufficient to fully depict capital-risk relationship in banking system, which experienced changes in capital regulatory standards following the evolutions of the Basel Accords. At least, the other fourteen countries, which were granted with the BCBS membership status also went through changes in capital regulatory standards by aligning their national rules on the stringent rules designed in the new Basel Accords. Hence, it might be relevant to widen the scope of the sample to banks operating in the new BCBS member countries. Besides, it also possible to extend the sample to banking systems, which display similar features to WAEMU; though such an endeavor might face the challenges related to accessibility of relevant data and resources in terms of time and budget.

CONCLUSION

This thesis carries out an investigation on banking regulation in the scope of the Basel Accords. It first discusses banking regulation and its relevancy in the light of prominent theories such as system theories, modern firm-based theories, corporate governance, and general theories of regulation. Thereafter, the research thoroughly scrutinizes the Basel Accords since they appear as the benchmark framework in global banking regulation. To this end, we critically discuss various standards developed under the successive three Basel Accords; we highlight their relevancy and their main shortcomings. Consequently, capital regulation appears as the core concern in the Basel Accords and its regulatory standards are designed to control bank risk-taking behaviors in order to prevent crises and maintain a sound banking system worldwide.

Furthermore, we delved into the theoretical literature and the prior empirical findings to analyze capital-risk relationship in the banking industry. This review found controversial conclusions regarding interactions between capital levels and bank risks. From a theoretical standpoint, one strand of the literature emphasizes the unintended effects of more stringent regulatory capital requirements due to problems such as asset substitution moral hazards, monitoring-based incentives, asymmetry information, moral hazard or self-interest behavior (Bris & Cantale, 2004; Besanko & Kanatas, 1996; Rochet, 1992; Kim & Santomero, 1988; Koehn & Santomero, 1980). Using the mean-variance approach, the proponents of this theory assert that more stringent capital regulation increases incentives for higher risk-taking behaviors. In contrast, Furlong & Keeley (1989) and Keeley & Furlong (1990) show that a more stringent capital regulation will prevent a value-maximizing bank to develop excess risk taking behaviors. Between these two extremes lies an emerging U-shaped relationship whereby a bank risk level first decreases as its capital position increases and then increase when it becomes well-capitalized. The empirical investigations also yield mixed evidence, confirming the controversial theoretical foundations. While empirical studies on banks operating in BCBS member-countries roughly converged on a positive capital-risk relationship, banks in the non-member countries display negative relationship.

Following the mixed evidence in the extant literature, we achieve an additional empirical investigation purporting to make a comparison on capital-risk

relationship between BCBS member- and non-member BCBS countries. To our knowledge, no prior empirical study has yet investigated bank capital-risk relationship from this perspective. Using the comparative framework of Turkey and WAEMU banking systems, the objective of such a study is threefold. First, it aims to compare the trend of the capital-risk relationship in Turkish banking industry to that of the WAEMU banking industry. Second, it compares the trend of capital-risk relationship in Turkish banking industry before and after the introduction of Basel II capital adequacy requirements in 2007. Finally, it compares the trend of capital-risk relationship in Turkish banking industry before and after becoming a full member of the BCBS in 2009.

Based on the Simultaneous Equations Modelling as developed by Shrieves & Dahl (1992), we refer to the three-stage least squares estimations to compare capital-risk interrelations in Turkey and WAEMU. Both for Turkey and WAEMU, the statistical outputs reveal a negative association between bank risk-taking behaviors and flat capital ratio (CAP) for the time span 2002-2006. This implies that banks with low risky assets portfolio hold high equity capital positions when Turkey and WAEMU were complying with the Cooke ratio for capital regulation. In the period 2007-2015, the unweighted capital ratio was irrelevant to explain risk-behaviors for both Turkish and WAEMU's banks. In contrast, the risk-based capital ratio became a relevant indicator for risk profile of banks in Turkey alone. As such, the findings reveal a positive association between risk-based capital ratio and risk-taking behaviors in Turkey, indicating that banks with higher level of risky investments hold higher capital positions. The regression outputs with the dummy variable REG also confirm that changes in regulatory standards in Turkey from 2007 have affected the trend of capital-risk relationship. Indeed, Turkish banks display negative capital-risk relationship during the time span 2002-2006, which is the period they complied with the Cooke ratio for capital regulation. From 2007, they shifted to more stringent capital regulatory standards and the trend of capital-risk interaction also changed to positive. The findings also reveal that change in membership status (from non-member status to BCBS full member) does not affect capital positions; rather, it reduces risk-taking behaviors of banks in Turkey.

Overall, the findings support to the posited hypotheses as summarized in the Table 32.

Table 32: Hypotheses and Test Results

Hypotheses		Test Results
H_1	Under the Cooke ratio, Turkish and WAEMU's banks display a similar trend in capital-risk relationship.	Supported
H_2	When regulated with different capital adequacy standards (Cooke ratio for WAEMU versus Basel II capital regulatory standards for Turkey), Turkish and WAEMU's banks show a divergent capital-risk relationship.	Supported
H_3	The compliance with a more stringent capital adequacy requirement affects the capital-risk relationship in Turkish banking system.	Supported
H_4	The change of BCBS membership status affects the capital-risk relationship in Turkish banking system.	Supported

Source: Created by the author

The concluding decisions on the hypotheses advance the knowledge about capital-risk relationship in the banking industry. This investigation reveals a negative capital-risk interrelationship for banks operating in BCBS non-member countries and subject to the Cooke ratio. This result is in line with the general trend reported in prior empirical investigation in the BCBS non-member countries. The negative interrelationship between capital and risk supports that changes in capital level do not pave the way to assets substitution moral hazard problems, as is the case in member-countries. Furthermore, the study points out that the transition from the Cooke ratio of Basel I Accord to more stringent regulatory capital standards, as required under Basel II and Basel III Accords modifies the trend of capital-risk interrelationship.

However, the generalizability of the findings is restricted to banks in Turkey and WAEMU. Yet, it is possible to refer to a more comprehensive sample to shed more light on the findings and draw conclusions that are more reliable. For example, future investigations may examine capital-risk interrelationship on a sample of banks operating in new BCBS member-countries, that is Spain and the 14 countries, which got membership status respectively from 2001 and 2009. This sample would provide a relevant framework to assess impacts of both changes in regulatory standards and membership on capital-risk interrelationship.

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APPENDIX

Table 33: Comparison of key Development Indicators between WAEMU and Turkey

Key Indicators	Average 1980-1989		Average 1990-1999		Average 2000-2009		Average 2010-2015	
	WAEMU	TURKEY	WAEMU	TURKEY	WAEMU	TURKEY	WAEMU	**TURKEY**
Population, total	46.895.916	48.577.844	62.841.271	58.103.987	83.597.437	67.326.879	105.433.818	75.514.977
Life expectancy at birth, total (years)	48,70	61,35	51,35	66,76	53,88	72,10	57,89	74,63
GDP per capita (current US$)	376,98	1.544,90	386,35	3.129,85	514,11	6.444,22	772,63	10.237,27
GDP per capita growth (annual %)	-0,66	1,91	0,23	2,32	0,96	2,38	2,41	3,49
GDP growth (annual %)	2,15	4,10	3,12	3,98	3,84	3,77	5,43	5,21
Inflation, consumer prices (annual %)	13,96	51,27	9,71	77,24	2,87	23,53	1,60	7,99
Inflation, GDP deflator (annual %)	11,19	50,69	10,09	79,26	3,58	21,51	2,38	7,18
Poverty gap at $1.90 a day (2011 PPP) (%)	1,70	0,38	32,83	0,57	18,96	0,31	18,40	0,05
Poverty gap at $3.10 a day (2011 PPP) (%)	6,49	2,18	48,65	3,01	36,94	2,05	36,39	0,72
Domestic credit provided by financial sector (% of GDP)	28,53	31,38	17,76	27,94	14,32	48,24	22,83	80,49
Domestic credit to private sector by banks (% of GDP)	23,89	17,90	13,98	18,73	13,44	22,62	21,14	60,00
Listed domestic companies, total	-	80	33	197	39	269	38	271
Stocks traded, total value (% of GDP)	-	-	0,21	17,52	0,48	41,01	1,00	47,95

Source: Computed by the authors using development Indicators from World Bank database

Table 34: Comparative overview of the weight of the banking sector in the economy in Turkey and WAEMU (2001-2015)

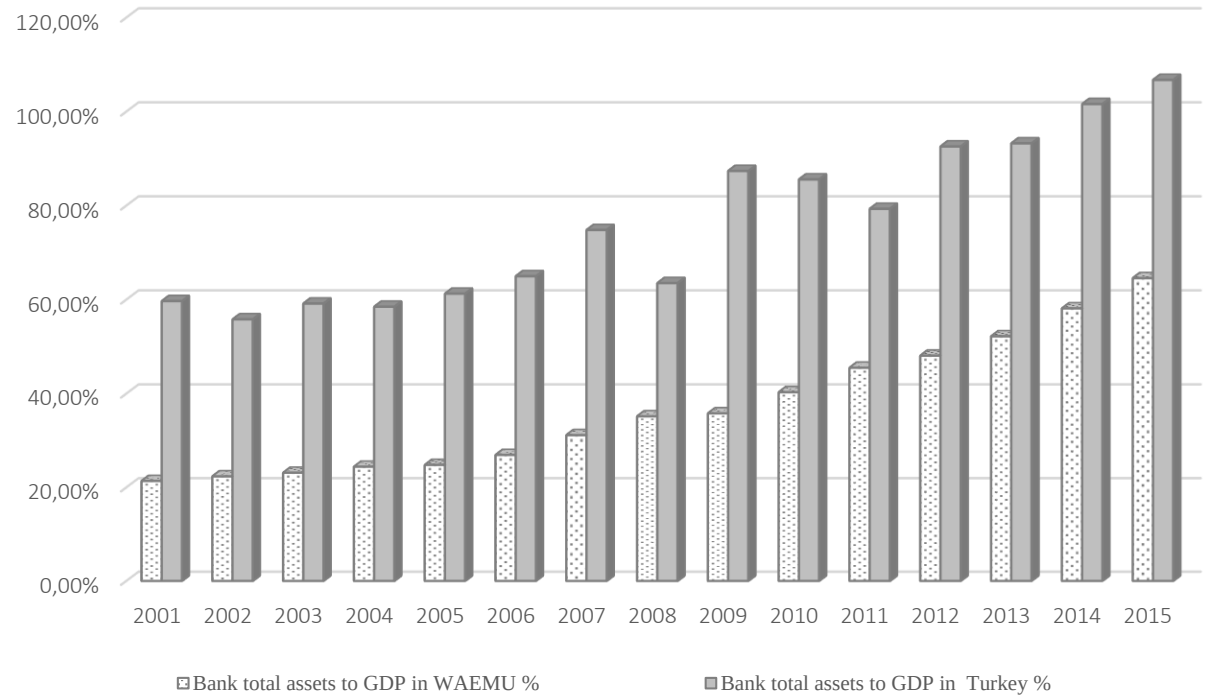
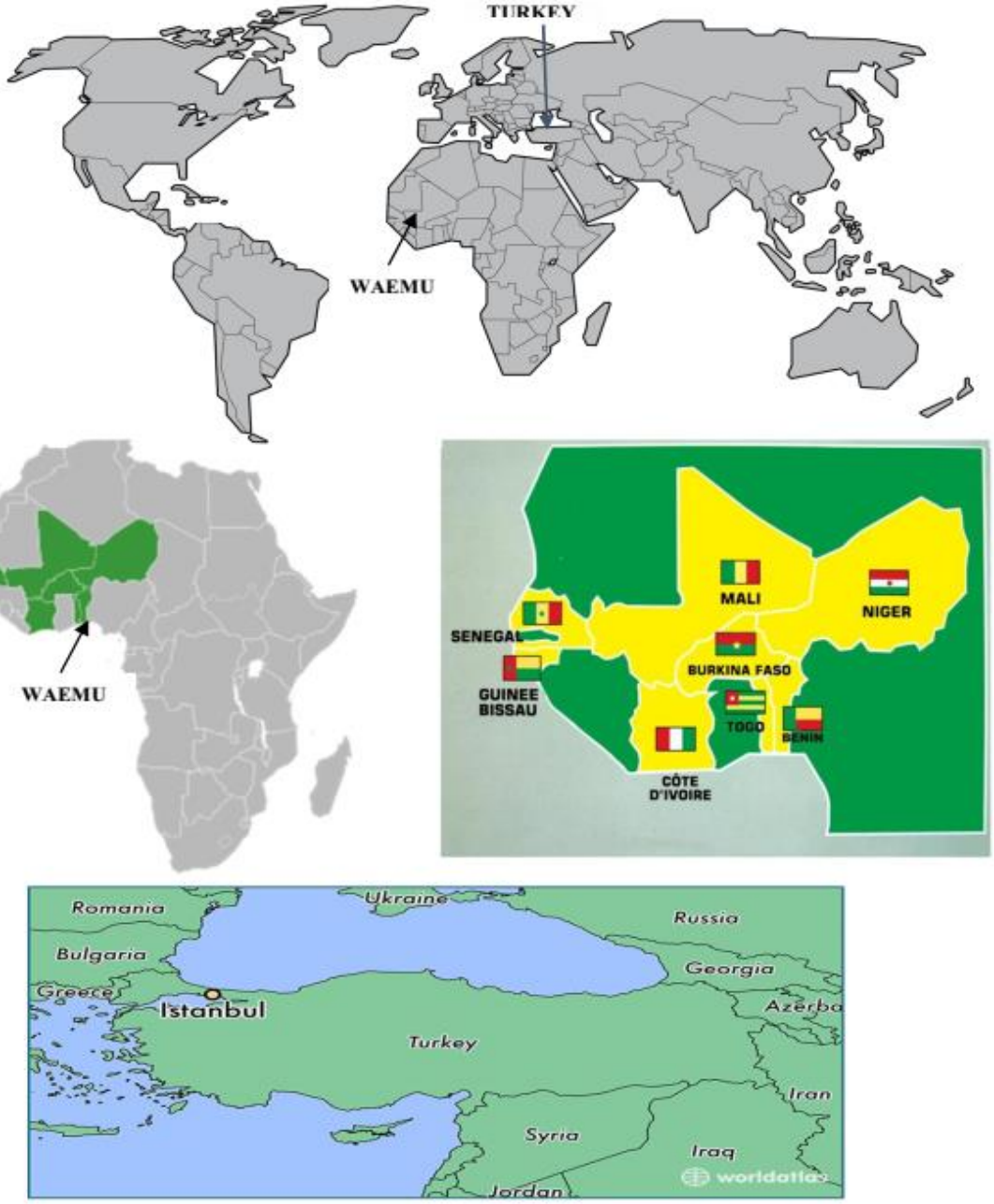


Figure 5: Ratio of bank total assets to GDP in Turkey and WAEMU

Source: By the Author based on data from WAEMU Banking Central Bank, Banks Association of Turkey, and World Bank

Table 35: Geographical location and Main Features of WAEMU and Turkey



Countries	Land Area (sq. km)	Population	GDP (current US$) Millions	GDP per capita (current US$)	GDP growth (annual %)	Inflation[1] (annual %)
Benin	112.760	10.879.829	8.290,99	762,05	2,09	0,32
Burkina Faso	273.600	18.105.570	10.678,20	589,77	4,02	0,95
Cote d'Ivoire	318.000	22.701.556	31.759,25	1.398,99	9,16	1,24
Guinea-Bissau	28.120	1.844.325	1.056,78	572,99	4,80	1,40
Mali	1.220.190	17.599.694	12.746,69	724,26	5,96	1,44
Niger	1.266.700	19.899.120	7.142,95	358,96	3,61	1,01
Senegal	192.530	15.129.273	13.609,99	899,58	6,49	0,15
Togo	54.390	7.304.578	4.087,90	559,64	5,37	1,79
WAEMU	**3.466.290**	**113.463.945**	**89.372,75**	**787,68**	**5,19**	**1,04**
TURKEY	**769.630**	**78.665.830**	**717.879,79**	**9.125,69**	**3,97**	**7,67**

[1] Inflation: consumer prices; All the data are related to year ending on 31 December 2015
Source: World Development Indicators from World Bank database (Data downloaded on 23 February 2017)

Table 36: Characteristics of Member-Countries of the Basel Committee

Country Name	Date of Entry	Continent		GDP (U.S.D. Billion)				Population (million inhabitants)			
			RS	1975	2001	2009	2015	1975	2001	2009	2015
Belgium	1974	Europe-UE	1	66,03	237,84	484,55	454,04	9,80	10,29	10,80	11,29
Canada	1974	America	1	173,83	736,38	1.371,15	1.550,54	23,21	31,08	33,63	35,85
France	1974	Europe-UE	1	362,00	1.382,22	2.693,83	2.421,68	54,25	61,36	64,71	66,81
Germany	1974	Europe-UE	1	488,78	1.950,65	3.418,01	3.355,77	78,67	82,35	81,90	81,41
Italy	1974	Europe-UE	0	226,94	1.162,32	2.185,16	1.814,76	55,44	56,97	59,10	60,80
Japan	1974	Asia	1	512,86	4.159,86	5.035,14	4.123,26	111,94	127,15	128,05	126,96
Luxembourg	1974	Europe-UE	0	3,27	21,05	50,39	57,79	0,36	0,44	0,50	0,57
Netherlands	1974	Europe-UE	0	98,97	426,57	857,93	752,55	13,67	16,05	16,53	16,94
Sweden	1974	Europe-UE	1	81,72	239,92	429,66	492,62	8,19	8,90	9,30	9,80
Switzerland	1974	Europe	1	-	278,63	539,53	664,74	6,34	7,23	7,74	8,29
United Kingdom	1974	Europe-UE	1	241,76	1.535,94	2.314,58	2.848,76	56,23	59,12	62,28	65,14
United States	1974	America	1	1.688,92	10.621,82	14.418,74	17.947,00	215,97	284,97	306,77	321,42
Spain	2001	Europe-UE	0	-	625,98	1.499,07	1.199,06	-	40,76	46,36	46,42
Argentina	2009	America	0	-	-	334,49	583,17	-	-	40,80	43,42
Australia	2009	Australia	1	-	-	926,56	1.339,54	-	-	21,69	23,78
Brazil	2009	America	0	-	-	1.667,02	1.774,72	-	-	196,70	207,85
China	2009	Asia	1	-	-	5.059,42	10.866,44	-	-	1.331,26	1.371,22
Hong Kong SAR	2009	Asia	0	-	-	214,05	309,93	-	-	6,97	7,31
India	2009	Asia	0	-	-	1.365,37	2.073,54	-	-	1.214,18	1.311,05
Indonesia	2009	Asia	1	-	-	539,58	861,93	-	-	238,47	257,56
Korea, Rep.	2009	Asia	1	-	-	901,93	1.377,87	-	-	49,18	50,62
Mexico	2009	America	1	-	-	894,95	1.144,33	-	-	116,82	127,02
Russian Federation	2009	Europe	0	-	-	1.222,64	1.326,02	-	-	142,79	144,10
Saudi Arabia	2009	Asia	0	-	-	429,10	646,00	-	-	27,41	31,54
Singapore	2009	Asia	0	-	-	192,41	292,74	-	-	4,99	5,54
South Africa	2009	Africa	0	-	-	295,94	312,80	-	-	50,02	54,96
Turkey	2009	Europe	1	-	-	614,55	718,22	-	-	71,26	78,67
BCBS Member countries				3.945	23.379	49.956	61.310	634	787	4.340	4.566
Share of global GDP (%)				67,09	70,56	83,55	83,41				
Share of the world population (%)								15,59	12,70	63,44	62,16
World				**5.880**	**33.134**	**59.793**	**73.502**	**4.066**	**6.196**	**6.841**	**7.347**

RS = Representative Structure = 1 if Country is represented by the Central Bank and a supervisory authority; 0 if represented by only one of this structure
Source: Computed by the author based on statistic from world bank database

Table 37: Profile of the Sample build up with Turkish Banks

N°	Banks	Groups	Date of Establishment	Rank by Total Assets	Total Assets (EUR Million)	Number of Branch Offices	Number of Employees
1	Deutsche Bank A.Ş.	Bank under the Dep Insurance Fund	1988	31	957,90	1	121
2	Anadolubank A.Ş.		1996	21	3.538,92	106	1.784
3	Citibank A.Ş.	Development and Investment Bank	1981	25	2.327,95	8	468
4	Birleşik Fon Bankası A.Ş.		1958	32	834,46	1	231
5	Türkiye Garanti Bankası A.Ş.		1946	3	80.744,32	968	19.689
6	Denizbank A.Ş.		1997	8	29.313,15	694	12.938
7	Finans Bank A.Ş.		1987	9	28.842,65	630	12.451
8	HSBC Bank A.Ş.	Foreign Bank	1990	14	6.924,70	90	3.188
9	Alternatifbank A.Ş.		1991	18	4.678,55	53	928
10	Turkland Bank A.Ş.		1991	29	1.635,45	33	608
11	Arap Türk Bankası A.Ş.		1977	30	1.376,12	7	288
12	Türkiye İş Bankası A.Ş.		1924	2	88.550,21	1.374	24.756
13	Akbank T.A.Ş.		1948	4	77.010,82	841	13.843
14	Yapı ve Kredi Bankası A.Ş.		1944	5	71.840,06	936	18.366
15	Türk Ekonomi Bankası A.Ş.	Privately-owned Deposit Bank	1927	10	22.654,98	515	9.640
16	Şekerbank T.A.Ş.		1953	16	6.768,26	273	3.611
17	Turkish Bank A.Ş.		1981	34	428,71	13	225
18	Adabank A.Ş.		1984	47	15,62	1	29
19	Türkiye Cumhuriyeti Ziraat Bankası A.Ş.		1863	1	101.659,86	1.814	25.015
20	Türkiye Halk Bankası A.Ş.	State-owned Deposit Bank	1938	6	65.765,18	964	16.956
21	Türkiye Vakıflar Bankası T.A.O.		1954	7	60.394,38	924	15.615
	Total for the Sample	**21**			**656.262,23**	**10.246**	**180.750**
	Total for the Turkish Banking industry	**47**			**737.482,38**	**10.781**	**196.699**
	%	**45%**			**89%**	**95%**	**92%**

Source: Created by the author using data from data from the statistical reports of The Bank Association of Turkey (https://www.tbb.org.tr/en/banks-and-banking-sector-information/statistical-reports/20)
Information available as for 31.12.2016

Table 38: Profile of the Sample build up with WAEMU's Banks

N°	Bank	Country	Date of Establishment	Rank by Total Assets	Total Assets (EUR Million)	Number of Branch Offices	Number of Employees
1	Bank of Africa (BOA)	Benin	1989	4	1296,62	45	561
2	Ecobank		1989	13	970,04	38	404
3	United Bank of Africa (UBA)		1992	49	264,83	16	224
6	Ecobank	Burkina Faso	1997	9	1070,21	42	428
8	Bank of Africa (BOA)		1997	10	1001,28	40	406
7	Société Générale de Banques au Burkina (SGBB)		1974	23	652,76	22	266
4	United Bank of Africa (UBA)		1974	30	494,88	28	293
5	Banque Internationale pour le Commerce, l'Industrie et l'Agriculture du Burkina (BICIA)		1974	45	322,35	19	301
9	Banque Commercial du Burkina (BCB)		1988	65	180,50	18	181
10	Société Générale de Banques en Côte d'Ivoire (SGBCI)	Côte d'Ivoire	1966	1	1735,21	67	1140
12	Ecobank		1989	3	1634,07	52	639
13	Banque Internationale pour l'Afrique Occidentale (BIAO)		1980	6	1142,04	73	801
16	Société Ivoirienne de Banque (SIB)		1966	7	1139,21	52	695
15	Bank of Africa (BOA)		1995	15	924,41	28	337
11	Banque Internationale pour le Commerce et l'Industrie de la Côte d'Ivoire (BICICI)		1966	16	906,59	42	571
14	Banque Nationale d'Investissement (BNI)		1999	17	886,17	31	639
17	Banque de Développement du Mali (BDM)	Mali	1968	14	933,63	98	433
20	Ecobank		1998	18	832,13	41	401
21	Bank of Africa (BOA)		1982	19	816,62	54	319
19	Banque Nationale de Développement Agricole (BNDA)		1982	25	564,77	42	389
18	Banque Internationale pour le Mali (BIM)		1980	28	539,81	83	389
23	Banque Internationale pour le Commerce et l'Industrie (BICI)		1998	67	178,33	8	102
22	Banque Commerciale du Sahel (BCS)		1982	69	176,70	14	389
26	Bank of Africa (BOA)	Niger	1994	38	401,04	25	236
24	Société Nigérienne de Banque (SONIBANK)		1990	41	360,38	11	233
27	Ecobank		1999	43	340,40	18	261
25	Banque Internationale pour l'Afrique au Niger (BIA Niger)		1993	52	232,38	81	185
28	Banque Commerciale du Niger (BCN)		1988	109	22,98	1	44

N°	Bank	Country	Date of Establishment	Rank by Total Assets	Total Assets (EUR Million)	Number of Branch Offices	Number of Employees
30	Compagnie Bancaire de l'Afrique Occidentale (CBAO)	Senegal	1965	5	1237,79	87	1028
29	Société Générale de Banques au Sénégal (SGBS)		1965	8	1121,36	42	801
31	Ecobank		1999	11	988,44	39	342
34	Banque Islamique du Sénégal (BIS)		1982	39	396,40	23	132
33	Caisse Nationale de Crédit Agricole (CNCA)		1984	40	370,39	33	303
32	Crédit du Sénégal (CDS)		1989	50	262,18	8	126
35	Ecobank	Togo	1988	29	526,71	24	287
36	Banque Internationale pour l'Afrique (BIA)		1965	72	143,59	10	128
37	Société Interafricaine de Banque (SIAB)		1977	113	16,51	1	30
	Total for the Sample	**37 banks**			**25083,72**	**1.356**	**14.444**
	Total for the WAEMU's Banking industry	**122 banks**			**42491,02**	**2430**	**25597**
	%	**30%**			**59%**	**56%**	**56%**

Source: Created by the author using data from data from the statistical reports of The WAEMU's Banking Committee (http://www.bceao.int/-Periodiques-.html)
Information available as for 31.12.2015

$$\begin{aligned}
Ln(Y) = \alpha + \beta_1 Ln(X_1) + \ldots + \beta_p Ln(X_p) \quad &\leftrightarrow \quad Ln(Y) = e^{Ln(\alpha)} + Ln(X_1^{\beta 1}) + \ldots + Ln(X_p^{\beta p}) \\
&\leftrightarrow \quad Ln(Y) = Ln(e^{\alpha} X_1^{\beta 1} \ldots X_p^{\beta p}) \\
&\leftrightarrow \quad Y = e^{\alpha} X_1^{\beta 1} \ldots X_p^{\beta p} \\
&\leftrightarrow \quad Y = \lambda \prod_{i=1}^{p} X_i^{\beta_i} \text{ , where } \lambda = e^{\alpha}
\end{aligned}$$

Box 3: From Linear to non Linear Relationship through Log-Transformation

Regression Outputs for Turkish Banks

Table 39: Estimation of the Linear Model Using Flat Capital Ratio—TURKEY (2003-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	63	9	.060471	0.1655	75.88	0.0000
Equation2	63	9	.1162963	0.2584	11.04	0.2728
Equation3	63	8	34.71724	-27.9189	1.08	0.9977

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	.2528901	.1252052	2.02	0.043	.0074923	.4982879
dZ	.0023017	.0026264	0.88	0.381	-.002846	.0074493
CAP						
L1.	.0036188	.0433658	0.08	0.933	-.0813767	.0886142
SIZE	.000316	.005629	0.06	0.955	-.0107166	.0113485
ROA	-.0721543	.0816321	-0.88	0.377	-.2321503	.0878417
LIQ	.0409533	.0529153	0.77	0.439	-.0627589	.1446654
OBSA	-.0033958	.0105577	-0.32	0.748	-.0240885	.0172969
INF	-1.962478	23.2816	-0.08	0.933	-47.59357	43.66861
GDPG	1.021449	9.405216	0.11	0.914	-17.41243	19.45533
_cons	.087522	1.552446	0.06	0.955	-2.955216	3.13026
Equation2						
dCAP	-.3390913	50.1831	-0.01	0.995	-98.69616	98.01797
dZ	-.0034223	.0645286	-0.05	0.958	-.1298961	.1230514
RISK						
L1.	-.3259253	3.854049	-0.08	0.933	-7.879722	7.227871
SIZE	-.01328	.1493214	-0.09	0.929	-.3059447	.2793847
ROA	.2384233	.6014001	0.40	0.692	-.9402992	1.417146
LIQ	-.2999422	1.584746	-0.19	0.850	-3.405987	2.806102
OBSA	.0232292	.1227152	0.19	0.850	-.2172882	.2637467
INF	-85.77816	1037.111	-0.08	0.934	-2118.478	1946.921
GDPG	37.44147	462.5178	0.08	0.935	-869.0768	943.9597
_cons	6.186019	72.70745	0.09	0.932	-136.318	148.69
Equation3						
dCAP	568.9046	1579.44	0.36	0.719	-2526.741	3664.55
dRISK	-148.8498	439.9585	-0.34	0.735	-1011.153	713.453
Z						
L1.	.0324556	.3896735	0.08	0.934	-.7312905	.7962016
SIZE	.0184757	2.729134	0.01	0.995	-5.330529	5.367481
ROA	39.67375	98.80176	0.40	0.688	-153.9742	233.3216
LIQ	-23.46356	59.89833	-0.39	0.695	-140.8621	93.93501
OBSA	2.319834	11.10162	0.21	0.834	-19.43894	24.0786
INF	0	(omitted)				
GDPG	-148.8578	712.5899	-0.21	0.835	-1545.508	1247.793
_cons	22.13323	69.69316	0.32	0.751	-114.4629	158.7293

Endogenous variables: dCAP dRISK dZ
Exogenous variables: L.CAP SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 40: Estimation of the Linear Model Using Risk-Based Capital Ratio—TURKEY (2003-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	63	9	.323946	0.4577	43.79	0.0000
Equation2	63	9	.1066081	0.3768	38.92	0.0000
Equation3	63	9	5.401832	0.2999	27.27	0.0013

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.7014032	.7980765	-0.88	0.379	-2.265604	.8627979
dZ	.0155758	.0141059	1.10	0.270	-.0120713	.0432229
RBC						
L1.	-.3175968	.0864788	-3.67	0.000	-.4870921	-.1481015
SIZE	-.0250814	.0299116	-0.84	0.402	-.083707	.0335443
ROA	-1.626131	.4601799	-3.53	0.000	-2.528067	-.724195
LIQ	.7775137	.3169288	2.45	0.014	.1563448	1.398683
OBSA	-.020759	.0571915	-0.36	0.717	-.1328523	.0913343
INF	-197.6747	169.6837	-1.16	0.244	-530.2485	134.8992
GDPG	84.24885	68.5856	1.23	0.219	-50.17646	218.6741
_cons	13.45938	11.5453	1.17	0.244	-9.168985	36.08774
Equation2						
dRBC	-.0353178	.0830249	-0.43	0.671	-.1980436	.127408
dZ	-.0035751	.0052599	-0.68	0.497	-.0138843	.0067342
RISK						
L1.	-.2836581	.0850162	-3.34	0.001	-.4502867	-.1170295
SIZE	-.0117607	.0097092	-1.21	0.226	-.0307903	.0072689
ROA	.1871708	.1946543	0.96	0.336	-.1943446	.5686863
LIQ	-.2686602	.1080908	-2.49	0.013	-.4805143	-.0568061
OBSA	.0213649	.0197683	1.08	0.280	-.0173803	.0601101
INF	-78.13673	50.89191	-1.54	0.125	-177.883	21.60957
GDPG	34.30061	20.25002	1.69	0.090	-5.388693	73.98991
_cons	5.603295	3.436178	1.63	0.103	-1.13149	12.33808
Equation3						
dRBC	4.285854	4.38515	0.98	0.328	-4.308883	12.88059
dRISK	23.99768	14.35222	1.67	0.095	-4.132164	52.12752
Z						
L1.	-.1001062	.0243825	-4.11	0.000	-.1478951	-.0523173
SIZE	-.3766877	.4614188	-0.82	0.414	-1.281052	.5276765
ROA	9.233501	8.553478	1.08	0.280	-7.531008	25.99801
LIQ	-2.735948	4.264918	-0.64	0.521	-11.09503	5.623138
OBSA	-1.122799	.9466524	-1.19	0.236	-2.978204	.7326056
INF	5156.242	2851.664	1.81	0.071	-432.9179	10745.4
GDPG	-2062.348	1173.839	-1.76	0.079	-4363.03	238.3346
_cons	-340.1483	194.4651	-1.75	0.080	-721.2929	40.99638

Endogenous variables: dRBC dRISK dZ
Exogenous variables: L.RBC SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 41: Estimation of the Log-Transformation Model Using Flat Capital Ratio—TURKEY (2002-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	84	9	.2579152	0.8309	429.48	0.0000
Equation2	84	9	.2244622	0.7887	315.60	0.0000
Equation3	84	9	.425013	0.8274	428.94	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.2202158	.1228465	-1.79	0.073	-.4609905	.0205588
LnZ	-.0236358	.0434901	-0.54	0.587	-.108875	.0616033
LnCAP L1.	.7084185	.0677674	10.45	0.000	.5755969	.8412401
SIZE	-.0465233	.0197748	-2.35	0.019	-.0852812	-.0077654
LnROA	.0533786	.0345981	1.54	0.123	-.0144325	.1211897
LnLIQ	.0909874	.0733479	1.24	0.215	-.052772	.2347467
LnOBSA	.0355387	.0623716	0.57	0.569	-.0867073	.1577848
LnINF	.4041722	.1259443	3.21	0.001	.1573259	.6510186
LnGDPG	.3369558	.2254463	1.49	0.135	-.1049109	.7788224
_cons	2.412218	.927185	2.60	0.009	.5949689	4.229467
Equation2						
LnCAP	-.0683841	.0816395	-0.84	0.402	-.2283945	.0916263
LnZ	.0600662	.0357743	1.68	0.093	-.01005	.1301825
LnRISK L1.	.6318308	.0695973	9.08	0.000	.4954226	.7682389
SIZE	-.0029332	.0188863	-0.16	0.877	-.0399496	.0340831
LnROA	.0172373	.0318162	0.54	0.588	-.0451213	.0795958
LnLIQ	-.063841	.0671408	-0.95	0.342	-.1954345	.0677526
LnOBSA	.1081619	.0451319	2.40	0.017	.0197049	.1966189
LnINF	.0991256	.1107028	0.90	0.371	-.117848	.3160991
LnGDPG	.1938431	.2010006	0.96	0.335	-.2001108	.587797
_cons	.3300456	.8513922	0.39	0.698	-1.338653	1.998744
Equation3						
LnCAP	-.3204954	.1605429	-2.00	0.046	-.6351538	-.005837
LnRISK	-.3432529	.2188134	-1.57	0.117	-.7721194	.0856135
LnZ L1.	.9191764	.0655945	14.01	0.000	.7906135	1.047739
SIZE	-.052002	.035642	-1.46	0.145	-.121859	.0178549
LnROA	.021935	.0618184	0.35	0.723	-.0992269	.1430968
LnLIQ	.1081963	.1261245	0.86	0.391	-.1390032	.3553959
LnOBSA	.0697303	.1054099	0.66	0.508	-.1368693	.2763298
LnINF	.3421313	.2067662	1.65	0.098	-.0631231	.7473856
LnGDPG	.1160442	.3767393	0.31	0.758	-.6223512	.8544396
_cons	1.782889	1.574868	1.13	0.258	-1.303796	4.869573

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 42: Estimation of the Log-Transformation Model Using Risk-Based Capital Ratio—TURKEY (2002-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	84	9	.2683655	0.9032	791.55	0.0000
Equation2	84	9	.2100951	0.8149	360.24	0.0000
Equation3	84	9	.425013	0.8274	428.94	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.024181	.182649	-0.13	0.895	-.3821664	.3338045
LnZ	-.0985383	.0466462	-2.11	0.035	-.1899632	-.0071134
LnRBC						
L1.	.7672458	.0763686	10.05	0.000	.617566	.9169255
SIZE	-.0468247	.0205664	-2.28	0.023	-.0871341	-.0065153
LnROA	.0368796	.036696	1.01	0.315	-.0350432	.1088023
LnLIQ	.1760665	.0738031	2.39	0.017	.031415	.320718
LnOBSA	-.0928534	.0671535	-1.38	0.167	-.224472	.0387651
LnINF	.3173645	.1300134	2.44	0.015	.0625429	.5721861
LnGDPG	.1295488	.2362837	0.55	0.584	-.3335587	.5926564
_cons	2.211748	.9659752	2.29	0.022	.3184714	4.105025
Equation2						
LnRBC	-.0640071	.0715229	-0.89	0.371	-.2041894	.0761753
LnZ	.0562216	.0337911	1.66	0.096	-.0100077	.1224508
LnRISK						
L1.	.5913891	.0853657	6.93	0.000	.4240754	.7587029
SIZE	-.0027455	.0175683	-0.16	0.876	-.0371788	.0316878
LnROA	.016134	.0291787	0.55	0.580	-.0410553	.0733232
LnLIQ	-.0597547	.0651188	-0.92	0.359	-.1873851	.0678757
LnOBSA	.1012388	.0427311	2.37	0.018	.0174874	.1849901
LnINF	.0927808	.102837	0.90	0.367	-.108776	.2943377
LnGDPG	.1814358	.1863446	0.97	0.330	-.183793	.5466645
_cons	.3089203	.7899998	0.39	0.696	-1.239451	1.857291
Equation3						
LnRBC	-.3204954	.1605429	-2.00	0.046	-.6351538	-.005837
LnRISK	-.6637483	.3092747	-2.15	0.032	-1.269916	-.057581
LnZ						
L1.	.9191764	.0655945	14.01	0.000	.7906135	1.047739
SIZE	-.052002	.035642	-1.46	0.145	-.121859	.0178549
LnROA	.021935	.0618184	0.35	0.723	-.0992269	.1430968
LnLIQ	.1081963	.1261245	0.86	0.391	-.1390032	.3553959
LnOBSA	.0697303	.1054099	0.66	0.508	-.1368693	.2763298
LnINF	.3421313	.2067662	1.65	0.098	-.0631231	.7473856
LnGDPG	.1160442	.3767393	0.31	0.758	-.6223512	.8544396
_cons	1.782889	1.574868	1.13	0.258	-1.303796	4.869573

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 43: Estimation of the Linear Model Using Flat Capital Ratio—TURKEY (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	168	9	.0321179	0.6352	142.01	0.0000
Equation2	168	9	.158414	0.2982	88.13	0.0000
Equation3	168	9	17.22281	0.1608	43.36	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	.1943869	.024694	7.87	0.000	.1459876	.2427863
dZ	.0001933	.0003776	0.51	0.609	-.0005468	.0009334
CAP						
L1.	-.0766357	.024961	-3.07	0.002	-.1255585	-.027713
SIZE	-.0032881	.0018313	-1.80	0.073	-.0068775	.0003012
ROA	.508987	.2296929	2.22	0.027	.0587972	.9591768
LIQ	.0111969	.0209978	0.53	0.594	-.0299581	.0523519
OBSA	-.0037471	.0023683	-1.58	0.114	-.0083889	.0008946
INF	.3960369	.1948042	2.03	0.042	.0142278	.777846
GDPG	-.0252436	.0638232	-0.40	0.692	-.1503348	.0998475
_cons	.045818	.0488618	0.94	0.348	-.0499495	.1415854
Equation2						
dCAP	.6974825	1.353855	0.52	0.606	-1.956024	3.350989
dZ	-.00414	.0019398	-2.13	0.033	-.0079419	-.0003382
RISK						
L1.	-.460317	.1755695	-2.62	0.009	-.8044269	-.1162072
SIZE	-.007527	.0088854	-0.85	0.397	-.024942	.009888
ROA	3.969974	2.025729	1.96	0.050	-.000381	7.94033
LIQ	-.0917282	.1123249	-0.82	0.414	-.3118809	.1284245
OBSA	.0292986	.0132466	2.21	0.027	.0033357	.0552616
INF	-.2766932	1.104597	-0.25	0.802	-2.441663	1.888277
GDPG	-.0588519	.3229458	-0.18	0.855	-.691814	.5741103
_cons	.4580173	.2731728	1.68	0.094	-.0773915	.9934261
Equation3						
dCAP	199.7198	161.1007	1.24	0.215	-116.0317	515.4713
dRISK	-42.12898	38.53999	-1.09	0.274	-117.666	33.40801
Z						
L1.	-.147122	.0315704	-4.66	0.000	-.2089987	-.0852452
SIZE	.1291051	.8690055	0.15	0.882	-1.574114	1.832325
ROA	-30.39599	115.1469	-0.26	0.792	-256.0797	195.2877
LIQ	9.930552	9.606755	1.03	0.301	-8.898342	28.75945
OBSA	-2.4585	1.383505	-1.78	0.076	-5.17012	.2531202
INF	-64.55066	123.9676	-0.52	0.603	-307.5227	178.4214
GDPG	-11.89995	34.69111	-0.34	0.732	-79.89327	56.09337
_cons	9.839132	24.88231	0.40	0.693	-38.92929	58.60756

Endogenous variables: dCAP dRISK dZ
Exogenous variables: L.CAP SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 44: Estimation of the Linear Model Using Risk-Based Capital Ratio—TURKEY (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	168	9	.058825	0.4029	49.21	0.0000
Equation2	168	9	.4475177	-4.6006	11.20	0.2620
Equation3	168	9	60.5178	-9.3618	3.66	0.9323

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.2354806	.0408658	-5.76	0.000	-.3155762	-.155385
dZ	-.0001223	.0006592	-0.19	0.853	-.0014142	.0011697
RBC						
L1.	-.0120818	.0217662	-0.56	0.579	-.0547427	.0305791
SIZE	-.0019629	.0031891	-0.62	0.538	-.0082135	.0042877
ROA	.5037237	.3738214	1.35	0.178	-.2289527	1.2364
LIQ	.016166	.0384162	0.42	0.674	-.0591283	.0914604
OBSA	-.0050764	.0046041	-1.10	0.270	-.0141002	.0039474
INF	.5248655	.3567756	1.47	0.141	-.1744018	1.224133
GDPG	-.2363421	.1169571	-2.02	0.043	-.4655738	-.0071105
_cons	.0019449	.0871334	0.02	0.982	-.1688335	.1727233
Equation2						
dRBC	-7.386584	10.73657	-0.69	0.491	-28.42988	13.65671
dZ	.0024802	.0099228	0.25	0.803	-.0169681	.0219286
RISK						
L1.	.4309544	1.418078	0.30	0.761	-2.348427	3.210336
SIZE	-.0012749	.0263809	-0.05	0.961	-.0529805	.0504306
ROA	-.0590396	7.525356	-0.01	0.994	-14.80847	14.69039
LIQ	.1464456	.4877513	0.30	0.764	-.8095293	1.102421
OBSA	-.0584439	.139556	-0.42	0.675	-.3319685	.2150808
INF	3.886337	6.308	0.62	0.538	-8.477117	16.24979
GDPG	-1.709287	2.533968	-0.67	0.500	-6.675773	3.257199
_cons	-.5412547	1.726677	-0.31	0.754	-3.925479	2.84297
Equation3						
dRBC	1035.816	2038.887	0.51	0.611	-2960.328	5031.961
dRISK	254.7439	491.191	0.52	0.604	-707.9727	1217.46
Z						
L1.	-.1816234	.1202327	-1.51	0.131	-.4172751	.0540283
SIZE	1.273231	3.866637	0.33	0.742	-6.305239	8.8517
ROA	-516.3201	1103.22	-0.47	0.640	-2678.592	1645.952
LIQ	.8142706	34.25329	0.02	0.981	-66.32094	67.94948
OBSA	.6583726	9.038819	0.07	0.942	-17.05739	18.37413
INF	-524.5916	1133.083	-0.46	0.643	-2745.394	1696.211
GDPG	227.0394	501.3119	0.45	0.651	-755.5139	1209.593
_cons	24.9842	94.33265	0.26	0.791	-159.9044	209.8728

Endogenous variables: dRBC dRISK dZ
Exogenous variables: L.RBC SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 45: Estimation of the Log-Transformation Model Using Flat Capital Ratio—TURKEY (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	168	9	.1880035	0.8996	1514.27	0.0000
Equation2	168	9	.2001088	0.5151	179.12	0.0000
Equation3	168	9	.3005066	0.8081	723.33	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.0516409	.1087482	-0.47	0.635	-.2647835	.1615016
LnZ	.0115529	.0294883	0.39	0.695	-.0462431	.0693489
LnCAP						
L1.	.7765156	.0474555	16.36	0.000	.6835046	.8695267
SIZE	-.0346239	.0107077	-3.23	0.001	-.0556105	-.0136373
LnROA	.036296	.0134369	2.70	0.007	.0099601	.0626319
LnLIQ	.0580216	.0427387	1.36	0.175	-.0257447	.1417879
LnOBSA	-.0045952	.0238591	-0.19	0.847	-.0513582	.0421679
LnINF	.4313791	.1696358	2.54	0.011	.098899	.7638592
LnGDPG	.0443469	.0199057	2.23	0.026	.0053324	.0833615
_cons	1.707658	.5095335	3.35	0.001	.7089907	2.706325
Equation2						
LnCAP	-.037654	.0671704	-0.56	0.575	-.1693056	.0939976
LnZ	.0386903	.029899	1.29	0.196	-.0199107	.0972912
LnRISK						
L1.	.6229552	.0711027	8.76	0.000	.4835965	.7623138
SIZE	-.0073001	.0132027	-0.55	0.580	-.033177	.0185767
LnROA	-.0071747	.0150624	-0.48	0.634	-.0366964	.0223471
LnLIQ	-.0059326	.0472905	-0.13	0.900	-.0986202	.0867551
LnOBSA	.0452667	.0223331	2.03	0.043	.0014946	.0890389
LnINF	.124524	.1803738	0.69	0.490	-.2290021	.47805
LnGDPG	.014554	.0212879	0.68	0.494	-.0271696	.0562776
_cons	.1394861	.579199	0.24	0.810	-.995723	1.274695
Equation3						
LnCAP	-.2711774	.0973031	-2.79	0.005	-.4618879	-.0804669
LnRISK	.2084726	.1679017	1.24	0.214	-.1206087	.5375538
LnZ						
L1.	.885383	.0416251	21.27	0.000	.8037993	.9669667
SIZE	-.0319849	.0194081	-1.65	0.099	-.070024	.0060542
LnROA	.0322927	.023247	1.39	0.165	-.0132707	.077856
LnLIQ	.1362127	.0717505	1.90	0.058	-.0044157	.2768411
LnOBSA	-.117386	.0355551	-3.30	0.001	-.1870727	-.0476993
LnINF	-.0996014	.2713112	-0.37	0.714	-.6313615	.4321587
LnGDPG	.0061131	.0319685	0.19	0.848	-.056544	.0687702
_cons	.7185786	.8605099	0.84	0.404	-.9679899	2.405147

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 46: Estimation of the Log-Transformation Model Using Risk-Based Capital Ratio—TURKEY (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	168	9	.1891305	0.9003	1568.09	0.0000
Equation2	168	9	.1928473	0.5496	192.86	0.0000
Equation3	168	9	.3005066	0.8081	723.33	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	.2537061	.0989074	2.57	0.010	.0598511	.447561
LnZ	-.0384808	.0294584	-1.31	0.191	-.0962182	.0192566
LnRBC						
L1.	.814757	.050091	16.27	0.000	.7165803	.9129336
SIZE	-.0267813	.0110874	-2.42	0.016	-.0485121	-.0050505
LnROA	.0474672	.0132884	3.57	0.000	.0214224	.073512
LnLIQ	.0686382	.0426699	1.61	0.108	-.0149933	.1522697
LnOBSA	-.0640254	.0234026	-2.74	0.006	-.1098936	-.0181571
LnINF	.2897597	.1702871	1.70	0.089	-.0439969	.6235163
LnGDPG	.0274959	.0200151	1.37	0.170	-.011733	.0667249
_cons	1.609323	.5139016	3.13	0.002	.6020943	2.616552
Equation2						
LnRBC	-.0362877	.0623839	-0.58	0.561	-.1585579	.0859826
LnZ	.0372863	.0290242	1.28	0.199	-.0196001	.0941728
LnRISK						
L1.	.6003496	.058712	10.23	0.000	.4852762	.715423
SIZE	-.0070352	.0123853	-0.57	0.570	-.03131	.0172396
LnROA	-.0069143	.0147322	-0.47	0.639	-.035789	.0219603
LnLIQ	-.0057173	.0457826	-0.12	0.901	-.0954495	.0840149
LnOBSA	.0436241	.022272	1.96	0.050	-.0000282	.0872764
LnINF	.1200053	.1730571	0.69	0.488	-.2191803	.4591909
LnGDPG	.0140258	.0204125	0.69	0.492	-.0259819	.0540336
_cons	.1344245	.5547303	0.24	0.809	-.952827	1.221676
Equation3						
LnRBC	-.2711774	.0973031	-2.79	0.005	-.4618879	-.0804669
LnRISK	-.0627049	.1535041	-0.41	0.683	-.3635674	.2381577
LnZ						
L1.	.885383	.0416251	21.27	0.000	.8037993	.9669667
SIZE	-.0319849	.0194081	-1.65	0.099	-.070024	.0060542
LnROA	.0322927	.023247	1.39	0.165	-.0132707	.077856
LnLIQ	.1362127	.0717505	1.90	0.058	-.0044157	.2768411
LnOBSA	-.117386	.0355551	-3.30	0.001	-.1870727	-.0476993
LnINF	-.0996014	.2713112	-0.37	0.714	-.6313615	.4321587
LnGDPG	.0061131	.0319685	0.19	0.848	-.056544	.0687702
_cons	.7185786	.8605099	0.84	0.404	-.9679899	2.405147

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 47: Estimation of the Log-Transformed Model Using Flat Capital Ratio and Dummy Variable (REG)—TURKEY (2002-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	273	12	.2043274	0.8875	2254.75	0.0000
Equation2	273	12	.2151963	0.6980	617.99	0.0000
Equation3	273	12	.4192605	0.7616	862.04	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.1760492	.0735065	-2.40	0.017	-.3201193	-.0319791
LnZ	-.0186792	.0315936	-0.59	0.554	-.0806016	.0432432
LnCAP						
L1.	.7812214	.0323711	24.13	0.000	.7177753	.8446676
SIZE	-.039535	.0083863	-4.71	0.000	-.0559718	-.0230981
LnROA	.0452808	.0123729	3.66	0.000	.0210302	.0695313
LnLIQ	.0539587	.0336198	1.60	0.109	-.0119349	.1198522
LnOBSA	-.0175052	.0188392	-0.93	0.353	-.0544293	.0194188
LnINF	.308765	.0578032	5.34	0.000	.1954728	.4220571
LnGDPG	.0332901	.0133592	2.49	0.013	.0071065	.0594737
REG	.3598016	.1187014	3.03	0.002	.1271511	.5924522
REGlnRISK	.3269206	.0781176	4.18	0.000	.1738129	.4800282
REGlnZ	.0028088	.0332637	0.08	0.933	-.0623869	.0680046
_cons	1.332807	.2164059	6.16	0.000	.908659	1.756955
Equation2						
LnCAP	.0237296	.0628929	0.38	0.706	-.0995381	.1469974
LnZ	.047575	.0370335	1.28	0.199	-.0250094	.1201594
LnRISK						
L1.	.6208089	.0411713	15.08	0.000	.5401146	.7015033
SIZE	.0101414	.0098216	1.03	0.302	-.0091085	.0293914
LnROA	-.0079781	.0138495	-0.58	0.565	-.0351226	.0191664
LnLIQ	-.0720212	.0369302	-1.95	0.051	-.144403	.0003606
LnOBSA	.0552589	.019291	2.86	0.004	.0174491	.0930686
LnINF	.0316144	.0603467	0.52	0.600	-.086663	.1498917
LnGDPG	.0031241	.0142238	0.22	0.826	-.024754	.0310022
REG	.2778141	.139067	2.00	0.046	.0052477	.5503804
REGlnCAP	.1020387	.0555837	1.84	0.066	-.0069032	.2109807
REGlnZ	-.0143317	.0425115	-0.34	0.736	-.0976526	.0689892
_cons	-.5154996	.2499402	-2.06	0.039	-1.005373	-.0256258
Equation3						
LnCAP	-.0293839	.1294949	-0.23	0.820	-.2831892	.2244213
LnRISK	.0746333	.1763161	0.42	0.672	-.2709399	.4202065
LnZ						
L1.	.7399455	.0359163	20.60	0.000	.6695509	.8103401
SIZE	-.0230931	.020468	-1.13	0.259	-.0632097	.0170236
LnROA	-.0454481	.0276032	-1.65	0.100	-.0995493	.0086532
LnLIQ	-.0204265	.0744521	-0.27	0.784	-.16635	.125497
LnOBSA	-.1436969	.0398764	-3.60	0.000	-.2218533	-.0655406
LnINF	.2799895	.1188478	2.36	0.018	.047052	.5129269
LnGDPG	.0409112	.0280452	1.46	0.145	-.0140564	.0958789
REG	.3690346	.2713263	1.36	0.174	-.1627552	.9008243
REGlnCAP	-.0293211	.1057971	-0.28	0.782	-.2366797	.1780375
REGlnRISK	.1406314	.1973479	0.71	0.476	-.2461634	.5274262
_cons	1.683533	.4988175	3.38	0.001	.705869	2.661198

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG REG REGlnRISK REGlnZ L.LnRISK REGlnCAP L.LnZ

Table 48: Estimation of the Log-Transformed Model Using Risk-Based Capital Ratio and Dummy Variable (REG)—TURKEY (2002-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	273	12	.2475611	0.8785	2204.45	0.0000
Equation2	273	12	.2120647	0.7067	620.19	0.0000
Equation3	273	12	.4242469	0.7559	839.38	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	.2145773	.1202102	1.79	0.074	-.0210302	.4501849
LnZ	-.1018853	.0376775	-2.70	0.007	-.1757317	-.0280388
LnRBC						
L1.	.8594273	.0470696	18.26	0.000	.7671726	.9516821
SIZE	-.0213651	.0107023	-2.00	0.046	-.0423412	-.000389
LnROA	.0304992	.0149685	2.04	0.042	.0011614	.0598369
LnLIQ	.0609119	.0408393	1.49	0.136	-.0191317	.1409555
LnOBSA	-.0629341	.0222636	-2.83	0.005	-.10657	-.0192982
LnINF	.3074718	.0687661	4.47	0.000	.1726927	.4422509
LnGDPG	.0300894	.015739	1.91	0.056	-.0007585	.0609373
REG	-.0164976	.1541127	-0.11	0.915	-.3185529	.2855576
REGlnRISK	.0178187	.1116661	0.16	0.873	-.2010429	.2366803
REGlnZ	.055794	.0426391	1.31	0.191	-.0277771	.1393651
_cons	1.542432	.2527783	6.10	0.000	1.046995	2.037868
Equation2						
LnRBC	-.0926412	.0484381	-1.91	0.056	-.1875781	.0022956
LnZ	.0495507	.0351465	1.41	0.159	-.0193352	.1184367
LnRISK						
L1.	.5685686	.0456378	12.46	0.000	.4791201	.658017
SIZE	-.018022	.0097266	-1.85	0.064	-.0370858	.0010417
LnROA	.0163878	.0135245	1.21	0.226	-.0101197	.0428953
LnLIQ	.0036653	.0369431	0.10	0.921	-.0687419	.0760724
LnOBSA	.0502619	.0192532	2.61	0.009	.0125262	.0879976
LnINF	.0340682	.0588682	0.58	0.563	-.0813113	.1494477
LnGDPG	.0051201	.0138759	0.37	0.712	-.0220762	.0323164
REG	.0707602	.1259413	0.56	0.574	-.1760801	.3176005
REGlnRBC	.0092686	.0432554	0.21	0.830	-.0755104	.0940476
REGlnZ	.0039079	.0402701	0.10	0.923	-.07502	.0828357
_cons	.0576545	.2503015	0.23	0.818	-.4329274	.5482363
Equation3						
LnRBC	-.1587688	.1316354	-1.21	0.228	-.4167695	.0992319
LnRISK	-.1880486	.2623173	-0.72	0.473	-.7021811	.3260839
LnZ						
L1.	.726454	.0361317	20.11	0.000	.6556372	.7972707
SIZE	-.0260258	.0206169	-1.26	0.207	-.0664341	.0143825
LnROA	-.0415691	.0276662	-1.50	0.133	-.0957939	.0126556
LnLIQ	-.0148868	.0748591	-0.20	0.842	-.1616079	.1318344
LnOBSA	-.1319313	.0402093	-3.28	0.001	-.21074	-.0531226
LnINF	.2750986	.1188534	2.31	0.021	.0421502	.5080471
LnGDPG	.0398668	.0280494	1.42	0.155	-.015109	.0948425
REG	.7060956	.2875947	2.46	0.014	.1424204	1.269771
REGlnRBC	.1113914	.1161148	0.96	0.337	-.1161893	.3389722
REGlnRISK	.3582786	.2545519	1.41	0.159	-.1406339	.8571912
_cons	1.488076	.5100375	2.92	0.004	.4884204	2.487731

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG REG REGlnRISK REGlnZ L.LnRISK REGlnRBC L.LnZ

Table 49: Estimation of the Log-Transformed Model Using Flat Capital Ratio and Dummy Variable (MEMB)—TURKEY (2002-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	273	12	.2287715	0.8590	1689.65	0.0000
Equation2	273	12	.2174218	0.6917	570.98	0.0000
Equation3	273	12	.4419831	0.7351	740.68	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.142548	.0758511	-1.88	0.060	-.2912135	.0061175
LnZ	-.0377671	.0333163	-1.13	0.257	-.1030657	.0275316
LnCAP						
L1.	.7993042	.037025	21.59	0.000	.7267365	.8718718
SIZE	-.0393209	.009613	-4.09	0.000	-.0581619	-.0204798
LnROA	.0348853	.0145497	2.40	0.016	.0063685	.0634022
LnLIQ	.027882	.0383231	0.73	0.467	-.0472298	.1029939
LnOBSA	-.0071073	.0225597	-0.32	0.753	-.0513234	.0371088
LnINF	.1439057	.059814	2.41	0.016	.0266724	.261139
LnGDPG	-.0044474	.0142462	-0.31	0.755	-.0323695	.0234748
MEMB	.0679777	.1291465	0.53	0.599	-.1851448	.3211003
MEMBlnRISK	.1891051	.0843954	2.24	0.025	.0236932	.3545169
MEMBlnZ	.0232714	.0346058	0.67	0.501	-.0445548	.0910975
_cons	1.007011	.2335886	4.31	0.000	.5491854	1.464836
Equation2						
LnCAP	.0424317	.0536113	0.79	0.429	-.0626445	.1475079
LnZ	.0355161	.034209	1.04	0.299	-.0315323	.1025646
LnRISK						
L1.	.6330365	.0421368	15.02	0.000	.5504499	.7156231
SIZE	.0044624	.0102663	0.43	0.664	-.0156593	.024584
LnROA	-.0103285	.0142818	-0.72	0.470	-.0383203	.0176633
LnLIQ	-.0489891	.0373876	-1.31	0.190	-.1222675	.0242893
LnOBSA	.0639564	.0201614	3.17	0.002	.0244407	.103472
LnINF	-.0789227	.0542786	-1.45	0.146	-.1853068	.0274615
LnGDPG	-.0010473	.0135429	-0.08	0.938	-.0275909	.0254962
MEMB	-.1495728	.1451449	-1.03	0.303	-.4340516	.134906
MEMBlnCAP	.0123675	.0446506	0.28	0.782	-.075146	.099881
MEMBlnZ	.0266865	.040804	0.65	0.513	-.0532877	.1066608
_cons	-.5021043	.2346476	-2.14	0.032	-.9620051	-.0422035
Equation3						
LnCAP	-.0769053	.1099579	-0.70	0.484	-.292419	.1386083
LnRISK	.0432179	.1503455	0.29	0.774	-.2514539	.3378898
LnZ						
L1.	.751569	.0390207	19.26	0.000	.6750898	.8280482
SIZE	-.0317277	.0218429	-1.45	0.146	-.0745391	.0110837
LnROA	-.0479454	.0286831	-1.67	0.095	-.1041632	.0082724
LnLIQ	-.0254771	.0770571	-0.33	0.741	-.1765062	.1255521
LnOBSA	-.1194892	.0421758	-2.83	0.005	-.2021522	-.0368262
LnINF	-.0626545	.1144395	-0.55	0.584	-.2869519	.1616429
LnGDPG	-.0142515	.0276974	-0.51	0.607	-.0685373	.0400343
MEMB	-.0044814	.1910057	-0.02	0.981	-.3788457	.3698829
MEMBlnCAP	-.0412354	.0809071	-0.51	0.610	-.1998104	.1173395
MEMBlnRISK	.1202761	.1889528	0.64	0.524	-.2500646	.4906167
_cons	.9932025	.4862092	2.04	0.041	.0402499	1.946155

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG MEMB MEMBlnRISK MEMBlnZ L.LnRISK MEMBlnCAP L.LnZ

Table 50: Estimation of the Log-Transformed Model Using Risk-Based Capital Ratio and Dummy Variable (MEMB)—TURKEY (2002-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	273	12	.238147	0.8875	2309.09	0.0000
Equation2	273	12	.2145369	0.6998	609.25	0.0000
Equation3	273	12	.4463305	0.7299	734.52	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	.1687578	.1005197	1.68	0.093	-.0282572	.3657727
LnZ	-.0817554	.0341224	-2.40	0.017	-.148634	-.0148768
LnRBC						
L1.	.8308669	.044072	18.85	0.000	.7444874	.9172463
SIZE	-.0299287	.0104312	-2.87	0.004	-.0503735	-.009484
LnROA	.0351861	.0148248	2.37	0.018	.0061301	.0642421
LnLIQ	.0547346	.0389189	1.41	0.160	-.021545	.1310143
LnOBSA	-.0734918	.0228723	-3.21	0.001	-.1183207	-.0286628
LnINF	.2710517	.063189	4.29	0.000	.1472035	.3948999
LnGDPG	.0014682	.0144426	0.10	0.919	-.0268388	.0297753
MEMB	.1537458	.151755	1.01	0.311	-.1436886	.4511801
MEMBlnRISK	.0097426	.1001647	0.10	0.923	-.1865767	.2060619
MEMBlnZ	.0051313	.0410521	0.12	0.901	-.0753293	.0855919
_cons	1.476256	.2301547	6.41	0.000	1.025161	1.92735
Equation2						
LnRBC	-.0540603	.0470256	-1.15	0.250	-.1462289	.0381082
LnZ	.0295648	.0327254	0.90	0.366	-.0345757	.0937054
LnRISK						
L1.	.6117992	.0466595	13.11	0.000	.5203482	.7032501
SIZE	-.0140615	.0098562	-1.43	0.154	-.0333793	.0052563
LnROA	.00516	.0139559	0.37	0.712	-.0221931	.0325131
LnLIQ	-.0025395	.0365745	-0.07	0.945	-.0742242	.0691453
LnOBSA	.0541957	.0201694	2.69	0.007	.0146645	.093727
LnINF	-.0864139	.0521759	-1.66	0.098	-.1886769	.015849
LnGDPG	-.003382	.0129666	-0.26	0.794	-.0287962	.0220321
MEMB	-.2351568	.1329519	-1.77	0.077	-.4957378	.0254242
MEMBlnRBC	-.0294303	.0406647	-0.72	0.469	-.1091317	.0502711
MEMBlnZ	.0369895	.0390298	0.95	0.343	-.0395074	.1134864
_cons	-.1691998	.2347361	-0.72	0.471	-.6292741	.2908745
Equation3						
LnRBC	-.1322755	.1116509	-1.18	0.236	-.3511073	.0865563
LnRISK	-.0874431	.2001235	-0.44	0.662	-.4796781	.3047918
LnZ						
L1.	.7480864	.0392762	19.05	0.000	.6711064	.8250664
SIZE	-.0396066	.0220049	-1.80	0.072	-.0827353	.0035222
LnROA	-.0413233	.0287984	-1.43	0.151	-.0977671	.0151205
LnLIQ	-.0066146	.0773454	-0.09	0.932	-.1582088	.1449795
LnOBSA	-.1232006	.0423744	-2.91	0.004	-.206253	-.0401482
LnINF	-.0689973	.1144682	-0.60	0.547	-.2933507	.1553562
LnGDPG	-.016264	.0277293	-0.59	0.558	-.0706125	.0380845
MEMB	.0321144	.2144155	0.15	0.881	-.3881323	.452361
MEMBlnRBC	-.0328638	.0968092	-0.34	0.734	-.2226063	.1568788
MEMBlnRISK	.1196868	.2140398	0.56	0.576	-.2998235	.5391971
_cons	1.094174	.4947723	2.21	0.027	.1244378	2.06391

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG MEMB MEMBlnRISK MEMBlnZ L.LnRISK MEMBlnRBC L.LnZ

Regression Outputs for Banks in the WAEMU

Table 51: Estimation of the Linear Model Using Flat Capital Ratio—WAEMU (2003-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	111	9	.0332301	-0.9174	25.64	0.0023
Equation2	111	9	.6817241	-27.8336	1.70	0.9954
Equation3	111	9	1.931095	0.0917	22.89	0.0064

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.0910093	.4974079	-0.18	0.855	-1.065911	.8838923
dZ	.0199983	.1090622	0.18	0.855	-.1937598	.2337563
CAP						
L1.	.0299726	.3367739	0.09	0.929	-.630092	.6900372
SIZE	-.0000112	.0119822	-0.00	0.999	-.0234959	.0234734
ROA	.0331089	3.848671	0.01	0.993	-7.510148	7.576366
LIQ	-.0130553	.0561926	-0.23	0.816	-.1231907	.0970801
OBSA	.0268027	.1483991	0.18	0.857	-.2640541	.3176596
INF	-.121696	.7660583	-0.16	0.874	-1.623143	1.379751
GDPG	.0053619	.5707589	0.01	0.993	-1.113305	1.124029
_cons	-.0054298	.2830192	-0.02	0.985	-.5601372	.5492776
Equation2						
dCAP	-34.83772	167.122	-0.21	0.835	-362.3909	292.7154
dZ	.3786377	1.781881	0.21	0.832	-3.113785	3.87106
RISK						
L1.	.5530744	6.169936	0.09	0.929	-11.53978	12.64593
SIZE	-.0458664	.2971471	-0.15	0.877	-.6282639	.5365312
ROA	12.08388	62.92048	0.19	0.848	-111.238	135.4058
LIQ	-.2041688	1.904096	-0.11	0.915	-3.936128	3.52779
OBSA	-.1201502	4.654452	-0.03	0.979	-9.242709	9.002409
INF	-2.303897	12.88421	-0.18	0.858	-27.55649	22.9487
GDPG	-1.675247	10.6131	-0.16	0.875	-22.47655	19.12605
_cons	.3087536	1.998963	0.15	0.877	-3.609143	4.22665
Equation3						
dCAP	104.8804	150.1111	0.70	0.485	-189.3319	399.0927
dRISK	4.570607	2.58035	1.77	0.077	-.486786	9.628
Z						
L1.	.0041476	.0289168	0.14	0.886	-.0525283	.0608234
SIZE	.0940471	.2743094	0.34	0.732	-.4435894	.6316836
ROA	-42.33359	115.6202	-0.37	0.714	-268.945	184.2778
LIQ	1.743541	3.757061	0.46	0.643	-5.620164	9.107246
OBSA	-1.323604	1.720853	-0.77	0.442	-4.696414	2.049205
INF	5.312531	7.828644	0.68	0.497	-10.03133	20.65639
GDPG	4.693117	15.53609	0.30	0.763	-25.75706	35.1433
_cons	-1.773583	5.400572	-0.33	0.743	-12.35851	8.811344

Endogenous variables: dCAP dRISK dZ
Exogenous variables: L.CAP SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 52: Estimation of the Linear Model Using Risk-Based Capital Ratio—WAEMU (2003-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	111	9	.0795929	-2.7676	11.42	0.2479
Equation2	111	9	.2364591	-2.4689	14.09	0.1191
Equation3	111	9	1.790107	0.2195	26.34	0.0018

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.33345	.6800928	-0.49	0.624	-1.666407	.9995074
dZ	.0444973	.1505226	0.30	0.768	-.2505217	.3395163
RBC						
L1.	-.0116799	.2071138	-0.06	0.955	-.4176155	.3942557
SIZE	-.0022554	.01399	-0.16	0.872	-.0296753	.0251645
ROA	-.624475	5.533921	-0.11	0.910	-11.47076	10.22181
LIQ	-.0001895	.1090529	-0.00	0.999	-.2139293	.2135503
OBSA	.0408253	.2128276	0.19	0.848	-.3763091	.4579597
INF	-.3656256	1.101446	-0.33	0.740	-2.52442	1.793169
GDPG	.2062539	.8208203	0.25	0.802	-1.402524	1.815032
_cons	.0358468	.3074501	0.12	0.907	-.5667444	.638438
Equation2						
dRBC	-2.45566	6.653386	-0.37	0.712	-15.49606	10.58474
dZ	.1308699	.2225849	0.59	0.557	-.3053884	.5671282
RISK						
L1.	-.0641439	1.227483	-0.05	0.958	-2.469967	2.341679
SIZE	-.0026529	.0484667	-0.05	0.956	-.0976458	.09234
ROA	-2.290312	9.093302	-0.25	0.801	-20.11286	15.53223
LIQ	-.0350066	.8305225	-0.04	0.966	-1.662801	1.592788
OBSA	.2026168	1.256948	0.16	0.872	-2.260955	2.666189
INF	-1.018576	2.433602	-0.42	0.676	-5.788348	3.751197
GDPG	.6418048	1.282106	0.50	0.617	-1.871076	3.154686
_cons	.0882532	.8129008	0.11	0.914	-1.505003	1.681509
Equation3						
dRBC	16.29086	80.22881	0.20	0.839	-140.9547	173.5364
dRISK	6.64069	12.38746	0.54	0.592	-17.63829	30.91967
Z						
L1.	-.001827	.037093	-0.05	0.961	-.0745278	.0708739
SIZE	.02862	.2679268	0.11	0.915	-.496507	.5537469
ROA	20.37826	87.92237	0.23	0.817	-151.9464	192.7029
LIQ	-.1000573	2.554458	-0.04	0.969	-5.106703	4.906589
OBSA	-1.02951	1.797845	-0.57	0.567	-4.553221	2.494201
INF	7.827542	8.475456	0.92	0.356	-8.784046	24.43913
GDPG	-4.565445	8.848865	-0.52	0.606	-21.9089	12.77801
_cons	-.3414419	5.233957	-0.07	0.948	-10.59981	9.916925

Endogenous variables: dRBC dRISK dZ
Exogenous variables: L.RBC SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 53: Estimation of the Log-Transformation Model Using Flat Capital Ratio—WAEMU (2002-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	148	9	.316768	0.6750	399.87	0.0000
Equation2	148	9	.1002721	0.6606	288.89	0.0000
Equation3	148	9	.6043303	0.6550	332.94	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-2.196006	1.00214	-2.19	0.028	-4.160164	-.2318486
LnZ	-.0284076	.0412262	-0.69	0.491	-.1092093	.0523942
LnCAP						
L1.	.974497	.0578526	16.84	0.000	.861108	1.087886
SIZE	.100395	.0504133	1.99	0.046	.0015868	.1992032
LnROA	-.0144175	.0154283	-0.93	0.350	-.0446564	.0158214
LnLIQ	-.3856785	.1790458	-2.15	0.031	-.7366017	-.0347552
LnOBSA	.2988636	.1692502	1.77	0.077	-.0328608	.630588
LnINF	-.0041962	.0136676	-0.31	0.759	-.0309843	.0225918
LnGDPG	.0442299	.0290184	1.52	0.127	-.0126452	.1011049
_cons	-1.770962	.7904359	-2.24	0.025	-3.320188	-.2217363
Equation2						
LnCAP	-.0005347	.0187632	-0.03	0.977	-.03731	.0362406
LnZ	-.0045201	.0125558	-0.36	0.719	-.029129	.0200888
LnRISK						
L1.	.2056497	.0661732	3.11	0.002	.0759526	.3353468
SIZE	.0220478	.0120706	1.83	0.068	-.0016101	.0457057
LnROA	.0038255	.0047444	0.81	0.420	-.0054734	.0131243
LnLIQ	-.1559435	.0218999	-7.12	0.000	-.1988666	-.1130205
LnOBSA	.132092	.0164927	8.01	0.000	.0997668	.1644171
LnINF	.0002284	.0043243	0.05	0.958	-.0082472	.0087039
LnGDPG	.0134023	.0075444	1.78	0.076	-.0013846	.0281891
_cons	-.3078942	.2047148	-1.50	0.133	-.7091279	.0933395
Equation3						
LnCAP	.0133597	.1129364	0.12	0.906	-.2079916	.234711
LnRISK	-3.09309	1.888499	-1.64	0.101	-6.794481	.6083008
LnZ						
L1.	.793574	.0615616	12.89	0.000	.6729155	.9142324
SIZE	.1981356	.0856799	2.31	0.021	.0302061	.366065
LnROA	-.0724499	.0273669	-2.65	0.008	-.126088	-.0188118
LnLIQ	-.4803614	.3420629	-1.40	0.160	-1.150792	.1900696
LnOBSA	.4230172	.3201256	1.32	0.186	-.2044174	1.050452
LnINF	-.0041702	.0261091	-0.16	0.873	-.055343	.0470027
LnGDPG	.0266261	.0553884	0.48	0.631	-.0819332	.1351854
_cons	-3.341365	1.385273	-2.41	0.016	-6.056451	-.6262788

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 54: Estimation of the Log-Transformation Model Using Risk-Based Capital Ratio—WAEMU (2002-2006)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	148	9	.3012628	0.7602	547.36	0.0000
Equation2	148	9	.1002185	0.6609	289.20	0.0000
Equation3	148	9	.6043303	0.6550	332.94	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	1.549079	1.001829	1.55	0.122	-.4144694	3.512628
LnZ	-.0070062	.0387986	-0.18	0.857	-.0830499	.0690376
LnRBC						
L1.	.9769725	.0551606	17.71	0.000	.8688598	1.085085
SIZE	-.0040916	.0467588	-0.09	0.930	-.0957373	.087554
LnROA	-.0326277	.0151143	-2.16	0.031	-.0622512	-.0030041
LnLIQ	.3541772	.1759702	2.01	0.044	.0092819	.6990724
LnOBSA	-.3279019	.1665634	-1.97	0.049	-.6543601	-.0014437
LnINF	-.0052918	.0129975	-0.41	0.684	-.0307665	.0201829
LnGDPG	-.0193275	.0278732	-0.69	0.488	-.073958	.035303
_cons	-.3127591	.7442938	-0.42	0.674	-1.771548	1.14603
Equation2						
LnRBC	-.0005344	.0187432	-0.03	0.977	-.0372704	.0362016
LnZ	-.0045177	.0125787	-0.36	0.719	-.0291714	.0201361
LnRISK						
L1.	.2055398	.066881	3.07	0.002	.0744555	.3366241
SIZE	.022036	.0121915	1.81	0.071	-.0018589	.0459309
LnROA	.0038234	.00472	0.81	0.418	-.0054276	.0130745
LnLIQ	-.1558602	.0221613	-7.03	0.000	-.1992955	-.1124249
LnOBSA	.1320214	.0165379	7.98	0.000	.0996077	.1644351
LnINF	.0002282	.0043222	0.05	0.958	-.0082431	.0086996
LnGDPG	.0133951	.0075385	1.78	0.076	-.0013801	.0281703
_cons	-.3077296	.2052673	-1.50	0.134	-.7100462	.094587
Equation3						
LnRBC	.0133597	.1129364	0.12	0.906	-.2079916	.234711
LnRISK	-3.07973	1.916568	-1.61	0.108	-6.836135	.6766741
LnZ						
L1.	.793574	.0615616	12.89	0.000	.6729155	.9142324
SIZE	.1981356	.0856799	2.31	0.021	.0302061	.366065
LnROA	-.0724499	.0273669	-2.65	0.008	-.126088	-.0188118
LnLIQ	-.4803614	.3420629	-1.40	0.160	-1.150792	.1900696
LnOBSA	.4230172	.3201256	1.32	0.186	-.2044174	1.050452
LnINF	-.0041702	.0261091	-0.16	0.873	-.055343	.0470027
LnGDPG	.0266261	.0553884	0.48	0.631	-.0819332	.1351854
_cons	-3.341365	1.385273	-2.41	0.016	-6.056451	-.6262788

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 55: Estimation of the Linear model using Flat Capital Ratio—WAEMU (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	296	9	.0362278	0.2667	107.00	0.0000
Equation2	296	9	.2397267	0.3217	142.28	0.0000
Equation3	296	9	18.11836	0.2593	100.51	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.0046585	.0131428	-0.35	0.723	-.0304179	.0211009
dZ	.0000395	.0002086	0.19	0.850	-.0003694	.0004484
CAP						
L1.	-.21019	.0330496	-6.36	0.000	-.2749661	-.1454139
SIZE	-.0209109	.0028898	-7.24	0.000	-.0265748	-.0152471
ROA	.4450454	.0620295	7.17	0.000	.3234699	.566621
LIQ	.0022712	.0213833	0.11	0.915	-.0396394	.0441817
OBSA	-.0178875	.0208399	-0.86	0.391	-.0587329	.0229579
INF	-.1047857	.0759262	-1.38	0.168	-.2535983	.0440268
GDPG	-.1073705	.0713838	-1.50	0.133	-.2472801	.032539
_cons	.4379589	.0590955	7.41	0.000	.3221339	.5537839
Equation2						
dCAP	-.0297525	1.04038	-0.03	0.977	-2.068859	2.009354
dZ	.0006414	.0013928	0.46	0.645	-.0020884	.0033713
RISK						
L1.	-.568408	.0494543	-11.49	0.000	-.6653366	-.4714794
SIZE	.0280264	.0203697	1.38	0.169	-.0118975	.0679503
ROA	-.0243782	.6320577	-0.04	0.969	-1.263188	1.214432
LIQ	-.4675535	.1467312	-3.19	0.001	-.7551413	-.1799656
OBSA	.7252538	.1404512	5.16	0.000	.4499746	1.000533
INF	-.1038222	.5013366	-0.21	0.836	-1.086424	.8787794
GDPG	.7805884	.4889213	1.60	0.110	-.1776797	1.738857
_cons	.0394488	.3931533	0.10	0.920	-.7311176	.8100152
Equation3						
dCAP	33.48148	77.95195	0.43	0.668	-119.3015	186.2645
dRISK	-4.529508	6.568472	-0.69	0.490	-17.40348	8.344461
Z						
L1.	-.198752	.0208622	-9.53	0.000	-.2396412	-.1578628
SIZE	-.9817609	1.535663	-0.64	0.523	-3.991604	2.028083
ROA	42.81589	48.54087	0.88	0.378	-52.32246	137.9542
LIQ	-9.938351	10.85194	-0.92	0.360	-31.20776	11.33106
OBSA	2.296439	10.5716	0.22	0.828	-18.42351	23.01639
INF	-.2976038	37.83722	-0.01	0.994	-74.45719	73.86198
GDPG	23.80507	36.44615	0.65	0.514	-47.62808	95.23822
_cons	24.86223	30.09151	0.83	0.409	-34.11604	83.8405

Endogenous variables: dCAP dRISK dZ
Exogenous variables: L.CAP SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 56: Estimation of the Linear Model Using Risk-Based Capital Ratio—WAEMU (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	296	9	.0481576	0.2785	107.70	0.0000
Equation2	296	9	.2383183	0.3296	144.07	0.0000
Equation3	296	9	18.12538	0.2588	101.00	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
dRISK	-.0310739	.0176623	-1.76	0.079	-.0656913	.0035435
dZ	.0000737	.0002757	0.27	0.789	-.0004666	.000614
RBC						
L1.	-.2546176	.0364887	-6.98	0.000	-.3261342	-.183101
SIZE	-.0275654	.0038476	-7.16	0.000	-.0351066	-.0200243
ROA	.479795	.0823854	5.82	0.000	.3183226	.6412674
LIQ	.0397114	.0281407	1.41	0.158	-.0154433	.0948661
OBSA	-.0766527	.0280742	-2.73	0.006	-.1316771	-.0216284
INF	-.1437443	.1005836	-1.43	0.153	-.3408845	.0533959
GDPG	-.1116851	.0949089	-1.18	0.239	-.2977032	.074333
_cons	.5724857	.0782765	7.31	0.000	.4190666	.7259048
Equation2						
dRBC	-.2596599	.7004232	-0.37	0.711	-1.632464	1.113144
dZ	.0006883	.0013742	0.50	0.616	-.002005	.0033817
RISK						
L1.	-.5615598	.0523883	-10.72	0.000	-.664239	-.4588807
SIZE	.0244794	.0194467	1.26	0.208	-.0136355	.0625942
ROA	.0896035	.5324708	0.17	0.866	-.95402	1.133227
LIQ	-.4482916	.152793	-2.93	0.003	-.7477604	-.1488227
OBSA	.7046921	.148312	4.75	0.000	.414006	.9953782
INF	-.1212601	.4990348	-0.24	0.808	-1.09935	.8568301
GDPG	.749826	.4822656	1.55	0.120	-.1953972	1.695049
_cons	.1001078	.3650282	0.27	0.784	-.6153344	.81555
Equation3						
dRBC	45.20266	53.15688	0.85	0.395	-58.98291	149.3882
dRISK	-2.507055	7.105667	-0.35	0.724	-16.43391	11.4198
Z						
L1.	-.1981628	.0207088	-9.57	0.000	-.2387512	-.1575743
SIZE	-.7421428	1.441616	-0.51	0.607	-3.567658	2.083373
ROA	35.98914	41.17006	0.87	0.382	-44.70269	116.681
LIQ	-11.59837	11.08106	-1.05	0.295	-33.31684	10.1201
OBSA	3.742038	10.73333	0.35	0.727	-17.2949	24.77898
INF	1.722355	37.91067	0.05	0.964	-72.58119	76.0259
GDPG	24.49927	35.93325	0.68	0.495	-45.9286	94.92714
_cons	20.39799	28.12624	0.73	0.468	-34.72841	75.5244

Endogenous variables: dRBC dRISK dZ
Exogenous variables: L.RBC SIZE ROA LIQ OBSA INF GDPG L.RISK L.Z

Table 57: Estimation of the Log-Transformation Model Using Flat Capital Ratio—WAEMU (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	296	9	.4383662	0.4990	279.22	0.0000
Equation2	296	9	.1399921	0.4262	220.66	0.0000
Equation3	296	9	.618509	0.7844	1138.07	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.0056888	.2847076	-0.02	0.984	-.5637055	.5523279
LnZ	.0722106	.0306585	2.36	0.019	.0121211	.1323001
LnCAP						
L1.	.4974658	.0481249	10.34	0.000	.4031427	.5917888
SIZE	-.1731691	.03203	-5.41	0.000	-.2359469	-.1103914
LnROA	-.0357745	.02185	-1.64	0.102	-.0785998	.0070507
LnLIQ	-.0329798	.078238	-0.42	0.673	-.1863235	.1203639
LnOBSA	.0224612	.043024	0.52	0.602	-.0618643	.1067868
LnINF	-.0388445	.0157414	-2.47	0.014	-.0696972	-.0079919
LnGDPG	-.0242195	.0291371	-0.83	0.406	-.0813273	.0328882
_cons	1.64173	.6180537	2.66	0.008	.4303672	2.853093
Equation2						
LnCAP	.0073614	.0308735	0.24	0.812	-.0531496	.0678724
LnZ	.0036777	.0106759	0.34	0.730	-.0172467	.0246021
LnRISK						
L1.	.5137866	.0467103	11.00	0.000	.4222361	.6053372
SIZE	.0177823	.0124781	1.43	0.154	-.0066744	.0422389
LnROA	-.0044746	.006916	-0.65	0.518	-.0180297	.0090805
LnLIQ	-.088062	.0220217	-4.00	0.000	-.1312238	-.0449002
LnOBSA	.0324395	.0130295	2.49	0.013	.0069023	.0579768
LnINF	-.0003179	.0051646	-0.06	0.951	-.0104403	.0098044
LnGDPG	-.0171453	.00936	-1.83	0.067	-.0354905	.0012
_cons	-.4352244	.1957137	-2.22	0.026	-.8188163	-.0516325
Equation3						
LnCAP	-.3288423	.1447986	-2.27	0.023	-.6126422	-.0450423
LnRISK	.313602	.400747	0.78	0.434	-.4718477	1.099052
LnZ						
L1.	.8183287	.0386779	21.16	0.000	.7425215	.8941359
SIZE	-.1846905	.0601137	-3.07	0.002	-.3025113	-.0668698
LnROA	-.2171497	.026865	-8.08	0.000	-.2698042	-.1644953
LnLIQ	-.0537409	.1113781	-0.48	0.629	-.272038	.1645562
LnOBSA	.0494936	.0605385	0.82	0.414	-.0691596	.1681468
LnINF	-.0432679	.0231454	-1.87	0.062	-.088632	.0020962
LnGDPG	.0449589	.0413498	1.09	0.277	-.0360853	.1260031
_cons	2.475832	.9306137	2.66	0.008	.6518627	4.299801

Endogenous variables: LnCAP LnRISK LnZ
Exogenous variables: L.LnCAP SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

Table 58: Estimation of the Log-Transformation Model Using Risk-Based Capital Ratio—WAEMU (2007-2015)

Three-stage least-squares regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Equation1	296	9	.4607482	0.4696	245.56	0.0000
Equation2	296	9	.1410243	0.4177	217.44	0.0000
Equation3	296	9	.6187129	0.7842	1137.31	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Equation1						
LnRISK	-.0467315	.3107364	-0.15	0.880	-.6557637	.5623008
LnZ	.0679155	.0323434	2.10	0.036	.0045235	.1313075
LnRBC						
L1.	.4916265	.0501445	9.80	0.000	.3933452	.5899079
SIZE	-.1893318	.0332353	-5.70	0.000	-.2544718	-.1241918
LnROA	-.0314877	.0229047	-1.37	0.169	-.07638	.0134046
LnLIQ	.0508169	.0839766	0.61	0.545	-.1137742	.215408
LnOBSA	-.0080666	.0455186	-0.18	0.859	-.0972815	.0811483
LnINF	-.0386106	.016545	-2.33	0.020	-.0710383	-.0061829
LnGDPG	-.0075056	.0307739	-0.24	0.807	-.0678213	.0528101
_cons	2.047976	.6486426	3.16	0.002	.7766594	3.319292
Equation2						
LnRBC	.0073929	.0314287	0.24	0.814	-.0542062	.068992
LnZ	.003717	.0106918	0.35	0.728	-.0172387	.0246726
LnRISK						
L1.	.5175783	.0494376	10.47	0.000	.4206823	.6144743
SIZE	.0179061	.0129558	1.38	0.167	-.0074868	.0432991
LnROA	-.0045046	.0069659	-0.65	0.518	-.0181575	.0091483
LnLIQ	-.0887132	.0216937	-4.09	0.000	-.1312321	-.0461943
LnOBSA	.0326748	.013036	2.51	0.012	.0071246	.058225
LnINF	-.0003194	.0052029	-0.06	0.951	-.0105169	.009878
LnGDPG	-.0172743	.0093655	-1.84	0.065	-.0356303	.0010816
_cons	-.438386	.2017682	-2.17	0.030	-.8338444	-.0429276
Equation3						
LnRBC	-.3295751	.1452741	-2.27	0.023	-.614307	-.0448431
LnRISK	-.0153765	.4192346	-0.04	0.971	-.8370612	.8063083
LnZ						
L1.	.8181831	.0386633	21.16	0.000	.7424044	.8939617
SIZE	-.1848124	.0601899	-3.07	0.002	-.3027826	-.0668423
LnROA	-.2172301	.0268807	-8.08	0.000	-.2699154	-.1645448
LnLIQ	-.0539639	.1114397	-0.48	0.628	-.2723817	.1644539
LnOBSA	.0497402	.0605706	0.82	0.412	-.068976	.1684564
LnINF	-.0433669	.0231664	-1.87	0.061	-.0887721	.0020384
LnGDPG	.0449859	.0413626	1.09	0.277	-.0360832	.1260551
_cons	2.476621	.9311154	2.66	0.008	.6516679	4.301573

Endogenous variables: LnRBC LnRISK LnZ
Exogenous variables: L.LnRBC SIZE LnROA LnLIQ LnOBSA LnINF LnGDPG L.LnRISK L.LnZ

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SOSYAL BİLİMLER ENSTİTÜSÜ
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HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İŞLETME ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 20.10.2017…

Tez Başlığı / Konusu: BANKACILIK DÜZENLEMESİ VE BASEL NORMLARI: TÜRKİYE VE BAEPB İÇİN SERMAYE-RİSK İLİŞKİSİ ÜZERİNE KARŞILAŞTIRMALI BİR ARAŞTIRMA.

Yukarıda başlığı/konusu gösterilen tez çalışmamın a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 238 sayfalık kısmına ilişkin, 20/10/2017 tarihinde şahsım/tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda belirtilen filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 14 'tür.

Uygulanan filtrelemeler:

1- Kabul/Onay ve Bildirim sayfaları hariç,
2- Kaynakça hariç
3- Alıntılar dâhil
4- 5 kelimeden daha az örtüşme içeren metin kısımları hariç

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Gereğini saygılarımla arz ederim.

Tarih ve İmza

20.10.2017

Adı Soyadı:	TCHIGNAGBE GUY CRESCENT MEBOUNOU TOSSOU
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İŞLETME ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 17/11/2017

Tez Başlığı / Konusu: BANKACILIK DÜZENLEMESİ VE BASEL NORMLARI: TÜRKİYE VE BAEPB İÇİN SERMAYE-RİSK İLİŞKİSİ ÜZERİNE KARŞILAŞTIRMALI BİR ARAŞTIRMA

Yukarıda başlığı/konusu gösterilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır,
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne müdahale içermemektedir.
4. Gözlemsel ve betimsel araştırma (anket, ölçek/skala çalışmaları, dosya taramaları, veri kaynakları taraması, sistem-model geliştirme çalışmaları) niteliğinde değildir.

Hacettepe Üniversitesi Etik Kurullar ve Komisyonlarının Yönergelerini inceledim ve bunlara göre tez çalışmamın yürütülebilmesi için herhangi bir Etik Kuruldan izin alınmasına gerek olmadığını; aksi durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Tarih ve İmza
17.11.2017

Adı Soyadı:	TCHIGNAGBE GUY CRESCENT MEBOUNOU TOSSOU
Öğrenci No:	N11246520
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Statüsü:	☐ Y.Lisans ☒ Doktora ☐ Bütünleşik Dr.

DANIŞMAN GÖRÜŞÜ VE ONAYI

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Curriculum vitae

Tchignagbé Guy Crescent MEBOUNOU TOSSOU
Born on June 15, 1982 in Parakou (Benin)
Marital status: Married

Education status

Degree	Name of the school	Counrty	years
Bachelor Degree in Business Administration	Abomey-Calavi University	Benin	2002
Bachelor Degree in Accounting	Academy of Nantes	France	2007
Bachelor in Degree in Law	Abomey-Calavi University	Benin	2007
Master Degree in Governance and Democracy	Abomey-Calavi University	Benin	2007
Master Degree in Business Administration	Abomey-Calavi University	Benin	2009
Master Degree in Accounting	Academy of Nantes	France	2011
Ph.D. in Business Administration	Hacettepe University	Turkey	2017

Published Papers

- T. Guy Crescent Mebounou, Mehmet Baha Karan, Hodonou Dannon , 2015; " Liquidity and bank profitability in WAEMU zone: a panel data analysis, ", Afro-Asian Journal of Finance and Accounting, Vol. 5, N° 2, pp. 113-134.
- Alexis Abodohoui, Imelda Aurore da-Silva, Guy Crescent Tchignagbé MEBOUNOU TOSSOU, Zhan Su; 2014 “What are the Real Chances for Africa to Develop its Trade?” European Journal of Business and Management, Vol. 6, N° 33, pp. 90-100.

Work experiences

Period		Jobs	Working Institutions
- October 2003 – October 2017	:	Lecturer of Accounting, Finance, Statistics, and Corporate Governance in Business Schools	Parakou University, ESGIS, UPIB, HECM, ISM Adonaï, Cours Sonou
- May 2008 – October 2011	:	Accounting and Audit	Accounting Firm “Etudis Conseils Afrique”
- January 2008 - April 2008	:	Accounting and Audit (Internship)	Accounting Firm SAFECO
- October 2007 – December 2007	:	Bachelor Programs’ Coordinator	International Polytechnic University Of Benin (UPIB)
- August 2003 – January 2004	:	Internship in Accounting Department	Benin National Broadcast House

Foreign language: French, English, Turkish

Skills and Interests

Highly motivated for Teaching and Research in Management, Accounting and finance field, excellent interpersonal and communication skills, team worker, responsible, hard worker, able to take initiatives, able to work independently under pressure and with little or no supervision.

References

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