Risk-taking behavior of banks, ownership structures and effect of regulations on franchise value and efficiency: empirical evidence from US Banking Sector.

by

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A dissertation submitted in partial fulfillment of the requirements
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No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the **Department of Finance & Investment, NUST Business School National University of Sciences and Technology, Islamabad, Pakistan** in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Field of **Business Administration.**

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Annex L
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Dedication

My thesis is dedicated to the memory of my late husband Babar Ali Khan, my late son Asfandyar Ali Khan , my dearest daughter Jumanah and to my family and all my friends that I consider family.

First and foremost, I dedicate my work to the memory of my late husband Babar who started me on this journey of self-determination. I was 41 years old in June of 2010 when he called me from work. He asked me how much I weighed. I was surprised at the question and told him that my weight was a secret that he would never find out. He insisted, and I told him 50 kgs. He laughed and asked if he could put it down twice. I asked where he needed to put my weight and was told that he had decided to get me enrolled in the PhD program at NUST and was filling out the application forms for me. It was a funny thing to do but nothing ever surprised me about Babar. He always did things first and worried about the consequences later. I did not really take him seriously because ever since we got married 14 years ago, I had wanted to do PhD but one thing or another got in the way of my dream. This time he decided that I had too much time on my hands and wanted me to stay busy with a new hobby. I had a lot of concerns about how the house would function and who would pick and drop the children while I was at the university. I was informed that he would be stepping in to take care of these chores. Babar at the time was the Vice president and branch manager at Askari bank limited and his work was five minutes from our house. His office overlooked the children's school so I was convinced that all would be well. There were minor issues like the time he left milk to boil on the stove and sent one of his staff members to go to our house and turn off the stove or the time when he forgot to pick the children - but in his mind

these were minor issues – little did I know that these were the gestures apart from my dearest daughter Jumanah, that would keep me going when I lost my husband and son in December 2010.

My PhD is dedicated to my most perfect, dearly loved son Asfandyar – I called him Janu because he was my life. I lost him to a drag race accident when he was only 11 years and 4 months old and it killed me. Not a day goes by that I don't remember him or think about him. When I started my PhD Janu was very excited, he wanted to know how I felt as a student. He used to ask my sister-in-law Hina, who was one of my professors to give him updates on how I was doing. I will probably never recover from losing my son, but I am grateful to Almighty Allah that he gave me the time to be with my special little boy and to love him. He has held my heart since the day he was born.

I also dedicate my PhD to my most favorite and beloved daughter Jumanah, she is my beacon, my strength, the purpose in my life, she is my heart and my soul. I always call her my favorite daughter and she laughs and says, "But Ma I am your only daughter!!!" I have never met anyone with so much courage and patience as the tiny 9-year-old child who kept me going day in and day out when we lost two of the most important people in our life - Babar and Janu. I am so thankful to Allah that I have Jumanah as my daughter. Jumanah is now 17 and has just graduated from high school and being the special child that she is she ensured that she honored her brother on her graduation. All the students at her school were asked to provide two photographs: one from their childhood and one from their graduation. All the other children provided their own childhood pictures but Jumanah provided one that had her and her brother in it. She made sure that she included her brother in the most important milestone of her life. My daughter is truly a gift to me from Allah and I pray for her success and happiness always.

I am most grateful to my mother, my siblings, their spouses, my nephews and my nieces for all their support and help on this journey. It is safe to say that neither Jumanah nor I could have

survived without their help. Thank you, Ami, for being the silent tower of support. Thank you for your help and your mentoring – most of all thank you for always being there. Thank you Sahar and Tariq bhai and their son Aizaz for their unwavering support. Thank you for bringing us to St. John's and helping us start a new life filled with peace and tranquility. Thank you Adil and Hina for always taking care of us. Both of you have always helped out in whatever capacity you can – thank you for your generosity and your warm loving hearts. Thank you to my most loved nephews Bilal and Asad for all the love and support. Thank you to Masood bhai (Adil's father in law) who looked after Jumanah and brought her home from school alongwith with my nephews Bilal and Asad while I was at the university. Masood bhai has always had a very grounding influence on all of us siblings – his patience, his kindness and his wisdom are greatly appreciated. A big heart felt thank you to Amber and Abid and my nephew Maher and niece Leena for the wonderful times in Fairfax, trips to Disney world and for the best Ramadan's in the US. Thank you, Sonia and Suleman, for looking after Jumanah when I was working or at the university, and thank you for all the fun filled activities that you guys included us in. A special mention of my dearly loved nieces Zeenat and Zainab – they are the rays of sunshine in our lives and they are the most awesome nieces one could ever want.

I must also thank my favorite aunt P. Meyer for all her love and support. She was the world's best khala. Sadly, she passed away in April 2019 and I never got a chance to tell her how grateful I was for all the times that I needed strength and guidance and she was always there to help in any capacity that I required. I have to thank my mamoo Uncle Joji and my mammi Aunty Jabeen for the many times that I needed help and they were ready to provide it in an instance. I could not have made it this far without all of you. I remember the days that I needed peace and solace and they offered their house in the mountains that I could go to and be off the grid. Also, a special mention for my favorite cousin Ahsan and his wonderful wife Linda, thank you for the trip to Philadelphia and San Diego and for all the things that you did for Jumanah and I during the most difficult times

of our lives.

My PhD could not have happened without my best friend Suhail, has stood by me for the past many years. Overtime some people become closer than family, and I am proud to call Suhail family. Suhail is one of the most unusual people that I will ever know, he knows what friendship truly is and he honored me by naming his son after mine. I am truly blessed that I have him in my life and no matter where we may be, we will always remain friends. My prayers for your continued success Suhail.

Finally, my PhD would not have been possible without Haroon, Humayun and Noman – the three brothers who made it their mission to ensure that Jumanah and I were safe and looked after. Not only did one of the three visit us every day during the years that we were in Pakistan they included us in their family. Jumanah and I are blessed to know them, and we cherish our friendship with them. These are the friends that I am honored to call family, may they prosper and succeed in life.

In the end I must acknowledge my husband's nephew Jamal and niece Sana. Sadly, Jamal is no longer with us – he passed away in a tragic road accident in 2017. Both Sana and Jamal have always been my favorite children – they have stood by me at all times and in any capacity that they could, and I love them both dearly.

I also must add to this list Murtaza bhai, my cook, helper, cleaner, gardener and the many other roles that he played – He not only looked after Jumanah and I, but he protected us from many things. I can never thank him enough for all the things he did for us. He is the most trustworthy, loyal human being that can exist in this world also no one can cook like he does. So, my heart felt thank you to Murtaza bhai.

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Thank you, Dr. Dawood, for your guidance and your patience with me, I am very grateful for your supervision. I have to acknowledge that you are a gem of a person and supervising long distance is not an easy task, but you made it a priority and I can never thank you enough for it.

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Abstract

Regulators, researchers and academia have long held their deep-rooted interest in the characteristics of financial institutions, which have experienced their share of crises in the past half century. The recent wave of crises that started following sub-prime mortgage crises of 2008 subsequently led to global recession and resulted in stringent regulations requiring banks and financial institutions to comply with directives from International bodies as well as national regulators. Despite the severity of its consequences on the real estate sector and financial institutions, the impact on the financial industry has not been fully explored in terms of interlinkages between risk-taking, derivative usage, ownership structures, regulations, efficiency and franchise value. The thesis comprises of three essays: the first essay is based on dynamic panel methodology investigating effect of bank stability, ownership structure and capital regulations on efficiency of US BHCs employing interactive variables for ownership structure and stability. The results show that BHCs with higher stability are typically more efficient. Regarding the ownership structure, BHCs with higher proportion of institutional ownership especially those exerting the market discipline such as the mutual funds and hedge funds positively affect the efficiency of BHCs. On the other hand, higher levels of government ownership adversely impact the efficiency of BHCs. Overall empirical findings support the regulatory view that higher stability levels and close monitoring by shareholders help in improving the efficiency.

The focus of the second essay is an analysis of the impact that ownership structure, stability, competition and capital regulations would have on franchise value of US BHCs. My results show that BHCs with the higher stability enjoy higher franchise value. Higher institutional investment is associated with higher franchise value in line with arm-length owner-manager relationship hypothesis and the ability to sell the underperforming banks. On the contrary, BHCs with higher family ownership have lower franchise values indicating the existence of agency problem. Though maintaining higher capital buffers alone did not significantly influence franchise value of BHCs, however, capital regulations when used interactively with ownership structure are found to have a moderating effect on franchise value of US BHCs. The results indicate that increase in the capitalization moderates marginal effect of both family as well as institutional ownership on franchise value negatively.

The third essay in the series focuses on the issue of how the decision to transact in derivatives and ownership structure would shape the risk-taking behavior of US BHCs. The empirical findings suggest that ownership structure affects stability of US BHCs and higher ownership concentration with financial institutions that manage assets on behalf of their clients such as mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund, trust and endowment companies are associated with lower stability as compared with those BHCs with a higher level of government ownership. The empirical results indicate that the using credit derivatives results in higher stability and supports the hedging

hypothesis. Meanwhile, interest rate derivative and foreign exchange derivative usage decreases the stability of US BHCs supporting the substitution hypothesis. Overall, the empirical results reveal how the risk-taking behavior, propensity to use derivatives and ownership structure of US BHCs are connected.

This thesis has important implications for regulators, governments and different categories of owners. Regulators can also find these results valuable in understanding the risk appetites of family, government and institutional investors and their effects on stability, efficiency and franchise value of BHCs. The study concludes that understanding of the ownership structure, stability, capitalization in the purview of efficiency and franchise value are important for regulators especially at the macro-economic level and while framing regulations to check the risk-taking by banks.

Key words: Risk-taking, ownership structures, stability, z_score, Regulatory capital ratio, efficiency, franchise value, derivatives.

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List of Abbreviations

BCBS	Basel committee for banking supervision
BHC	Bank holding company
DIV	Diversification - Net non-interest income scaled by net interest income
EFF	Efficiency - non-interest expenses less the amortization of intangible assets as a percent of net interest and non-interest income
EFFRR	Effective federal fund reserve rate
FDIC	Federal deposit Insurance Corporation
FI	Financial institutions
FRBC	Federal reserve bank of Chicago
GSPG	Growth rate of gross state-wise product
GOV	Government shareholding
HERF	Herfindahl- Hirschman's Index
INST	Institutional shareholding
LIQUID	Liquidity – defined as loans to deposit ratio
ROA	Return on assets
ROE	Return on equity
REG	Regulatory capital ratio
SIZE	Size of the firm – log of total assets
UNEMPG	State-wise unemployment growth rate

Part-I

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

An environment of heightened competition coupled with the excessive risk-taking by banks and other financial institutions and the inherent unstable nature of the international banking industry was one of the causes that started the financial crisis in 2008, making it one of the most devastating crises in the US history. The effects of this crisis also spilled over to the international and in particular the European markets many of whom were heavily invested in the US market.

What followed as a consequence of this crisis was a string of stricter regulatory and risk management measures on the national and international level as well as an intense focus on how to manage the risk-taking behaviors of financial institutions effectively. It became a priority to identify and isolate the risks affecting the financial stability and to find a way to mitigate these risks. The regulatory pressure on financial institutions to curb excessive risk therefore became the center of interest for researchers, regulators and investors alike, especially with BASEL III's full implementation scheduled for 2019. Furthermore, at the national level Dodd Frank Act (2010) and its extension Volcker's rule (2013) were put into place to keep excessive risk-taking under control.

The existing empirical literature based on the drivers behind the risk-taking behavior of banks has been directed either primarily towards more stringent regulatory measures or to

strengthening risk management systems of banks[1]. However, adhering to the stringent regulations and keeping a check on excessive risk while still trying to maintain profitability can be a challenging proposition for the financial institutions. As a result, the higher resilience may have unintended consequence of lowering efficiency, empirical literature suggests that bank efficiency is linked to its ownership structure, Laeven (1999) suggest that the ownership structure of banks is not only complex but also involves several dimensions. Though several studies have examined the relationship between efficiency and ownership structures[2] of banks however, the interactions between risk-taking, ownership structure and efficiency remain under explored, furthermore efficiency is also impacted by the capital regulations Kwan and Eisenbeis (1997). Therefore, the first essay of the thesis addresses the inter-twined relationship between risk-taking, capital regulations, ownership structure and efficiency of US bank holding companies (BHCs). Since both risk-taking and ownership structure are determinants of efficiency, the research follows Lin et al., (2016) and creates unique interactive variables for stability and ownership structure and uses a dynamic panel methodology that not only considers the time variation but also the interaction to see whether efficiency in impeded or enhanced in the sample under study.

One of the primary functions of any institution is to generate profits and by extension have a high franchise value, there is some evidence suggesting consequential relationship of the ownership structure with franchise value (Pathan et al., 2015; Jiménez et al., 2013) and with

[1] for instance, Saunders et al. (1990), Gorton and Rosen (1995), Sullivan and Sponge (2007), Anderson and Fraser (2000), Lee (2002), and Ashraf and Goddard, (2012).
[2] for example, Jensen and Meckling (1976), Morck et al., (1998), Laeven (1999), Fries and Taci (2005), Williams and Nguyen (2005), Micco et al., (2007), Lin and Zhang (2009), Berger et al. (2009), and Cornett et al., (2010) among many others.

stability (Laeven and Levine, 2009; Ashraf et al. 2016; Barry et al., 2008) of banks. Furthermore, bank regulations while interacting with varying types and levels of shareholding, market competition, and the economic environment can also affect franchise value. The second essay in this thesis addresses the question of how the risk-taking, regulations and ownership structure would affect franchise value of banks using dynamic panel methodology alongwith interactive variables for shareholding and bank regulations.

The current fast pace in financial innovation which includes the use of various categories and types of derivative instruments as well as the new role assumed by the different investors in particular the institutional investors has led not only to increased liquidity but has also resulted in assumption of higher level of risk by banks. The last essay in the thesis focuses on how the decision to transact in derivatives would affect the bank risk. While previous research has explored the relationship between insolvency risk of a bank and the decision to contract in derivatives, they have not included the effect of ownership structure. Furthermore, previous research such as that by Kim and Koppenhaver (1992), Carter and Sinkey (1998), Brewer et al., (2000), and Cardone-Riportella et al., (2010) point out that size, capital structure as well as the net interest margin are important determinants of the decision to transact in derivative instruments. Therefore, the last essay includes the impact of these variables alongwith ownership structure on bank stability and the decision to transact in derivatives.

The study is unique and different from the previous research conducted in this area in terms of sample coverage, methodology as well as definitions of the main variables used. Furthermore, the time-period and choice of sample on reflects relative stability, global crisis and recovery in the US banking sector.

Banks in the US are held by bank holding companies (BHCs) that own and control the domestic banks and engage in the standard activities which include but are not limited to lending and deposit taking. The ownership of these bank holding companies is made up of different categories of ownership and is classified as families and individuals, government, banks, investment banks, insurance companies, mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.

Previous studies have used time invariant static variables for ownership structures, assuming no change in the ownership structure over time Morck et al., (1988), Laeven and Levine (2009). However, bank ownership can experience a considerable change in both the ownership and its types Ashraf et al., (2016). Ashraf et al., (2016) study banks from GCC region while this thesis focusses on US BHCs where the ownership structure of banks is more complex, the BHCs not only hold an individual bank or more but also engage in banking activities themselves. Furthermore, alongwith the use of a dynamic panel time variant dataset this study involves the use of interactive variables to help explain the impact of intertemporal changes of ownership with risk and ownership with regulations using the instrument variable GMM technique.

The thesis contributes through establishing empirical evidence towards understanding the relationships between risk, stability, efficiency, franchise value and ownership structure of US BHCs. The thesis also highlights certain implications from a policy perspective and for shareholders/owners, academics and regulators. From a policy perspective, a framework that takes into consideration a holistic picture and addresses the intertwined relationships between stability, capital regulations, and ownership structure and equating them to efficiency and

franchise value is important for financial stability. The introduction of new and stricter regulations by national regulators and directives by BCBS that have followed the financial crisis shows that there is a need to carefully evaluate the regulatory policies such that they may not adversely affect the stability, efficiency and franchise value of banks while keeping risk at an acceptable level. Therefore, policy should account for possible tradeoff between higher stability and desire for higher efficiency and franchise value. From the standpoint of owners and investors, this thesis helps in understanding how their risk appetite would affect stability, franchise value and efficiency of US BHCs. From an academic stand point this study provides a future research area on whether there exists an optimal structure for ownership structures that would align the stability, franchise value and efficiency of the US BHCs and to ensure that the returns on investment for these stakeholders were safeguarded against excessive risk-taking behaviors.

Another important contribution of this thesis is concerning how the decision to transact in derivatives affects its insolvency risk and its stability. Using four different measures for derivative usage the empirical results indicate that the propensity to use credit derivatives decreases the insolvency risk of US BHCs making them more stable while the use of interest rate derivative instruments and foreign exchange derivative instruments increases insolvency risk and reduces stability.

After this detailed and comprehensive review behind the rationale and the contribution made by this dissertation, the next subsection goes on to formally develops a problem statement for the thesis and is followed by the objectives and limitations.

1.2 Background of Study

The past few decades have been marked by wave upon wave of financial crisis for example the savings and loan crisis in US in the 1980's, followed by the South Asian currency crisis of 1998, the US sub-prime mortgage crisis in 2008 followed by 2010 sovereign debt crisis in Europe and the ensuing global recession. In the aftermath of each of these crisis regulators, policy makers and academics worked to ensure future crisis from happening. The regulators and policy makers came up with more stringent regulations like the Dodd Frank Act in 2008 and Volcker's rule in 2013, while the Basel committee also introduced new measures through BASEL III regulations. However, the unintended consequences of higher and more stringent regulations was lower efficiency and franchise value. To add to the issue was the fact that the banks were moving away from traditional lines of business and were looking towards increasing their revenue sources which included transacting in derivatives. The decision to use derivatives has a direct consequence for the stability of banks, whether it would be to hedge their risk or to earn revenue and therefore this thesis addresses how bank stability is affected by the decision to transact in derivatives.

The most widely accepted objective of any firm is maximizing the wealth of the shareholder. The role played by the ownership structure in shaping the risk-taking behavior of firms has been well documented, and previous literature based on ownership structure demonstrates that shareholders with larger stakes influence risk-taking behavior of firms through monitoring and control to benefit themselves (Jensen and Meckling, 1976; Shleifer and Vishny, 1986; Cai et al., 2009). In particular research on banks has found that the ownership structure of banks is affected by its risk taking behavior, for example Bouvatier et al., (2014), Laeven and

Levine, (2009), Bolton et al., (2011) and (2010), Magalhaes et al., (2010) Ashraf et al., (2016); Beltratti and Stulz, (2012), Battaglia and Gallo, (2017), Switzer et al., 2018. Although findings from these studies are not unanimous; however, there are some general inferences such as banks having concentrated ownership structure are riskier as compared to banks having dispersed ownership due to access to insider information (Laeven and Levine, 2009; Beltratti and Stulz, 2012; Ashraf et al., 2016; Auvray and Brossard, 2012).

Having established the importance of bank risk to match the risk appetite of all the stakeholders involved and the fact that the decision to take on risk can be affected by ownership structure this thesis investigates how the ownership structure, risk taking and capital regulations impact efficiency, franchise value and stability of US BHCs. This study focusses on US BHCs as banks in the US have a unique and complex ownership structure different from the rest of the world. Banks are generally held under a BHCs that own and control the domestic banks engaged in the standard banking activities, which include taking in deposits, and providing credit facilities. The thesis uses banks and BHCs interchangeably as the same rules and regulations that apply to banks also apply to BHCs. The definition of a BHC as per National Information Center responsible for collecting data on banking activities in the US is:

"Bank Holding Company: A company that owns and/or controls one or more U.S. banks or one that owns, or has controlling interest in, one or more banks. A bank holding company may also own another bank holding company, which in turn owns or controls a bank; the company at the top of the ownership chain is called the top holder. The Board of Governors is responsible for

regulating and supervising bank holding companies, even if the bank owned by the holding company is under the primary supervision of a different federal agency (OCC or FDIC)"[3].

Under this definition the jurisdiction of BHC are clearly defined. Since they are subject to the same regulations and are also supervised by the Federal Reserve hence the use of bank and BHC interchangeably.

Another important discussion point for this thesis is that both risk-taking and stability are defined by z_score being a popular and widely accepted measure of insolvency risk as well as stability with many variations in its calculations (Leaven and Levine, 2009; Demirgüç-Kunt and Huizinga, 2010; Lepetit and Strobel, 2013; Berger et al., 2016; and Ashraf et al., 2016 and 2017). A lower z_score of a BHC would point towards a higher risk and a lower stability. This thesis uses z_score as an insolvency risk measure as well as stability measure.

The first essay of the thesis investigates the effect of stability, risk-taking and the ownership structure on the efficiency of US BHCs. The second essay addresses how BHC risk-taking and its ownership structure influence the franchise value of US BHCs using capital regulations as a moderator variable. Finally, the last essay of the thesis focusses on how the decision to transact derivatives would influence bank risk. The last essay explores how the ownership structure and decision to use interest rate, foreign exchange, credit derivative affects the stability of US BHCs using dichotomous variables for derivative usage.

[3] https://www.ffiec.gov/nicpubweb/content/help/institution%20type%20description.htm

1.3 Problem Statement and research gap

The existing literature regarding the ownership structure and its impact on bank performance has been center of interest of previous studies like Laeven and Levine (2009), Lin et al., (2016), Pessarossi and Weill (2015), and Ashraf et al., (2016). However, a cursory review of the existing literature pointed towards a few areas that needed attention. The effect of ownership structure has been focused on domestic vs foreign or public vs private ownership (Bhattacharya et al., 1997; Isik & Hassan, 2002; Ataullah & Le, 2006; and Lin et al., 2016). Though the impact of institutional shareholding on the performance of financial and non-financial institutions has been analyzed in studies by Pound (1988), and Elyasiani and Jia (2008). However, one of the shortcomings of these studies has been considering institutional owners as one homogeneous group while it can be argued that the distinct categories of institutional owners may hold different objectives. Hu and Izumida (2008) found different ownerships whether concentrated or diffused and different types of shareholders would either benefit the institutions or they could cost them depending upon a specific corporate governance environment. It is therefore apparent that the realm of institutional investors and their effect on the performance of banks/BHCs warrants further attention.

The second gap in current Bank ownership literature is the use of cross-sectional ownership data Morck et al., (1988), Laeven and Levine (2009), Barry et al. (2008) which is a serious gap in ownership literature. Since ownership can change over time Ashraf et al., (2016), therefore this study employs the use of a time variant dynamic ownership structure data alongwith annual financial and macro-economic data, and aims to understand the determinants of

efficiency, franchise value and risk-taking behaviour of US BHCs making it unique and adding to current empirical literature.

In order for stable and efficient financial markets to exist, it is imperative that a framework be devised for balance and control between risk- taking, regulations, ownership structure and performance of banks. With these in mind, the problem statement of this thesis evolves and focuses on three areas related to performance of US BHCs.

First, the possible relationship between stability, ownership structure, regulations and efficiency of banks are intertwined. Although both stability and ownership structure affect efficiency, however there also exists an interaction between stability and ownership, which affects the efficiency as well. Furthermore, capital regulations are also found to impact efficiency, Barth et al., (2004) found higher regulatory and capital restrictions on banks are related to lower efficiency leading to higher probability that a banking crisis would occur. The first essay in the thesis explores how the stability and ownership structure affect efficiency of US BHCs and whether stability when used interactively with ownership structure has a moderating effect or a mediating effect on efficiency after controlling for the effect of capital regulations on efficiency of US BHCs.

The second essay investigate the role of stability, capital regulations and ownership structure on determining franchise value of US BHCs. The second essay also addresses the question of how capital regulations and ownership structure jointly affect the franchise value using capital regulations as a moderator variable.

Finally, the third essay of my thesis focusses on how the insolvency risk of US BHCs is affected due to their decision to transact in different types derivative instruments like interest rate, foreign exchange and credit derivatives. Capelle-Blancard (2010) argue that the use of derivatives instruments can increase systemic risk and since one of the determinants of the decision to use derivative and insolvency risk is the ownership structure, therefore the last essay in the thesis focusses on how the risk is impacted by derivative usage and ownership structures.

1.4 Research Questions

The main research questions that the thesis focuses on is how the ownership structure of US Bank holding companies and stability affect different financial aspects of the BHCs. The thesis also addresses the question of how the BASEL regulations together with the ownership structure and stability affect the efficiency and franchise value of US BHCs and if the decision to transact in derivatives is influenced by ownership structure. The thesis addresses these questions in three essays, the first essay of the thesis focuses on whether risk-taking, regulations and ownership structure have an impact the efficiency of US BHCs. The questions addressed in the first essay are as follows:

1. Does stability impact efficiency of US BHCs?
2. What effect does the ownership structure have on the efficiency of BHCs?
3. Does market capitalization affect efficiency of US BHCs?
4. What effect does ownership structure have on efficiency of US BHCs when used interactively with stability?
5. Do macro-economic indicators such as the gross state-wise product growth rate and unemployment growth rate affect efficiency of US BHCs?

6. What role does income diversification and liquidity play towards affecting efficiency of US BHCs?

The second essay contributes towards the banking literature by further investigating how ownership structure and stability of US BHCs affects their franchise value, Demsetz et al., (1996) suggest that banks risk-taking behavior is affected by its ownership as well as its franchise value and may be modeled jointly. While Marcus (1984) and Martynova et al. (2014) find existence of a simultaneity bias where a specific level of stability and franchise value are jointly and simultaneously determined. In line with these reasonings the second essay in the thesis employs the simultaneous equations model to investigate determinants of franchise value of US BHCs and the research questions for the second essay are as follows:

1. What role does stability and ownership structure play in determining the franchise value of US BHCs?
2. Do bank regulations affect franchise value of BHCs?
3. Is efficiency and market competition a determinant of franchise value?
4. What role do macro-economic indicators such as gross-state wise product, unemployment growth rate and prime rate play in determining franchise value?

Finally, the financial industry in the past few decades has introduced new and innovative instruments and previous studies like Wagner (2004) and Instefjord (2005) point out that the existence of these instruments such as the credit derivative instruments could alter the risk-taking behaviour of banks. The last essay explores how the role of ownership structure and the decision of BHC to use derivative instruments affect the stability of US BHCs. This essay

uses simultaneous equation model with two stage probit least squares (2SPLS) for analysis and the following questions are addressed:

1. Is the decision to transact in derivatives sensitive to risk or does a BHC transact in derivatives as part of its risk management process?
2. What role does ownership structure play in the decision to deal in derivative instruments and do the ownership structures influence the stability of US BHCs?
3. Do capital regulations help in improving stability? What is the role of capital regulations in the decision of BHC to transact in derivatives?
4. Finally, the quality of loan portfolio is also an important determinant of both the decision of a BHC to use the derivatives instruments and the bank risk, therefore the effect of loan quality on derivative usage and insolvency risk of US BHCs is also included in this essay.

1.5 Objectives of the study

The aftermath of the 2008 sub-prime crisis proved that the most resilient systems can also fail, resulting in intense scrutiny of financial institutions by regulators, international bodies and governments. Risk taking behavior affects the fragility of the financial systems and impacts economy of the country Keeley (1990). However, Barth et al., (2008) found no evidence of improved stability even with extensive regulatory reforms and Basel guidelines. Furthermore, ownership structure has also been found to play an important and significant part in determining a banks risk- taking behavior (Jensen & Meckling, 1976; John, Litov, & Yeung, 2008; and Laeven & Levine 2009).

However, previous research involving the impact of ownership in bank studies consider only insider shareholding as a proxy for ownership structure (Demsetz et al., 1996a; Pathan et

al., 2015) or use the cross-section data only if using type of shareholdings Leaven and Levine (2009), which assumes no change in the ownership structure over time. Since the bank ownership can experience a considerable change in both the ownership and its types one of the objectives of this thesis is to extend the literature by using the dynamic panel time variant ownership structure data to explain the impact of intertemporal changes on the efficiency, franchise value and stability using a sample of 553 US Bank Holding Companies (BHCs) from 2004 to 2016[4] . To deal with multicollinearity and endogeneity issues in data the first two essays use the GMM IV model, which allows the simultaneous adjustment of both the efficiency and stability in the first study, and franchise value and bank stability in the second essay. Similarly, to deal with multicollinearity and endogeneity between stability and the decision to transact derivatives the third essay uses the 2 stage probit least squares (2SPLS) technique (details in related chapters).

Another important objective of this thesis is that while previous literature has focused on how ownership structure affects efficiency however the interactive effect of ownership structure and stability has remained underexplored. The only studies that have used ownership structure interactively with risk is by Lin et al., (2016) using degrees of freedom as a proxy for risk, Pessarossi and Weill, (2015) who regulatory capital ratio as their risk measure while this study uses bank stability measures as proxy for risk.

1.6 Theoretical & practical contribution and its limitations

As is the case with all research this study too has their limitation. First, although this is

[4] The thesis focus is on the 2004 – 2016 period because of the ownership structure data availability. Also, this period reflects relative stability, global financial crisis and recovery.

one of the most comprehensive datasets on bank ownership it pertains to a single country setting. Since countries differ in their approaches towards regulations, risk and ownership structure for example banks in the US are typically held under a BHC, which holds a number of domestic banks that are involved in the traditional functions related to taking deposit and provide lending solutions. Therefore, results cannot be generalized to be true for a multiple country setting or even universally and wherever possible this thesis has refrained from generalization of results. In some instances, however, the interpretation could imply that a more general inference is required that could be used on a global level.

Furthermore, though the time period under study covers a span of 13 years from 2004 to 2016 however, considering that the financial crisis took place in 2008 a longer time span might have explained the variations before the crisis period.

1.7 Significance of the study

This study is unique in a couple of ways, first of all the study uses a time variant dynamic panel dataset covering the relative stability, global financial crisis and recovery period of the US BHCs and spanning over 13 years from the year 2004 to 2016 as opposed to using cross sectional ownership structure data in past studies such as Laeven and Levine (2009). Secondly the time period used for the study was crucial as it included the effects of one of the most severe financial crises in US history followed by intense regulations at national and international levels.

The study adds to existing empirical literature by exploring and examining the possible relationship between efficiency, franchise value stability and ownership structures especially after 2007-2008 crisis when more regulations have emerged and hence it is pertinent to review these relationships not only to fill gap in the existing literature but also to understand their

implications towards the fragility of banking systems. Since each group of shareholders has different investment objectives and those may affect the efficiency of BHCs we categorize the ownership in three groups: families and individuals, government and institutional ownership categories. In the case of institutional shareholding we sub-divide the shareholders in two categories: financial institutional investor includes banks, investment banks and insurance companies, and asset management institutional investors comprises of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies. Furthermore, both institutional investors may have different motivation for holding stocks of a specific bank and the ability to relinquish their position.

This study opens a new perspective for policy makers on how to frame future regulations to include the specific effect of the ownership structure in shaping risk-taking behavior of BHCs, and to simultaneously account for efficiency, franchise value and stability of US BHCs. The study provides policy makers an insight on how the decision to use different types of derivatives impacts stability of US BHCs and when coupled with ownership structure what measures could be taken to prevent a crisis of the magnitude of the sub-prime crisis from occurring in the future.

Furthermore, the fast pace in expansion of the derivative markets all over the world requires not only considerable resources in terms financial, as well as human, and intellectual capital resources, not to mention the need for stronger internal control systems. Derivatives as hedging instruments offer potential in terms of improving the stability and resilience in financial markets and in providing an opportunity for BHCs diversify their revenue streams. However, on a cautionary note there is a greater need for regulatory scrutiny/oversight and transparency in reporting to safeguard the financial stability. For the shareholders and investors investing in the

BHCs, this study should be of interest as having stable BHCs would mean that the returns on their investment were safeguarded against excessive risk-taking behaviors. For banking academics, this study provides a future research area on whether there exists an optimal structure for ownership and since this research was based on US BHCs in a conventional and single country setting and it would be of interest to see if the results will hold in the case of emerging economies and Islamic banks.

1.8 Organization and structure of thesis

This study investigates the interconnected relationships between ownership structure, stability, derivative usage, efficiency and franchise value of US BHCs. The thesis is comprised of two sections spanning over 8 chapters. In the first Chapter an introduction and the background of the study is discussed, with a detail of the problem statement. The problem statement is followed by the purpose and significance of the study. Finally, the chapter concludes with the limitations of the study. Chapter 2 is based on the theoretical framework of the study, while Chapter 3 provides the literature review, Chapter 4 presents the data sources, and gives the research design and methodology. Chapter 5 analyzes the relationship between stability, ownership structure and efficiency of US BHCs while Chapter 6 investigates the effect of stability, regulations and ownership structure on franchise value. Chapter 7 discusses how ownership structure and transacting in derivatives affect the insolvency risk of US BHCs. Finally, the last chapter concludes the thesis.

CHAPTER TWO

LITERATURE REVIEW

The next section presents an extensive literature review related to the bank efficiency and franchise value. The first section of this chapter sec 2.1 discusses the literature review pertaining to the first essay based on ownership structure, stability, capital regulations and efficiency. The second section, sec 2.2 presents the literature review based on ownership structure, stability, capital regulations and franchise value, while the third section, sec 2.3 elaborates on the literature review with regards to ownership structure, the decision to use derivative instruments and stability of US BHCs. Finally, sec 2.4 summarizes this chapter and provides the contribution of this thesis.

2.1 Literature review on bank risk, stability, ownership structure and efficiency

Banking is one of the important channels aiding in economic development (Levine, 2005). Altunbas et al., (2010) argue that risk taking by banks can potentially impact growth, investments and credit as well as have implications on macroeconomic stability in the longer run. However, banks may function in a manner that could defeat these objectives (Barth et al., 2009) and may lead to events like the sub-prime mortgage crisis in 2008. Capital regulations are designed to keep a check on risk taking behavior of banks through mandatory capital requirements.

Since raising additional capital may not be preferred method to meet the regulatory capital requirements, the consequence of stringent regulations may result in higher risk-taking (Laeven and Levine, 2009). To comply with higher capital requirements, banks tend to opt for riskier portfolios to generate greater profits (Koehn and Santomero, 1980; Buser et al., 1981). Banks while complying with the capital regulations simultaneously adjust their risk appetite (Shrieves and Dahl, 1992; Jokipii and Milne, 2011; Stolz et al., 2003; Ashraf, 2008) suggesting that level of capital requirement can also affect the relationship between stability and efficiency. In other words, an increase in stability may follow a decline in the efficiency level (Fiordelisi et al., 2010).

Altunbas et al., (2001) studied the impact of risk-taking on bank efficiency and found that the largest influence on efficiency is that made by the financial capital. Meanwhile Kwan and Eisenbeis (1997) report that bank holding companies that are performing poorly with low efficiency levels take on higher levels of risk.

A banks risk taking behavior affects the fragility of the financial systems and impacts economy of the country Keeley (1990). Meanwhile Barth et al., (2008) found no evidence of improved stability even with extensive regulatory reforms and Basel guidelines. Furthermore, ownership structure has been found to play an important role in determining a banks risk- taking behavior (Jensen and Meckling, 1976; John, Litov, & Yeung, 2008; Laeven and Levine 2009). Anderson and Fraser (2000) provide evidence that bank risk taking is positively associated with managerial shareholding. Over the 2004-2008 period Anginer et al., (2014) used a sample of banks from 22 countries and found risk taking was higher in banks that had corporate governance standards that were shareholder-friendly.

Regarding the literature on the relationship between efficiency and the ownership structure of banks, Akhigbe et al., (2016) studied the effect of ownership on bank efficiency for publicly and privately held banks in the US and concluded that the difference in the profit efficiencies was small to the extent that the agency issues did not affect efficiency. However, Dong et al., (2014) while focusing on bank efficiency and ownership structures of Chinese banks concludes that higher ownership concentration in the form of government, state owned enterprises and private investors leading to more control and power improves the efficiency. By using 289 banks from 15 European countries, Fries and Taci (2005) reported better efficiency in the case of private foreign owned banks. Similarly, Micco et al., (2007) using a data set of banks comprising of 197 countries from 1996 to 2002 report that banks with state ownership have lower efficiency levels as compared to privately owned banks. While Cornett et al., (2010) by using a sample of South Asian banks from 1989 to 2000 found that the state-owned banks had lower profitability as compared to private banks.

In terms of the stability efficiency relationship, Iannotta et al. (2007) studied 181 banks from 15 European countries over the period from 1999–2004 and report that public sector banks are on average not only less profitable but also take on higher risk as compared to other banks. Similarly, Williams and Nguyen (2005), studied the impact of ownership structure on performance on a sample of commercial banks from South Asia from 1996 to 2003 and report that financial deregulation and private ownership improved bank performance as compared to the state-owned banks. Sullivan and Spong (2007) investigated the owner-manager agency problems on a sample of US banks, their findings suggest that bank efficiency improves when the managers also have an ownership stake in the mix.

The above literature review suggest that ownership structure plays a significant role in determining performance of banks, however the focus of these studies has been on foreign vs domestic, private vs state owned, manager vs owner. There is limited literature available on how institutional ownership would affect bank efficiency except Elyasiani and Jia (2008) who compared the performance with the institutional ownership's stability among BHCs from the banking industry and less regulated utility and industrial firms from the non-bank side to determine whether regulations would possibly displace monitoring of the owners. The authors find that performance of these companies whether BHC or otherwise is positively associated with institutional ownership and stability, while better performance is more prominent during the era of financial deregulation and for those organizations with lower likelihood of regulatory intervention. However, the relationship between efficiency and institutional ownership is not investigated especially after 2007-2008 crisis when more regulations have emerged and hence it is pertinent to review the relationship not only to fill existing gap in current efficiency literature but also to understand their implications towards the fragility of banking systems.

Since each group of shareholders has different investment objectives and those may affect the efficiency of BHCs we categorize the ownership in three groups: ownership by families and/or individuals, government and institutional ownership categories. In the case of institutional shareholding we sub-divide the shareholders in two categories: financial institutional investor includes banks, investment banks and insurance companies, and asset management institutional investors comprises of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies. Furthermore, both

institutional investors may have different motivation for holding stocks of a specific bank and the abilities to relinquish their positions.

2.2 Literature review on bank risk, stability, capital regulations, ownership structure and franchise value of US BHCs

Demsetz et al., (1996) define franchise value as the present value of streams of income that a firm will earn due to its operations. Franchise value hypothesis is one of the vital elements of empirical literature based on the concept of competition-fragility. The franchise value hypothesis introduced by Keeley (1990) suggests that when banks are facing a situation leading to a deterioration of their franchise value due to competition or declining profitability, they would resort to higher risk-taking to maintain that profitability. Hellman et al. (2000) report that increased competition due to higher financial market liberalization ultimately results in lower franchise values and drive banks to take on higher risk. On the contrary, Vidhan (2005) found that higher franchise values lower a banks incentive to take the risk.

Jiménez et al., (2013) found that higher franchise value has a significant role in reducing the risk-taking by banks using the Lerner's market power index as a proxy for franchise value for a sample of Spanish banks from 1988 to 2003. Meanwhile, Martynova et al., (2014) found that higher franchise value provides incentives for higher risk taking however they suggest that banks higher risk-taking stem from market-based mechanism rather than the altering of the loan portfolio. Konishi and Yasuda (2004) report that a decline in franchise value due to deregulations increased bank risk, their study was based on Japanese banks from 1990 to 1999.

Aziz and Lilti (2017) report that the effect of deregulation was partly the cause of the 2008 financial crisis. Boyd et al., (2006) use charter value, bank risk and size and found that the measures of competition are affected by a bank's probability of failure, their sample consisted of 2,500 U.S. banks and 2600 banks in 134 countries and their period ranged from the year 1993 to 2004.

Keeley (1990) found existence of an intertwined relationship between regulations, competition, and risk-taking in banks (referred to as the RCR nexus). This was followed by research on theoretical and empirical level on the RCR nexus by Cordella and Yeyati, (2002) who argue that in order to mitigate the both moral hazard problem and bank risk-taking behavior the bank regulations should enforce greater transparency. Repullo, (2004) reports that in the absence of bank regulations higher competition resulted in more risk; while Niinimaki (2004) study provided evidence to the magnitude of risk-taking being dependent on both the structure as well as the side of the market where the competition is taking place, while Salas and Saurina (2003) found banks that have a lower charter values would have higher amount of risk and finally Chen (2007) studied deregulation, risk and competition using bank data from European Union and report that as a result of deregulations the competition increases and risk decreases. Previous empirical literature considers the relationship between the franchise value and stability unidirectional assuming that a desired level of stability is a function of the franchise value, compliance with capital regulations and competition. However, since the relationship is simultaneous it follows logically that maintaining a desired level of franchise value is a function of its stability; therefore, this research empirically investigates the effects of RCR nexus on franchise value.

The RCR nexus becomes even more important especially since standard corporate governance theories suggest that ownership structure has the power to influence the corporate risk-taking behavior (Jensen and Meckling, 1976; Laeven and Levine, 2009; and John, Litov, & Yeung, 2008). De Nicolo and Loukianova (2007) found that the more concentrated the banking markets the higher the risk of bank failure when ownership is also considered. This paper extends the debate by adding ownership structures to the RCR nexus.

Previous studies like that of Unite and Sullivan (2003) and Williams and Nguyen (2005) focus on ownership structures but concentrate on the foreign versus the domestic ownership; these studies are based on East Asian countries where ownership structures are different from that of the United States. Anderson and Fraser (2000) use US banks for their study however their focus was limited to managerial shareholding and its effect on the bank risk-taking behavior. Laeven and Levine (2009) on the other hand employ cross-sectional ownership data to examine whether the relationship between regulations at the national level and bank risk are associated to the bank's ownership structure using financials of 200 banks from 2001 to 2005.

An important shortcoming especially in those studies that explored the relationship between stability and ownership structure is the use of cross-sectional ownership data that does not consider the change in ownership structure over time. For example, Patel et al., (2017) study franchise value and ownership, Laeven and Levine (2007) study the stability, ownership and regulations, Barry et al., (2008) bank ownership and risk, Patel et al., (2017) study ownership and franchise value of non-financial firms, De Nicoló (2000) use charter value, bank risk and size for a sample of US, Japanese and European banks. Among the exceptions are Ashraf et al., (2016) who have used time series data for ownership, but their sample is based on GCC

countries, further their focus is effect of ownership on risk-taking behavior while this study addresses the effect of ownership on the franchise value of US bank holding companies.

The most significant contribution that this thesis makes is that previous studies even the seminal paper by Laeven and Levine (2009) have used static variables for ownership structures which is a serious gap in ownership literature while we have use time variant dynamic ownership structure variables. This study also differs in terms of sample coverage, the methodology used as well as definition of the main variable of interest from previous work in this field. Though we have used franchise value as defined by Jiang and Zhang (2017) and Li and Zhang's (2006) measure however both these studies have used franchise value as an explanatory variable while this study uses franchise value as its main variable of interest. The study is unique in its sample and coverage period and investigates the interlinkages between stability, capital regulations, ownership structure and franchise value of US BHC's using a time variant dynamic panel ownership data spanning over 13 years from 2004 to 2016.

2.3 Literature review on derivative usage, ownership structure, bank risk and stability

The most widely accepted objective of the firm is to maximize shareholder wealth. The role of ownership structure in shaping the risk-taking behavior of firms has been well documented, Previous literature based on ownership structure demonstrates that shareholders with more significant stakes can influence risk-taking behavior of firms through monitoring and control to benefit themselves (Jensen and Meckling, 1976; Shleifer and Vishny, 1986; Cai, Garner, & Walkling 2009). In the banking context, Sullivan and Spong, (2007) using a sample of 267 US banks from 1985 to 1994 report that managers whose wealth is concentrated are more

risk-averse. Similar results have also been reported by Shehzad et al., (2010) while analyzing a sample of 500 commercial banks for the period from 2005 to 2007 and find that ownership concentration decreased bank risk. On the contrary, Laeven and Levine (2009) report that banks with owners who were powerful and had only a small fraction of their total wealth invested in a bank advocated for higher risk, their work was based on 296 banks from around 48 countries during the period 1996 to 2001.

The relative power of a specific group of shareholders can be reflected through the ownership structures. The ownership structure of a bank may include different categories of shareholders including management, government, individuals, families and institutional investors, all of whom have different investment objectives and risk appetite (Ashraf et al., 2016; Beck et al., 2011). Various categories of shareholdings, whether concentrated or diffused, can affect a firms' performance but it would be depending upon the specific corporate governance environment as well (Hu and Izumida, 2008). For example, banks with ownership structure with active government influence/control may exhibit a higher risk-aversion when compared to those banks with dispersed ownership structure (Ghosh and Chatterjee, 2018; Ashraf et al., 2016). Similarly, institutional investors due to the access to in-depth resources, superior analytical expertise and effectively exercising their voting power monitor and influence management decisions (Bouvatier et al., 2014) by (Barry et al., 2011).

The existing literature evaluating the impact of ownership structure assumes institutional investors as a single homogenous group (Switzer et al., 2018; Ashraf et al., 2016). However, it is crucial to consider that the different categories of institutional investors may not have similar motivations, especially for monitoring and evaluation of the management. Institutional investors

can easily be categorized into two major groups. First, are those institutional investors managing assets on behalf of their customers. These may include mutual funds, hedge/equity fund, trust, and endowments. This group of institutional investors is keener for the short-term performance of the firms in the portfolio due to their return reporting cycle and competition for new funds while the second category of institutional investors include those financial instructions managing assets on their behalf and may include banks, investment banks, and insurance companies.

The role of banks acting as the financial intermediaries exposes them to unacceptable risks such as insolvency risk, interest rate, and foreign exchange risk (Schuermann and Stiroh, 2006; Ashraf, Altunbas & Goddard, 2007). Derivatives are essential tools in armory of banks for risk management purposes (Bulbul et al., 2019). The existence and evolution of derivatives can alter the risk-taking behavior of banks (Wagner, 2004; Instefjord, 2005; Sundaram and Willey, 2009).

It is strongly believed that one contributory factor to the 2007-09 financial crisis was the excessive risk-taking associated with the use of derivative instruments for trading purposes (Trapp and Weiß, 2016). Derivative instruments are, by nature complex and one of the important complications associated with such complex financial instruments is the pro-cyclical nature of risk (Rajan, 2006). The situation is further exacerbated as the opaque interlinked dealer networks make counterparty risk difficult to evaluate, leading to increased systemic risk (Thorbecke, 1995; Ashraf and Goddard, 2012; Capelle-Blancard, 2010).

Before 2008 crisis derivative usage was hailed as contributory in building the resilience of financial systems (Bank for International Settlements, 2004). At the time, the Federal Reserve promoted the use of derivative instruments as a tool for risk management contributing towards

greater flexibility of the financial systems (Greenspan, 2004). Empirical literature focusing on derivative usage has investigated reasons that would influence the BHCs decision to transact in derivatives. The motivation to transact in derivatives can stem from either a banks desire to hedge its risk or for increasing its income stream. The first is commonly known as the hedging hypothesis, where banks may trade in derivatives to minimize the risk of adverse movements in the value of their assets and liabilities through hedging their risk (Brewer III et al., 2001).

Ghosh (2017) report that banks primarily use derivative instruments to hedge risk; however, banks may also have an incentive to use derivative instruments to reduce their risk exposures to financial stresses which may include credit, equity, foreign exchange, and interbank stress. Bliss et al., (2018) report that BHCs having a positive risk exposure to interest rate, foreign exchange, equity, commodity, and credit risk would use derivatives for reduction in the associated risks. Cyree et al., (2012) using a sample of 335 US commercial banks from 2003 to 2009, find evidence indicating that derivatives were used for risk management purposes while also providing services to customers. Derivatives can also be used by banks to transfer risk to third parties, Ashraf et al., (2007) using a sample of 72 US BHCs from 1997 to 2004 report that BHCs in the US used credit derivatives for risk management purposes to transfer selected risk to third parties.

The second motivation to use derivatives supported by empirical literature is the substitution hypothesis wherein banks use derivatives to increase their income stream which would increase their risk exposures (Li and Marinc; 2014). Though financial derivatives emerged as an important tool to mitigate the impact of undesirable risks that firms face however in the aftermath of the 2008 crisis, empirical research such as that by Instefjord (2005), Wagnor (2007),

Capelle-Blancard (2010), Nijskens and Wagner (2011), and Dewally and Shao (2013), found evidence of the detrimental effects of derivatives usage on financial stability of banks. Sundaram and Willey (2009) studied a sample of US banks from 1999 to 2006 and found that an increase in the use of derivatives was accompanied by an increase in bank risk. There are other studies such as Duffee and Zhou (2001) who report that the decision to use derivatives contributed to a reduction in the costs associated with insolvency. The effect of derivative usage on bank stability may also differ in terms of how well developed the banking system of a country may be; and Keffala (2016) while focusing on banks from emerging countries from 2003 to 2011 report that banks using derivatives are less stable in emerging countries as compared to banks from developed countries.

Previous studies such as Hirtle (2009), Li and Yu (2010), Ashraf and Goddard (2012), Hasan and Khasawneh (2009), Ghosh (2017), and Bulbul et al., (2019) among several others explored the relationship between risk-taking and the decision to use financial derivatives however, these studies do not include the effect of ownership structure. Furthermore, studies involving ownership structure and the risk-taking behavior of banks do not include the impact of transacting in financial derivatives and how this can affect their stability[5]. This study develops an empirical model for the relationship between bank risk and the propensity to use derivatives in simultaneous in nature and how ownership structure plays a role in determining the level of stability and the decision to transact in derivatives among the US BHCs.

[5] see for example, Saunders, Strock, and Travlos (1990), Ianotta et al., (2007), Laeven and Levine (2009)

2.4 Summary

This purpose of this chapter is to provide a review of the literature on the major focus areas of this thesis. This section covers a summary of the literature review of the three essays that make up this study and provides the gaps and contributions made by this thesis.

A review of empirical literature on ownership structures revealed that while empirical literature has focused on the effect of the ownership structure on various areas related to bank risk, stability, efficiency and franchise value, most of these studies reviewed use a cross sectional or time invariant ownership structure data. This includes the seminal work by Laeven and Levine (2009) however ownership structure can change both over time and in its type. To address this gap in ownership literature this thesis is based on a time variant dynamic panel financial and ownership structure dataset based on bank holding companies from the US from the year 2004 to 2016.

The second gap with regards to ownership structure data is based on a broad classification for institutional ownership. Previous literature with regards to institutional ownership category clubs together ownership by mutual fund companies, hedge/equity fund companies, corporations, real estate companies, structured fund and Union fund companies, trust and endowment companies, banks, investment banks, and insurance companies considers these as a homogeneous group in terms of their risk-taking behavior. However, institutional investors can be easily divided into two sub categories based on whether they are managing the assets on behalf of their customers such as mutual funds, hedge/equity fund, real estate, structured fund, union fund and trust and endowment funds or if they were holding shares for their own portfolio such as banks, investment banks and insurance companies. One of the most significant and

important contributions that this thesis makes is the bifurcation of the institutional owners into two categories based on the classification given above.

Third, though previous literature focused on ownership structure, risk and stability however they do not address if bank risk and stability measures when used interactively with ownership structure enhance or impede efficiency. Therefore, following Lin et al. (2016) who employed the use of interactive variables to study the moderating effect of bank risk and ownership on bank efficiency, this research also uses risk and ownership interactively to study whether the efficiency is impeded or enhanced. However, Lin et al., (2016) used degrees of financial freedom as a proxy for risk while this study uses bank stability measure z-score for moderating the effect of ownership on bank efficiency. Further Lin et al., (2016) uses stochastic frontier analysis for calculation of efficiency while this study uses financial ratio as a proxy for efficiency.

Another important contribution of this study is that adds to the current empirical literature, which considers the relationship between the franchise value and stability as unidirectional assuming that a desired level of stability is a function of the franchise value, compliance with capital regulations and competition. In order to address that, this study employs simultaneous equation IV GMM model to study the relationship between franchise value and risk. The study opens up a new perspective for policy makers on how to frame future regulations to include the effect of ownership structure. This study is based on US BHCs and differs from previous work in terms of sample coverage as well as the methodology used. We cover the period from 2004 to 2016 which includes the relative stability, global financial crisis and recovery period following the crisis. The reason for the choice of using a sample based on US

BHCs is that the sub-prime crisis highlighted the US banking industry and it piqued interest from regulators, policy makers researchers, and investors alike. It provides direction for regulators and policy makers in framing future regulations; it also offers the shareholders an insight over the management of their investments.

Finally, this thesis contributes to the existing literature by empirically investigating issues linking stability, risk-taking behavior, efficiency and franchise value to capital regulations and ownership structure of US BHCs. The thesis also examines if the stability and use of derivatives is linked to ownership structure of US BHCs. Empirical literature focusing on derivative usage has investigated factors that influence the decision to transact in derivatives, which can be from either a banks desire to hedge its risk or the hedging hypothesis, or it can be for increasing its income stream commonly referred to as the substitution hypothesis. This study simultaneously links the ownership structure and stability to the decision to transact derivatives which was a gap in previous literature where stability was linked to use of derivatives or ownership structure was linked to stability but did not include the impact of transacting in derivative or were based on risk-taking and the decision to use financial derivatives but did not include the effect of ownership structure. This study is the first to develop an empirical model for the relationship between bank stability and the decision to use derivatives which is simultaneous in nature and how ownership structure plays a role in determining the level of stability and the decision to transact in derivatives among the US BHCs.

CHAPTER THREE

THEORETICAL FRAMEWORK

A stable banking system that is well functioning would contribute towards the economic growth of a country largely due to their function as financial intermediaries, connecting the savers and the borrowers. Whereas an unstable banking system would slow down all other sectors of the economy due to a lack of availability of credit to the borrowers and possible disruptions in the interbank lending markets. Due to the contagion effects of instability, it becomes a priority for governments, supervisory authorities, regulators and policy makers to ensure that banking systems are stable having low risk and are competitive and efficient at the same time.

Apart from maintaining well-functioning banking systems, banks also have to be financially viable i.e. profitable. This chapter discusses the importance of ownership structure, capital regulations and derivative usage on efficiency, franchise value and stability. Starting with the sub-prime crisis in 2008 bank risk-taking behaviour has been under constant scrutiny at both national as well as international level. Particularly for the US banking, measures have been taken to discourage and curb excessive risk-taking, these measures comprise of regulations like the Dodd Frank Act, Volcker's rule and Basel directives. Since stability, efficiency and franchise value can be affected by the ownership structure of a firm, there is a need for the ownership structure to be accounted for in studies involving bank risk, efficiency and franchise value.

Efficiency, franchise value and stability of US BHCs is also affected by bank specific variables like size, liquidity, market competition and diversification strategies as well as macro-economic variables such as the state-wise GDP, unemployment growth rate and the prime lending rate. Any discussion about the effect of risk and stability in the US banking would be incomplete without including the effect of derivatives. The fast-paced development of these novel financial products for example, the interest rate, foreign exchange and credit derivatives in the past few decades has led to an increase in liquidity but at the price of assumption of higher level of risk by banks. The thesis therefore also explores how the derivative instruments would affect bank stability.

This chapter presents a theoretical framework for the quantitative analysis investigating whether ownership structure, capital regulations and stability determine efficiency and franchise value of US BHCs. It also examines the role of ownership structure and derivatives in determining the stability of US BHCs. Section 3.1 gives an overview of the US banking system and a discussion on the external regulations to help in keeping excessive risk-taking under control. This is followed by section 3.2 where the role of ownership structure, regulations and stability is discussed in the context efficiency, forming the hypothesis for the first essay in this dissertation. Section 3.3 is based on the theoretical perspective for the second essay and discusses the determinants of franchise value, which include ownership structure, regulations, and stability. Finally, section 3.4 discusses how stability may be affected by the

ownership structure and the decision to use derivative instruments by BHCs.

3.1 Overview of US Banking

The last few decades have seen an unprecedented increase in the competition between banks and non- traditional banking channels. This shift from the traditional banking channels to a wide variety of choices for depositors and investors means that the banks now compete directly with different types of financial institutions as well as with other banks. These financial institutions vary from investment banks, insurance companies, Mutual fund and hedge/Equity fund corporations, real estate, structured fund and union fund companies, as well as trust and endowment companies. One of the consequences of this development is an environment of increased competition that has led to banks assuming higher level of risk in order to generate greater returns for all their stakeholders including shareholders, investors and depositors.

This environment of intense competition and tendency of banks towards assuming excessive risk in return for higher profits has had its consequences. The consequences have ranged from the great depression of the 1930's, to the savings and loans issue in the 1980's, followed by the subprime mortgage crisis of 2008, and the sovereign debt crisis of 2010 and ensuing global recession.

One of the triggers that led to the last recession in the US was the sub-prime mortgage crisis that started in 2008; the crisis was caused by a huge decline of property values when the housing bubble in the US collapsed. The extent of this crisis extended beyond the borders of the US and spilled over to Europe, which was hit with the banking crisis; this then progressed into the sovereign debt crisis ultimately requiring bailouts from the International monetary fund, the

European commission, and the European central bank. Not only did this crisis leave severe consequences for the US and European economies but also the repercussions have continued. As an estimate, the Americans lost more than 25% of their net worth, while Europe struggled with its own economic crisis. When investigated, a large portion of the blame was assigned to the financial Institutions for taking on excessive risk, while the regulators were blamed for not being aware of the consequences of the excessive risks being taken by the financial institutions. However, regulatory authorities on the national and international levels were not only warning against the perils of excessive risk-taking but also were vying for regulations that are more stringent and demanding more transparency in operations.

Previous empirical literature based on the drivers behind the risk-taking behavior is directed primarily towards the regulatory authorities and their efforts towards strengthening capitalization and the liquidity of banks[6]. The most common methodology used by policymakers and regulators alike is to curtail excessive risk through regulations. Further, it can be argued that an atmosphere of deregulations in the 90's enabled banks to take on excessive risks, and that stricter regulations would result in more stable banking infrastructures. However, Mahoney (2016) argues that stability of the banking industry does not depend so much on regulatory environment as the stability of interest rate and exchange rate. Nevertheless, the sub-prime crisis paved the way for intense regulations both at national and international levels. At the national level it was the Dodd Frank Act of 2010[7] followed by its extension Volcker's rule in 2013 while the Basel committee for banking supervision (BCBS) focused on new standards in the form of

[6] For instance, Saunders et al. (1990), Gorton and Rosen (1995), Anderson and Fraser (2000), Lee (2002), Sullivan and Sponge (2007), and Ashraf and Goddard, (2012).

[7] It is pertinent to mention that the current US administration has repealed many of the clauses in the Dodd-Frank Act.

Basel III. Briefly below are the national and international regulations after the sub-prime crisis of 2008.

3.1.1. Dodd-Frank Act

The Obama administration in 2008-09 took steps in coming up with reform legislation to protect the consumers, thus came forth the Dodd-Frank Act in 2010 a massive piece of financial reform legislation aimed at identifying the potential risks towards the financial stability of the US banks. The Dodd-Frank Act created a council, named "The Financial Stability Oversight council", and as the name suggests the purpose was to oversee the financial institutions and identify threats to the fragility of the US banking stability from activities of these financial Institutions and to promote market discipline eliminating the need for future government bailouts. The threats can range from distress or failure of US bank holding companies to non-bank financial companies in the US and at the global level. The council was also given the task of facilitating a channel of communication between regulators and financial institutions. The council has the authority to set aside regulations that would threaten financial fragility of US banks.

3.1.2. Volcker's Rule

In December 2013 further federal legislation followed the Dodd-Frank Act called Volcker's rule. Volcker's rule restricts the banks in the US from making speculative investments that may not be or are not in the best interest of their customers. Volcker's rule argued that it was this type of speculative activity that had led to the financial crisis of 2007–2010. Volcker's rule also limited ownership of and relationship with hedge and private equity funds of these financial

Institutions. Both these regulations came into force to check the excessive risk-taking behavior of US banks that had resulted in catastrophic events leading to recession and slowed economic growth in the US and had affected European countries in varying degrees as well.

3.1.3. Basel Directives

The Basel committee for banking supervision was formed in 1974 by the central banks of a group of ten countries. The purpose of the committee was to promote financial stability and to prevent future crisis such as the savings and loans crisis that had led to extensive bankruptcies caused by inadequate securities to cover the extensive lending by banks all over the world. In 1988 Basel committee for Banking Supervision gave the first Basel accord called BASEL I, which was followed by a second accord called BASEL II in 2004. The first accord was directed towards credit risk and a minimum capital requirement to be kept as a buffer in case a party defaulted on its obligations. The accord required banks to hold a minimum amount of capital called the "Minimum risk-based capital adequacy". However due to over simplistic calculations BASEL I needed to be revamped and was replaced by BASEL II a few years later further refined to risk management and its modelling research. However, the sub-prime mortgage crisis of 2008 led the BCBS towards further directives in the shape of BASEL III in 2011 that were aimed at strengthening the capital requirements of banks alongwith an increase in the liquidity standards with the hope that it would help the individual banks absorb financial shocks.

3.2 Ownership structure, capital regulations, stability and efficiency

For the financial institutions to play their designated key role towards economic growth of a country, it is important for them to run efficiently, profitably and maintain an environment

of stability conducive to future growth. The recent shift in the financial markets where banks are in direct competition with non-financial institutions has led to an increased need for them to operate efficiently and to ensuring that bank risk is kept in accordance with the risk appetite of all stakeholders. The current environment of aggressive competition and market trends have forced banks to look at non-interest income to generate new revenue streams which resulted in increased risk-taking. The sub-prime mortgage crisis of 2008 is one such example of excessive risk-taking by financial institutions including banks and BHCs the result of which was extensive regulations and capital stringency measures including new capital and liquidity standards for banks.

The subsequent increase in the capital standards for maintaining higher levels of liquidity as a buffer for credit default risk translates into a lower amount of capital available for generating revenues. Since raising additional capital may not be preferred method to meet the compulsory requirements on regulatory capital, the consequence of these stringent regulations may result in higher levels of risk (Laeven and Levine, 2009). To comply with higher capital requirements, banks tend to go for riskier portfolios to generate greater profits (Koehn and Santomero, 1980; Buser et al., 1981). Complying with higher regulations also means that the risk appetite is adjusted simultaneously as argued by Shrieves and Dahl, (1992), Jokipii and Milne, (2011), Stolz et al., (2003), and Ashraf, (2008). This would suggest that level of capital requirement can also affect the relationship between stability and efficiency. In other words, an increase in stability may follow a decline in the efficiency level (Fiordelisi et al., 2010).

There is substantial literature with regards to bank efficiency from all over the world such as Berger et al. (1993), Berger and Mester (1997), Fare et al., (2004) in the US, Bhattacharyya

et al., (1997) in India, Leightner and Lovell (1998), Gilbert and Wilson (1998) and Hao et al., (1999) in East Asia, Isik and Hassan (2002) in Turkey, and Bonin et al., (2005), Fries and Taci (2005) in Europe. Previous literature on bank efficiency has also been linked to its ownership structure[8], Laeven (1999) suggest that ownership structure of banks is not only complex but also involves several dimensions. Banks that have major shareholding from governments are generally considered less efficient than privately-held banks or foreign banks (Micco et al., 2007; Berger et al., 2009; Lin and Zhang, 2009; Cornett et al., 2010; Pessarossi and Weill, 2015). Meanwhile, a higher proportion of institutional shareholdings may result in better efficiency albeit but with lower stability. This can be due to the ability of the institutional investors' to off load their position in the secondary market and carrying a relatively smaller proportion of individual bank shareholding in their overall portfolio (Fox and Lorsch, 2012). Furthermore, ownership concentration in family/individual may also exhibit different risk appetite (Ashraf et al., 2016).

Since the ownership structure is a significant determinant of efficiency, it is important to include a discussion on the ownership structure present in the dataset on hand. The dataset of US BHCs regarding ownership structure was made up of three distinct categories – family, government and institutional shareholding had two distinct categories of ownership. Family ownership included ownership by families and individuals while Institutional shareholding had ownership by banks, investment banks, insurance companies, mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, as well as trust and endowment companies. The existing literature on ownership structure usually assumes

[8] Laeven (1999) , Morck et al., (1998), Williams and Nguyen (2005), Fries and Taci (2005), Micco et al., (2007), Ferri (2009), Lin and Zhang (2009), Berger et al. (2009), and Cornett et al. (2010).

institutional investors as a homogenous group however the objectives for institutional investors managing funds on behalf of their customers can be different from those institutional investors holding shares for their portfolio.[9] This study extends current literature by further subdividing the institutional ownership into two categories. The first category being financial institutions – comprising of banks, investment banks and insurance companies while the second is made up of asset manager type of institutional investors – comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.

Apart from affecting efficiency, ownership structures also affect stability of banks Laeven and Levine (2009). Taking inspiration from Lin et al. (2016) research this research uses the interactive variables for ownership structure and stability and test its effect on efficiency. Stability is used as a moderator variable to gauge the effect that the different ownership categories have on the efficiency of US BHCs. The study uses insolvency risk given by z-score of the return on assets as a proxy for stability. Previous studies using the interactive variable technique include Pessarossi and Weill, (2015) who use ownership structure interactively with the regulatory capital ratio to explain its effect on bank efficiency, and Lin et al., (2016) who use ownership structure interactively with an index of financial freedom. However, neither of these studies includes the effect of institutional ownership or use a time variant dynamic panel ownership data.

[9] For a detailed discussion on classification of different types of institutional ownership categories please refer to Çelik and Isaksson (2014)

Furthermore, banks' decisions of achieving target stability while maintaining a desired level of efficiency are not taken in isolation. Previous studies focusing on the relationship between efficiency and stability of banks and BHCs have not taken into consideration the simultaneous nature of these decisions[10]. There is a need to view both decisions as coordinated and hence model them accordingly. The development of such a model on the premise that banks/BHCs take such decisions in a well-coordinated manner simultaneously, form this essay's principal and original contribution. Following that logic, this study constructs a simultaneous equation model following the generalized method of moments – instrument variable (GMM IV) approach based on the above premise and uses a sample consisting of 553 US BHCs for the period 2004 to 2016. Details regarding our methodology are presented in Chapter 4.

3.3 Determinants of franchise value

The exhaustive regulations that ensued in the aftermath of the global financial crisis (2007 – 2009) are geared towards enhancing the stability of financial institutions. While regulations play a significant role in shaping the scope of bank activities ensuring that excessive risk-taking by banks is restricted, theory indicates that regulations provide a different incentive to stakeholders towards assumption of higher risk levels. Therefore, the impact of these regulations and risk-taking behavior on the presumed franchise value (the ability to generate profit) of banks should also be taken into consideration. Existing literature that focusses on the relationship between risk-taking and franchise value indicates the existence of a simultaneity bias where a specific level of stability and franchise value are jointly or simultaneously determined. For instance,

[10] There are more than a few studies investigating the relationship between Bank efficiency and ownership structures for example Jensen and Meckling (1976), Morck et.al. (1998), Laeven (1999), Williams and Nguyen (2005), Fries and Taci (2005), Micco et al. (2007),), Lin and Zhang (2009), Berger et al. (2009), Cornett et al. (2010) among others.

Marcus (1984) found that as a bank engages in higher risk the franchise value declines suggesting that the risk appetite of banks affects the franchise value. On the contrary, Martynova et al., (2014) provide evidence that the banks franchise value enhances its risk-taking behavior. Furthermore, Demsetz et al., (1996) suggest that a banks' risk-taking is affected by its ownership as well as its franchise value and may be modeled jointly. Furthermore, there is evidence suggesting a significant relationship of ownership structure with franchise value (Pathan et al., 2015; Jiménez, 2013) and with stability (Laeven and Levine, 2009; Ashraf et al., 2016; Barry et al., 2008) of banks. Furthermore, regulations while interacting with varying types and levels of shareholding, market competition, and the economic environment can potentially affect the franchise value. From a policy point of view, it is imperative that a framework is devised by taking into consideration a holistic picture and addressing the intertwined relationship between Franchise value, risk-taking (stability), capital regulations and ownership structures.

Regarding the ownership structures ownership by families differs from the institutional ownership. The nature and constitution of institutional shareholders gives them access to information that other shareholders may not have. Further the institutional shareholders would also have the necessary skills to not only interpret the information but also carry out the required actions Barry et al., (2011). Although the impact of institutional shareholding on the performance of financial institutions has been analyzed in previous studies like that of Pound (1988) and Elyasiani and Jia (2008), but neither of these studies gave conclusive results. Meanwhile Barry et al., *(*2008) found that as more common shares are bought by Institutional investors, there is a shift in corporate governance and risk-taking behavior by banks. In the case of family ownership, it can be argued that family ownership can instill a variety of goals both economic as well as

noneconomic that would affect the franchise value, Claassen's et al., (2002) report an overall reduction in firm value in case of family ownership. Cronqvist and Nilsson (2003) did not find a significant impact of family ownership on franchise value and Shleifer and Vishny (1986) found that families can exploit their position as owners in a firm and extract the benefits often at the expense of the other ownership categories, furthermore this extraction of benefits by family owners would also affect the overall value of the firm.

Bank regulations while interacting with varying types and levels of shareholding, market competition and the economic environment can affect the franchise value of banks. Following that Carletti and Hartman, (2002) suggests regulations in the banking system could alleviate some of the negative impact of intense competition, therefore the second essay uses regulatory capital ratio as a proxy for regulations and analyze its effect on the franchise value. Laeven and Levine (2009) caution that regulations could cause an increase in risk but are dependent on the relative power of shareholders over managers. Shleifer and Vishny (1986) found that shareholders having large voting and cash flow rights not only have the power but incentives as well to affect risk-taking behavior of a firm. This implies that capital regulations can have an adverse impact on banks with such shareholders. On the other hand, without sufficient power to select a riskier portfolio, regulations would more probably affect the bank's stability positively.

This adds to the complicity of the already inter-twined relationship of stability, ownership structure and franchise value of banks. This study fills this gap by developing a dynamic model that not only consider the time variation but also the interaction among these variables. The second essay uses the instrumental variable GMM model that allows us the simultaneous adjustment of both the franchise value as well as bank stability. This study extends current

literature by using the time series ownership structure data to better capture the effect of intertemporal changes on the franchise value using a sample of 553 US Bank Holding Companies (BHCs) from 2004 to 2016. This study is unique and differs from previous research conducted in the area in terms of sample coverage, methodology as well as the definition of our main variable of interest. Detailed methodology is provided in Chaper 4.

3.4 Derivative usage, ownership structure and stability of BHCs

The evolvement of the long-established role of banks to act as financial intermediaries changed when banks started engaging in disintermediation activities due to higher competition and narrower profit margins. These disintermediation activities included trading in derivatives. Federal Reserve saw the decision to trade in derivatives as a hedging strategy for managing risk and as a contributory factor towards greater flexibility of the financial systems (Greenspan, 2004). Derivatives are essential tools in armory of banks for risk management purposes (Bulbul et al., 2019). It is also evident that the existence and evolution of derivatives can alter the risk-taking behavior of banks (Wagner, 2004; Instefjord, 2005; Sundaram and Willey, 2009). Though financial derivatives emerged as an important tool to mitigate the impact of undesirable risks that firms face however in the aftermath of the 2008 crisis, Capelle-Blancard (2010), Wagnor (2004), Instefjord (2005), Nijskens and Wagner (2011), and Dewally and Shao (2013), found evidence of the detrimental effects of derivatives usage on financial stability of banks.

The motivation to transact in derivatives can stem from either a banks desire to hedge its risk or for increasing its income stream. The first is commonly known as the hedging hypothesis, where banks may trade in derivatives to decrease the risk of adverse fluctuations in the value of

their assets and liabilities through hedging their risk (Brewer III, Jackson III and Moser; 2001). The second motivation to use derivatives supported by empirical literature is the substitution hypothesis wherein banks use derivatives to increase their income stream which would increase their risk exposures (Li and Marinc; 2014).

Previous studies such as Hirtle (2009), Li and Yu (2010), Ashraf and Goddard (2012), Hasan and Khasawneh (2009), Ghosh (2017), and Bulbul et al., (2019) among several others explored the relationship between risk-taking and the decision to use financial derivatives however, these studies did not include the effect of ownership structure. Furthermore, studies involving ownership structure and risk-taking behavior of banks do not include the impact of transacting in financial derivatives and how this can affect their stability[11]. The third essay of this thesis develops an empirical model for the relationship between bank risk and the decision to use derivatives that is simultaneous in nature and how ownership structure plays a role in determining the level of stability among the US BHCs using simultaneous equations and the two stage least squares methodology. The next chapter will discuss in detail the data sources and research design of this thesis and includes a brief section on the development of the covariates as well as the models employed in the research.

[11] see Saunders, Strock, and Travlos (1990), Ianotta et al., (2007), Laeven and Levine (2009) as examples

CHAPTER FOUR

DATA, RESEARCH DESIGN AND METHODOLOGY

This chapter gives the data sources, research design and research methodology used in my research, section 4.1 starts by providing an explanation on the sample used in the dissertation, sources of data collection, research design and methodology.

Section 4.2 discusses the variables while section 4.3 describes the research design and methodology used in the subsequent chapters for empirical investigation. Section 4.4 summarizes and concludes the chapter.

4.1 Data sources and Sample size

The sample used in this research consists of 553 Bank Holding Companies (BHCs) from the US, the sample period is from 2004 to 2016. The period 2004 to 2016 that was used for the research included the period of the sub-prime mortgage crisis from 2008- 2010, there were a significant number of BHCs that were merged or were acquired or simply ceased to exist during this time. Since the focus of this research includes ownership structure therefore the BHCs that were merged or acquired by another BHC during the crisis period are reflected through the merged BHC.

The financial data of US BHCs was obtained from annual financial data from the call report data of the Federal Reserve Bank of Chicago website. This financial data was then merged with ownership structure data for the US BHCs, the ownership structure data was sourced from Capital IQ for the same time-period. The choice of the time-period used for the study is due to two reasons, the first is availability of a dynamic panel ownership structure data and the second is that this time-period reflects the relative stability, global financial

crisis and recovery period of the US BHCs. The financial and ownership data was then merged with the macro-economic data. This included Unemployment data from Current Employment Statistics of the Bureau of Labor Statistics, US Department of Labor and Gross State-wise Product (GSP) data from The Bureau of Economic Analysis, US Department of Commerce for the period 2004 to 2016. Finally, the federal fund effective rate and discount rate was sourced from the Federal Reserve Banks website for the same period and merged to the dataset. Table 4.1 provides a list of the type of data alongwith its source that was used to construct the different variables for analysis.

Table 4.1: Data Sources

Variables	Data Sources
Financial Data	Call report data from Federal Reserve Bank of Chicago website (www.chicagofed.org)
Ownership data	Capital IQ website: https://www.capitaliq.com/
Macro-economic indicator data: Unemployment	Current Employment Statistics of the Bureau of Labor Statistics, US Department of Labor (www.bls.gov/ces/)
Gross state wise product	The Bureau of Economic Analysis, US Department of Commerce (www.bea.gov)
Federal fund effective rate and discount rate	Federal Reserve Bank website (www.federalreserve.gov)

Some observations had to be dropped as they were either missing or were obviously incorrect, also some of the observations in the dataset had outliers, the impact of outliers was mitigated through winsorizing the covariates at the 1st and 99th percentile. After making these adjustments, the dataset constituted of an unbalanced panel data for 553 US BHCs and 5353 observations.

4.2 Construction of variables

The main variables that this thesis focuses on are stability, efficiency and franchise value of the US BHCs. Sub- section 4.2.1 starts with an explanation of all the endogenous variables for the thesis, subsection 4.2.2 describes the ownership structures and the remaining explanatory and macro- economic covariates. Sub-section 4.2.2 describes the construction of the endogenous variable franchise value followed by the exogenous control and macro-economic variables. Finally, the sub-section 4.2.3 provides the endogenous variable for stability and the exogenous control and macro-economic variables.

4.2.1. Construction of endogenous variables for efficiency, franchise value, stability and derivative usage

This section describes how the endogenous variables were constructed for all three essays in the thesis.

4.2.1.1 Construction of variable for efficiency

There has been major advancement towards calculation of efficiency in the recent years; in the simplest possible terms, efficiency is defined as the ratio of output to input. In order for the management to have an effective control over the banks, the ability to quantify the efficiency and productivity is paramount to its success and a wide array of choices are available in making these comparisons (Fried et al., 1993).

Literature on efficiency has progressed from a simple ratio to various complex methodologies for calculating efficiency such as operational efficiency as explained by Farrell (1957) and X-efficiency by Leibenstein (1966) while recently more efforts have been geared towards calculation of bank efficiency through the stochastic frontier approach (SFA) and/or the data envelopment analysis (DEA). All three of these approaches have their relative merits

and demerits, the choice of which technique to use would ultimately depend on the situation and can range from the use of a simple ratio or the more complex SFA and DEA techniques. Laeven (1999) used DEA technique for a sample of South Asian banks to estimate their inefficiency. In a recent strand of literature Matthews (2013) used DEA technique for calculating efficiency for a sample of Chinese banks, while Pasiouras (2008) used DEA methodology for a sample of Greek banks. Although the DEA technique can handle multiple inputs and outputs however it is an extreme point technique and noise in data can cause significant problems, due to this the study deemed it more prudent to use an efficiency ratio rather than the DEA technique. Lin et al., (2016) uses the stochastic frontier approach employing a database from more than a dozen Asian countries to analyze the effect of changes in the bank ownership structure on efficiency. Pessarossi and Weill, (2015) also use the (SFA) stochastic frontier technique for calculating efficiency and study effect of capital ratios on the cost efficiency of banks from China.

For calculating efficiency, this study uses a simple efficiency ratio, in line with research by Gedajlovic and Shapiro, (1998), Thomsen and Pedersen, (2000), Barth el al., (2001), and Demirgüç-Kunt and Levine, (2004) all of whom have previously used financial ratios as performance indicators. Berger and Humphrey, (1992) suggest that inefficiency in the US banking sector is primarily operational and result from overuse of labor and capital inputs. Since the regulatory enforcement may also lead to higher burden on net operating revenue this study defines efficiency as the proportion of net operating revenues consumed by overhead expenses:

$$EFF_{it} = \frac{OE_{it} - NON_{it}}{NII_{it} + OI_{it}} \quad \text{.....(4.1)}$$

Where OE_{it} is noninterest expense, NON_{it} is amortization of intangible assets, NII_{it} is net interest income and OI_{it} is noninterest income. Since bank efficiency represents the proportion of operating revenues net of the overhead expenses scaled by Net interest income less net non-interest income, and hence a lower value would be indicative of greater efficiency.

4.2.1.2 Construction of variable for franchise value

De Jonghe and Vennet (2007) describe franchise value as the present value of the profits (present and future) that a bank is expected to generate in the foreseeable future. Accounting profit measures such as ROA and ROE have also been used previously as measures for franchise value. The empirical literature has identified several measures for calculating franchise value of banks including such as Tobin's Q (measure used by Villalonga and Amit, (2006;), Cronqvist and Nilsson, (2003), Laeven and Levine, (2009)), and Lerner's Index by Jiménez et al., (2007) and, Sharpe ratio by Demirgüç-Kunt and Huizinga, (2010).

Since franchise value would be reflected as the ability to generate higher returns this study defines it to include the effect for extending credit and therefore add the discount rate and prime rate in my calculation of franchise value. In line with Jiang and Zhang (2017) and Li and Zhang's (2006) measure, Franchise value is calculated as follows:

$$FV_{it} = \frac{1}{1+R_b}\left[ROE_{it} - R_c\right] \qquad (4.2)$$

FV_{it} is the franchise value of BHC i at time t, ROE_{it} refers to the return on equity for BHC i at time t; R_b refers to the discount rate and effective federal funds rate has been used as proxy for discount rate. The effective federal funds rate is used by depository institutions and/or banks to lend their reserve balances to other financial institutions including banks and BHCs on an overnight basis in the US. R_c refers to the capital cost taken as the average prime rate that

financial institutions including banks and BHCs charge on their short-term loans to various businesses as a proxy for capital cost. A higher value for FV_{it} will imply higher franchise value of BHC.

4.2.1.3 Construction of variable for stability

Empirical literature cites z-score as a widely used and popular measure for bank stability[12]. See for example Leaven and Levine (2009) and Demirgüç-Kunt and Huizinga (2010), Ashraf et al. (2016, 2017), Aziz et al., (2016). As the research on calculation of z-score has evolved so have different methodologies on its calculation. This research follows Lepetit and Strobel (2013) model and calculates stability as follows:

$$STB_{it} = \frac{\bar{r}_{it}+\mu_{it}}{\bar{\sigma}_{it}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.3)$$

where subscript *i* indicates the bank holding company and *t* indicates time. μ_{it} gives the mean of returns on Assets, $\bar{\sigma}_{it}$ is volatility of the returns on Assets while $\bar{r}_{it}$ is defined as the ratio of total equity capital scaled by the total Assets. Previous literature reports that the z-score is highly skewed, so for all estimations this study uses the logarithmic transformation of z-score, and this is in line with Leaven and Levine (2009), Schaeck and Cihák (2012) and Ashraf et al. (2016).

4.2.1.4 Construction of variable for derivative usage

The third essay of this study focuses on how the decision to transact in derivatives and ownership structure affect stability of US BHCs. This study uses dummy variables for derivative usage where DER_{it} = 1 if BHC i used any type of derivatives in year t and DER_{it} = 0

[12] This research uses Z-score as a proxy for stability, however it is pertinent to point out that Z_score is also an insolvency risk measure and therefore a higher value of Z_score points towards low insolvency risk and high stability levels while a lower Z-score value points towards higher risk of a BHC going insolvent and lower stability.

otherwise. However, the model is also tested for interest rate derivatives, foreign exchange derivatives and credit derivatives. In each instance the same methodology is employed as the total derivative usage. For Interest rate derivatives the dichotomous variable is defined as $INTR_{it}$ =1 if BHC i used interest rate derivatives in year t and 0 otherwise, for foreign exchange derivatives FOR_{it} =1 if BHC i used foreign exchange derivatives in year t and 0 otherwise and for credit derivatives CDX_{it} =1 if BHC i used credit derivatives in year t and 0 otherwise.

4.2.2 Construction of exogenous variables, control variables and macro-economic covariates determining efficiency, franchise value, derivative usage and stability

This section deals with the exogenous variables that were used throughout the study. Table 4.2 describe all exogenous, control and macro -economic co-variates for the three essays based on efficiency, franchise value, derivative usage and stability. Detailed discussion of each variable is in the respective chapter.

Table 4.2: Exogenous, control and macro-economic variables used for Efficiency, Franchise value, Derivative usage and stability in Chapter 5, 6 and 7 respectively

		Expected Relationship			
		Efficiency	Franchise Value	Derivative Usage	Stability
Variables	Definition	EFF_{it}	FV_{it}	DER_{it}	STB_{it}
Ownership structure:					
FI_{it}	Comprising of Banks, investment banks and insurance companies	+/-	NA	NA	+/-
$INST_{it}$	Comprising of comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.	+/-	+	NA	+

$FAMILY_{it}$	Comprising of individuals and family.	-	-	NA	-
GOV_{it}	Comprising of government shareholding.	-	NA	NA	-
$SIZE_{it}$	Controls for size effects of BHCs and is taken as the natural log of the total assets (expressed in US$ bn).	+/-	+	+	+
DIV_{it}	Diversification is defined as the ratio of Net non-interest income scaled by net interest income	+/-	+/-		NA
$LIQUID_{it}$	Liquidity is defined as net loans and leases to deposits ratio	-	-	+	NA
REGit	Tier 1 and Tier 2 capital scaled by the total risk weighted assets	+	-	NA	NA
$HERF_{it}$	Square of the total assets of a BHC scaled by the sum of total assets of all BHCs in the sample	+	+/-	+/-	NA
$EFFRR_{it}$	Effective federal funds reserve rate	+/-		NA	NA
$GSPG_{it}$	Gross state-wise product Growth	+/-	-	NA	NA
$UNEMPG_{it}$	State-wise Unemployment growth rate	-	+	NA	NA
FC_{it}	Dummy for the Financial crisis	NA	+/-	NA	NA
$LGROW_{it}$	Loan growth is defined as the ratio between loan growth and total assets.	NA	NA	NA	+
$LNLOSS_{it}$	Quality of loan portfolio defined as the annual rate of change in the loan loss provision ratio	NA	NA	+	+/-
ROA_{it}	Defined as net income scaled by total assets	NA	NA	NA	+
PR_{it-1}	Prime rate for lending at the end of previous year	NA	NA	NA	+/-
RWA_{it}	Risk weighted assets divided by total assets	NA	NA	NA	-
NIM_{it}	Net interest income scaled by total assets	NA	NA	+/-	

4.3 Research Design and Methodology

This section discusses the research design and methodology of the thesis, followed by the summary. Sub section 4.4.1 provides the methodology for first essay using efficiency as the endogenous variable. Sub-section 4.4.2 gives the research methodology for the second essay using franchise value as the endogenous variable and finally 4.4.3 gives the research methodology for the third essay using stability and the decision to transact in derivatives as the endogenous dependent variables.

4.3.1 Research methodology with efficiency as endogenous variable

Banks while complying with the capital regulations simultaneously adjust their risk appetite to maintain their stability (Shrieves and Dahl,1992; Jokipii and Milne ,2011; Stolz et al., 2003; Aziz and Lilti, 2017). Altunbas et al., (2007) report that determinants of bank risk-taking and incentives for moral hazard include efficiency and meeting the capital requirements. While Fiordelisi et al., (2010) argue that increase in bank risk may follow a decline in the efficiency level.

Since the ordinary least squares do not account for the panel structure of the dataset, following Magalhaes et al., (2010) who argue that due to the nature of the data set where the dependent variable would depend on its own past realizations it would be prudent to use the GMM methodology instead of the traditional fixed or random effects techniques. The choice in using this methodology is justified due to the specific characteristics of the database, which constitutes of dynamic accounting and ownership structure data of US BHCs, and both the variables for stability and efficiency would depend on past realizations would experience time clustering. Secondly, certain bank specific variables are suspected of being endogenous, like the bank size and liquidity. Thirdly, the panel data used has few time-periods as compared to the number of observations. Fourthly, due to the concerns for presence of endogeneity and simultaneous feedback in the data the use of the instrument variable generalized method of moments (IV GMM) technique devised by Arellano and Bover (1995) and by Blundell and Bond (1998) may be more prudent. Finally, due to assumption of the presence of heteroscedasticity and autocorrelation within the BHCs, but not across them GMM IV methodology was found to be the most suitable. Under GMM IV methodology two equations are used– the first is the original equation and the second is the transformed one given as Eq

(4.4.1), Eq (4.4.1a). The methodology involves a two-step estimation procedure which gives a finite-sample correction for the standard errors, producing coefficients that are less biased with lower standard errors, this methodology was proposed by Windmeijer (2005). All regressions include the lag of the dependent variables, and for the instrument variables the study used the lag of the dependent variable alongwith ownership structure variables, and for the instrument variables size, diversification and liquidity are used as they are suspected of not being strictly exogenous.

Altunbas et al., (2007) argue that efficiency and meeting the capital requirements are two important determinants of banks risk-taking and incentives for moral hazard. While Fiordelisi et al., (2010) argue that an increase in bank risk may follow a decline in the efficiency level. Further Coles et al., (2006, 2008) assume that bank risk, ownership and performance are jointly determined, while Kwan and Eisenbeis (1998) reported higher risk taking by BHCs with lower efficiency. Due to the possibility of endogeneity between efficiency and stability, we devise a simultaneous equations model wherein both efficiency and stability are treated as endogenous variables:

$$STB_{it} = \alpha_0 + \alpha_1 EFF_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \varphi X_{it} + E_{it} \qquad \text{Eq (4.4.1)}$$

$$EFF_{it} = \beta + \beta_1 EFF_{it-1} + \beta_2 S\check{T}B_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \qquad \text{Eq (4.4.1a)}$$

Where STB_{it} is the indicator of stability, EFF_{it} represents efficiency of US BHCs i at time t for ownership type j. The discretionary EFF_{it} in (2) depends on true value of the desired stability (STB_{it}) which however is not observable, but the observed efficiency (EFF_{it}) level in equation (4.2.1 a) of a BHC can be determined by an endogenously determined adjustment in $S\check{T}B_{it}$. The vectors X_{it} are observable BHC related variables while vector Y_{it} are control variables that are country/State-specific and help to explain variation in stability and franchise value. λ_t gives the (unobserved) individual as well the time-specific effects reflecting the nature

of the dataset as time varying panel data. $\tilde{E}_{it}$ and $\tilde{\varepsilon}_{it}$ reflect the error or the idiosyncratic terms which vary over time and between BHCs.

4.3.2 Research methodology with franchise value as endogenous variable

While previous empirical literature considers the relationship between the franchise value and stability as unidirectional assuming that a desired level of stability is a function of the franchise value, compliance with capital regulations and ownership structure. However, maintaining the desired level of franchise value is a function of its stability hence there exists a simultaneity bias and must be accounted in modeling the nexus of franchise value and stability as below:

$$STB_{it} = \alpha_0 + \alpha_1 FV_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \varphi X_{it} + E_{it} \qquad \text{Eq (4.4.2)}$$

$$FV_{it} = \beta + \beta_1 FV_{it-1} + \beta_2 \check{STB}_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \qquad \text{Eq (4.4.2a)}$$

FV_{it} is the franchise value of the US BHCs *i* at time *t* for ownership type *j* calculated using Jiang and Zhang (2017) and Li and Zhang's (2006) measure while STB_{it} measures stability for each BHC *i* at time *t* for ownership type *j*. The value of the discretionary FV_{it} for eq (4.4.2) depends on the true value of stability (STB_{it}) which however is not observable. Nevertheless, the observed level of franchise value (FV_{it}) in eq (4.4.2a) for the BHC is driven by an adjustment in the variable for stability ($\widetilde{STB}_{it}$) which is determined endogenously. The vectors X_{it} are observable BHC related variables while vector Y_{it} are control variables that are country/State-specific and help to explain variation in stability and franchise value. λ_t gives the (unobserved) individual as well the time-specific effects reflecting the nature of the dataset as time varying panel data. $\tilde{E}_{it}$ and $\tilde{\varepsilon}_{it}$ reflect the error or the idiosyncratic terms which vary over time and between BHCs.

Since the pooled OLS regression ignores the nature of data as panel structured and in the presence of unobserved heterogeneity gives an upward bias in the coefficient estimates for the lagged dependent variables therefore the use of lagged explanatory variables would make the model more dynamic Bond (2002). However due to the problem of correlation between lag of the explanatory variables and the error terms the assumption of orthogonality would be violated thereby creating endogeneity.

Due to both endogeneity concerns and simultaneity bias this study uses the two-step method for computing Eq (4.4.2) which accounts for both problems: endogeneity and simultaneity bias following Arellano and Bover (1995) and Blundell and Bond (1998).

The GMM model however is designed for datasets with "small T, large N" panels, with independent variables that are correlated with both the past error and the current realization of the error term with fixed effects; and with heteroscedasticity and autocorrelation within the individuals. Therefore, all regressions are run with the two-step IV GMM estimator. The IV GMM is a robust indicator of both the contemporaneous errors as well as the autocorrelation. Roodman (2009) argues that though the two-step method may be more efficient asymptotically however the standard errors are severely biased downwards. Therefore, the use of Windmeijer (2005) methodology for finite sample correction to the two-step method. The methodology allowed for the adjustment of franchise value and stability simultaneously as it considers both variables endogenous, and hence allowing BHCs to simultaneously determine their franchise value and stability levels. Further Hansen's J-test is used for validity of instruments and the Arellano and Bond test for the serially uncorrelated terms checked the reliability of the GMM estimates under the dynamic panel system.

4.3.3 Research methodology with stability and derivative usage as endogenous variables

The third essay in this dissertation is based on investigating the simultaneous relationship between stability of US BHCs and the propensity to use derivatives. The current fast pace of financial innovation which includes in part the use of derivatives as well as the new role assumed by the different investors, in particular the institutional investors has led not only to increased liquidity but has also resulted in assumption of higher level of risk and thereby lower stability by banks. In line with Ashraf and Goddard, (2012) model a simultaneous equations model is developed describing decisions by US banks to use derivatives towards and assuming risk decision, alongwith identification of covariates of bank stability (using z-score as a measure for stability) and the use of derivatives equations.

Standard estimation methods give biased and inconsistent estimates when there is simultaneity between variables. The bias may be corrected by using a suitable estimation technique, in this case one of the endogenous variable's stability is continuous while the other one i.e. the decision to transact derivatives is a dichotomous one. The study therefore uses the two stage probit least squares (2SPLS) which accounts for the problem of one endogenous continuous variable stability and a second endogenous dichotomous variable derivative usage. The relationship between the desired stability level of BHCs and the BHCs decision to transact in derivatives have been considered below with the following specifications in a simultaneous equations model setting:

$$STB_{it} = \gamma_1 DER_{it} + \beta_1' X_{it} + u_{it} \qquad \text{- Eq (4.4.3)}$$

$$DER_{it}^{*} = \gamma_2 STB_{it} + \beta_2' Y_{it} \qquad \text{- Eq (4.4.3a)}$$

where STB_{it} measures stability in BHC i's in the year t in Eq (4.4.3). DER_{it}* in eq (4.4.3a) is a latent unobserved variable determining the probability of BHC i using derivatives in the year t; and X_{it} is a vector of covariates for the stability equation i.e. Eq (4.4.3); and vector Y_{it}

represents the covariates for the decision to transact in derivatives equation i.e. Eq (4.4.3a). Furthermore, the decision to transact derivatives equation is modelled as below:

$$DER_{it} = 1 \; if \; DER_{it}^{*} + v_{it} > 0 \; and \; DER_{it} = 0 \; if \; DER_{it}^{*} + v_{it} < 0$$

where DER_{it} = 1 if BHC i transacted in derivatives in year t otherwise DER_{it} = 0. The disturbance terms are u_{it} ~ N (0, σ_{it}^2) and v_{it} ~ N (0,1).

The composite null hypothesis for this study is if the decision for a target stability level and decision to transact in derivatives are independent of each other, and the outcome of the BHCs decision to transact in derivatives did not impact the BHCs stability. In the case the null hypothesis is rejected then γ_1=γ_2=0, and the sign of coefficients determines the association between the stability and the decision to transact derivatives. A positive association would imply the support for hedging hypothesis where a decision to transact in derivatives is influenced by the desire to maintain higher stability levels, and in this case both $\gamma_1$and $\gamma_2$will be greater than 0. While a negative association would support the substitution hypothesis where banks transact in derivatives to increase their income leading to lower stability levels and will be reflected in negative co-efficients in both equations whereby both $\gamma_1$and $\gamma_2$will be less than 0. The use of the simultaneous equation model has the flexibility to accommodate both aspects of the relationship described above between stability and the decision of a BHC to use derivatives.

Due to this simultaneous relationship between STB_{it} and DER_{it} the application of OLS for Eq (4.12) and the probit in Eq (4.13) would give inconsistent and biased estimates for the co-efficients. Further the endogeneity between STB_{it} and DER_{it} would result in violation of the classical assumption that co-var = 0 between the covariates and the disturbance terms. For continuous variables, the problem of endogeneity can be avoided by using simultaneous

equation model estimations like the two stage least squares (2SLS). However, in this case, since the variable for stability is continuous while the variable for derivative usage is dichotomous and hence consistent with Maddala, (1983) the study uses the 2 stage probit least squares which is a variation of 2SLS. Ashraf and Goddard (2012) employed a similar model but their covariates differed from this study. The details of the 2 stage probit least squares or the 2SPLs are given below. For first stage of estimation the reduced form of the model is estimated as:

$$STB_{it} = \pi_2' Z_{it} + \varepsilon_{it} \qquad \text{Eq (4.4.3.b)}$$

$$DER_{it}^{**} = \pi_2' Z_{it} \qquad \text{Eq (4.4.3c)}$$

where Z_{it} denotes a vector with exogenous variables from X_{it}, Y_{it} or from both. DER_{it}^{**} being a latent variable where DER_{it} =1 if $DER_{it}^{**} + v_{it} > 0$ and DER_{it} = 0 if $DER_{it}^{**} + v_{it} < 0$. Further $\varepsilon_{it} \sim N(0, \sigma_{\varepsilon}^2)$ and $v_{it} \sim N(0,1)$ are the disturbance terms and Eq (4.4.3b) is estimated using the OLS methodology while Eq (4.4.3c) uses probit estimation.

The fitted values obtained for the dependent variables from the first- stage estimations of Eq (4.4.3b) and Eq (4.4.3c) are substituted in the second stage and denoted by $\widehat{STB}_{it}$ and $\widehat{DER}_{it}^{**}$ respectively, for z_score_{it} in Eq (4.4.3a) and DER_{it} in Eq (4..4.3b) as below:

$$STB_{it} = \gamma_1 \widehat{DER}_{it}^{**} + \beta_1' X_{it} + u_{it} \qquad \text{Eq (4.4.3d)}$$

$$DER_{it}^{*} = \gamma_2 \widehat{STB}_{it} + \beta_2' Y_{it} \qquad \text{Eq (4.4.3e)}$$

where DER_{it} =1 if $DER_{it}^{**} + v_{it} > 0$ and DER_{it} = 0 if $DER_{it}^{**} + v_{it} < 0$. Now since $\widehat{DER}_{it}^{**}$ is function of Z_{it} only hence $\widehat{DER}_{it}^{**}$ is not correlated to v_{it} and Eq (4.4.3.5) can be estimated through OLS. Likewise, Eq (4.4.3e) can be estimated by using the probit model as $\widehat{STB}_{it}$ is now a linear function of vector Z_{it} only, also there is no correlation between $\widehat{STB}_{it}$ and v_{it}. The

adjusted standard errors however are still required for estimated coefficients of both Eq (4.4.3d) and Eq (4.4.3e), the unadjusted standard errors being based on $D\hat{E}R_{it}^{**}$ and $S\hat{T}B_{it}$ instead of DER_{it}^{*} and $S\hat{T}B_{it}$.

The third essay also reports four separate versions of the model, having three distinct definitions for the dichotomous dependent variable: the use of derivatives. For the first model total derivative usage is used as the dichotomous variable denoted by DER_{it}, with DER_{it} = 1 if BHC i used any type of derivative instrument in the year t, and 0 otherwise. For the second model, DERit is replaced by $INTR_{it}$, and it is defined in the same way but for interest rate derivatives; for the third model DER_{it} is replaced by FOR_{it}, for foreign exchange derivatives; while in the last model, DER_{it} is replaced by CDX_{it} for credit derivatives. The differences between the four estimated models should reveal interesting patterns for each of the derivative instrument used.

4.4 Summary

This chapter provided a detailed description regarding the sample size, the method of data collection and the sources that were used to acquire the data for the empirical analysis alongwith the derivation and development of the primary covariates used in the three essays forming the thesis. It also covers in detail the research methodology used in the empirical analysis. After having established data sources, variables and methodology the next section covers the empirical essays on which this thesis is based.

Part -- II

CHAPTER FIVE

IMPACT OF OWNERSHIP STRUCTURES AND REGULATIONS ON BANK EFFICIENCY: EMPIRICAL EVIDENCE FROM US BANKS.

5.1 Introduction

During the last three decades, regulators and policymakers made every effort to curb risk-taking behavior of banks. Regulations were introduced at both national and global level including a series of Basel standards for capital regulations, Dodd-Frank Act, and Volcker's rule to enhance the resilience of banking and financial sector. The compliance with any regulation requires adjustment in the risk-taking behavior to ultimately enhance the resilience of banks. However, the desire of higher stability may have unintended consequence for lowering the efficiency of banks. Furthermore, banks' decisions of achieving target stability while maintaining a desired level of efficiency are not taken in isolation. Previous studies focusing on the relationship between efficiency and the stability and risk-taking of banks have not taken into consideration the simultaneous nature of these decisions[13]. There is a need to view both decisions as coordinated and hence model them accordingly. The development of a model that is based on the premise that BHCs take decisions regarding stability and efficiency levels simultaneously, and in a well-coordinated manner, represents this study's principal and original contribution.

[13] There are several studies investigating the relationship between Bank efficiency and ownership structures for example Jensen and Meckling (1976), Morck et.al. (1998), Laeven (1999), Williams and Nguyen (2005), Fries and Taci (2005), Micco et al. (2007),), Lin and Zhang (2009), Berger et al. (2009), Cornett et al. (2010) among many others.

Empirical literature suggests that bank efficiency is linked to its ownership structure. Laeven (1999) suggest that ownership structure of banks is not only complex but also involves several dimensions. Banks with major shareholding from governments are generally considered less efficient than privately-held banks or foreign banks (Micco et al., 2007; Berger et al., 2009; Lin and Zhang, 2009; Cornett et al., 2010; Pessarossi and Weill, 2015). On the other hand, a higher proportion of institutional shareholdings may result in better efficiency albeit with lower stability. This can be due to the institutional investors' ability to off load their position in the secondary market and carrying a relatively smaller proportion of individual bank shareholding in their overall portfolio (Fox and Lorsch, 2012). Furthermore, ownership concentration in family/individual may also exhibit different risk appetite (Ashraf et al., 2016).

The existing literature on ownership structure usually assumes institutional investors as a homogenous group however the objectives for institutional investors managing funds on behalf of their customers can be different from those institutional investors holding shares for their portfolio[14]. This research adds and extends the literature on ownership structure of banks by subdividing the institutional shareholding into two sub-categories. The first category being financial institutions – comprising of banks, investment banks and insurance companies while the second is made up of asset manager type of institutional investors – comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.

By using a sample consisting of 553 US BHCs for the period 2004 to 2016 in a simultaneous equation model following the generalized method of moments – instrument variable

[14] For a detailed discussion on classification of different types of institutional ownership categories please refer to Cęlik and Isaksson (2014)

(GMM IV) approach, we find empirical evidence suggesting that those BHCs which are more stable are highly efficient. Regarding the ownership structure, we find that the market discipline imposed by higher proportion of institutional investors in the ownership structure of US BHCs especially those with asset management orientation positively affect efficiency while the higher proportion of government ownership adversely affect the performance.

Most interesting finding of this paper is the unanimous result emerging from the interactive terms, "ownership categories with stability" that higher ownership in any category of the ownership coupled with higher stability of BHCs yields lower efficiency. The decrease in efficiency is more pronounced in the case of both institutional ownership categories.

The empirical findings have important and significant policy implications for investors and regulators. There is a need for regulators to carefully design the regulations that not only protect the stability of BHCs and thereby of the entire financial systems but also to protect the incentives for shareholders in the form of ability to generate return on their investments as suggested by Çelik and Isaksson (2014).

5.2 Related Literature

Related literature has been discussed in detail Chapter 3, sec 3.1

5.3 Empirical Model for efficiency, risk and ownership structures of US BHCs

Altunbas et al., (2007) argue that among other determinants efficiency and meeting the capital requirements are also important determinants for BHC risk-taking incentives and moral hazard issues. While Fiordelisi et al., (2010) argue that an increase in bank risk may follow a decline in the efficiency level. Further Coles et al., (2006, 2008) assume that bank risk, ownership

and performance are determined jointly, while Kwan and Eisenbeis (1998) reported higher risk taking by BHCs with lower efficiency. Taking into consideration that there may be endogeneity between efficiency and stability, this study devices a simultaneous equations model in which both efficiency and stability can be treated as endogenous variables:

$$STB_{it} = \alpha_0 + \alpha_1 EFF_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \varphi X_{it} + E_{it} \quad \text{Eq (5.1)}$$

$$EFF_{it} = \beta + \beta_1 EFF_{it-1} + \beta_2 S\tilde{T}B_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \quad \text{Eq (5.2)}$$

Where STB_{it} is the indicator of stability, EFF_{it} represents efficiency of US BHCs i at time t for ownership type j. (see Section 5.4 for definition of variables). The discretionary EFF_{it} in Eq (5.2) is dependent on true value of the desired stability (STB_{it}) which however is not observable. The observed efficiency (EFF_{it}) level of a BHC in Eq (5.2) however, can be determined by an endogenously determined adjustment in $S\tilde{T}B_{it}$. The vectors X_{it} are observable BHC related variables while vector Y_{it} are control variables that are country/State-specific and help to explain variation in stability and franchise value. λ_t gives the (unobserved) individual as well the time-specific effects reflecting the nature of the dataset as time varying panel data. $\tilde{E}_{it}$ and $\tilde{\varepsilon}_{it}$ reflect the error or the idiosyncratic terms which vary over time and between BHCs.

5.4 Definition of co-variates

This section discusses how the endogenous variable for efficiency has been measured followed by the definition and measurement of variables including ownership structure alongwith control variables and macroeconomic variables that were used for the empirical analysis.

5.4.1. Measurement of efficiency of US BHCs (EFF_{it})

The standard studies involving comparisons of how banks perform vary over using different techniques ranging from simple bank ratios to non-parametric techniques such as the stochastic frontier approach (SFA) and the data envelopment analysis (DEA), all these approaches have their relative merits and demerits. The choice of which technique to use would ultimately depend on the situation, for example Altunbas et al., (2001) used stochastic frontier (SFA) technique to measure efficiency based on a sample of German banks with private commercial, public savings and mutual cooperative ownership. Lensink et al. (2008) also used the SFA technique on a sample made of 2095 commercial banks from 105 countries to study effects of foreign vs domestic ownership on efficiency. While Lin et al., (2016) used the stochastic frontier approach employing a database from more than a dozen Asian countries to analyze the effect of how changes in a banks ownership structure affect efficiency before and after the financial crisis of 2008.

For calculating efficiency this study is using efficiency ratio in line with research by Gedajlovic and Shapiro (1998), Thomsen and Pedersen, (2000), Barth el al., (2001), and Demirguc-Kunt et al., (2004) all of whom have previously used financial ratios as performance indicators. Berger and Humphrey (1992) found that inefficiency in the US banking sector is primarily operational and result from overuse of labor and capital inputs. Since the regulatory enforcement may also lead to higher burden on operating revenue efficiency is calculated as non-interest expense minus the amortization of intangible assets as a percentage of net interest and non-interest income.

$$EFF_{it} = \frac{OE_{it} - NON_{it}}{NII_{it} + OI_{it}} \qquad (5.1)$$

Where OE_{it} is non-interest expense, NON_{it} is amortization of intangible assets, NII_{it} is the net interest income, while OI_{it} is non-interest income. Since bank efficiency represents the proportion of operating revenues net of the overhead expenses scaled by Net interest income less net non-interest income, therefore lower value of our efficiency variable EFF_{it} would be indicative of greater efficiency.

5.4.2 Stability measure of US BHCs (STB_{it})

Empirical literature cites z-score as a widely used measure of bank risk as well as stability. See for example Leaven and Levine (2009) and Demirgüç-Kunt and Huizinga (2010), Barry, Lepitet and Tarazi (2011), Lepetit and Strobel (2013), and Ashraf et al. (2016, 2017). As the research on calculation of z-score has evolved so have different methodologies on its calculation. This research follows Lepetit and Strobel (2013) model and calculates z-score (denoted by STB_{it}) as follows:

$$\mathrm{STB}_{it} = \frac{\bar{r}_{it}+\mu_{it}}{\bar{\sigma}_{it}} \qquad (5.2)$$

where subscript *i* indicates bank and *t* indicates time. μ_{it} is the mean of the returns on assets, $\overline{\sigma}_{it}$ is the volatility of the returns on assets while $\bar{r}_{it}$ is defined in this research as the ratio between the total equity capital and total assets. Lower STB_{it} of a BHC would point towards a higher probability of its failure. Previous literature reports that the z-score is highly skewed, so for all estimations the logarithmic transformation of z-score is used, and this is in line with Leaven and Levine (2009), Schaeck and Cihák (2012) and Ashraf et al., (2016). A negative association of STB_{it} with EFF_{it} is expected suggesting that those BHCs enjoying higher stability are more efficient.

5.4.3 Ownership structure of US BHCs (OWN_{ijt})

The ownership structure debate has generated a lot of interest and attention ranging from changes in ownership type to ownership concentration. The ownership structures may include different categories of investors with diverse investment objectives and risk management strategies. Taking a cursory look at the data set of the US BHCs ownership structures, there are distinct classes of ownership in the data that are clubbed together as institutional owners: these institutional owners varied from the banks themselves to mutual fund companies and trust funds, financial institutions, and insurance companies. The ownership structures also included other categories of ownership namely families, individuals, and government shareholding. Since each of these shareholders would have different investment objectives their strategies would also differ from one another in terms of returns on their investments albeit stability. This premise is in line with Hu and Izumida (2008) argue that different categories of shareholdings whether concentrated or diffused would either benefit the institutions or they could cost them depending upon a specific corporate governance environment.

The nature and constitution of institutional shareholders gives them access to information that other shareholders may not have, coupled with the fact that these shareholders would also have the necessary skills and thereby would be able to not only interpret but also carry out the required actions Barry et al., (2011). Pound (1988) and Elyasiani and Jia (2008) study the possible effect of institutional shareholding on performance of financial and non-financial firms, however neither of these studies gave conclusive results. It is also important that due consideration be given to the different categories of institutional owners who might have different objectives for their investments. These objectives could range from the time horizons of their holdings, monitoring the institutions and keeping a check on the management teams, as well as increased profits in the short

run. The institutional investors are considered as the sophisticated investors due to their outreach, superior analytical skills, and access to resources not only to interpret the market information but also to carry out the required strategy (Barry et al., 2011). Barry et al., (2011) argue that institutional shareholders influence the risk-taking decisions by the managers through their voting powers. However, it is important to take into consideration that the different categories of institutional investors may not have similar motivation for holding the shares of a BHC these may include the level of monitoring and evaluation of the management. One of the important limitations of the existing literature is that it assumes institutional investors as a single homogenous group. However, the institutional investors can be easily identified in two major categories. The first category consisting of financial institutions such as banks, investment banks and insurance companies while the second category includes asset managers such mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.

Even though ownership of publicly traded companies in the US is dispersed almost 50% are held by families Feldman et al., (2016). The second variable that this study uses ownership structure is ownership by families. BHCs owned by families have the power to exploit their power as owners of the firm and extract benefits for themselves that would be detrimental to other shareholders. Shleifer and Vishny (1986). Barth et al. (2010) found association of higher level of ownership by government with a lower efficiency level of banks and as the last category of ownership structure, this study has used government ownership category.

To capture the impact of types of ownership (denoted by OWN_{ijt}) on efficiency of BHCs in the US, this study uses the proportion of each ownership category as described below:

I. FI_{it} – comprising of banks, investment banks and insurance companies

II. $INST_{it}$ – comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies

III. $FAMILY_{it}$ – individuals and family.

IV. GOV_{it} – government shareholding.

By focusing on percentage of ownership, it is expected that OWN_{ijt} capture the impact of individual category of shareholders on efficiency. Lin et al., (2016) argue that a true representation of the performance of a financial institution cannot be made using ownership measures in isolation and suggest using an interactive variable approach where cost efficiency is determined by the interactive variable of ownership structure and risk. Pessarossi and Weill, (2015) while investigating the relation between capital requirements and bank efficiency for Chinese banks used the interactive ownership with the capital ratio to explain its effect on bank efficiency. In line with Lin et al., (2016) and using the interactive term for ownership categories with stability this study investigates whether bank efficiency is impeded or enhanced. The purpose of an interactive variable is to either moderate or mediate the relationship between the dependent and independent variable. In the case of this study the ownership structure is the independent variable and we are testing if stability moderates or mediates the relationship of ownership structure to efficiency. After incorporating the interactive terms, the simultaneous equation model can be written as:

$$STB_{it} = \alpha_0 + \alpha_1 EFF_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \omega OWN_{ijt} \times STB_{it} + \varphi X_{it} + E_{it} \quad \text{Eq (5.3)}$$

$$EFF_{it} = \beta + \beta_1 EFF_{it-1} + \beta_2 \check{STB}_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \omega OWN_{ijt} \times STB_{it} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \quad \text{Eq (5.4)}$$

5.4.4 Other bank specific control variables

X_{it} represents the vector of control bank-level including BHC size, diversification, quality of loan portfolio, capital stringency measures, bank liquidity and finally disintermediation and describe my variables accordingly in this section.

5.4.4.1 Size ($SIZE_{it}$)

Previous literature does not provide conclusive evidence of the effects of size on efficiency. Berger et al. (1987) suggest that increasing the bank size does not decrease cost savings and could lead to scale inefficiencies for larger banks. Berger and Mester (1997) report a positive but insignificant relationship of bank size with efficiency. Al-Amarneh (2014) results found larger banks to be less profitable and efficient, while results reported by D'Souza and Lai (2003) for bank size were inconclusive. For measuring the effect of size on efficiency $SIZE_{it}$ is taken as the natural logarithm of total assets (US$ bn), the variable $SIZE_{it}$ controls for the size effects.

5.4.4.2 Diversification effect (DIV_{it})

Banks and BHCs act as financial intermediaries connecting the savers and the borrowers, for a BHC to be efficient it must be able to earn stable returns from lending as well as from fee-based services it provides while keeping excessive risk at bay. The shift from the traditional lending towards more fee-based activities is called diversification brought on because financial institutions face regulatory pressures that limit their returns. To increase their profitability and income streams the financial institutions are using diversification in their portfolios Landskroner et al., (2005), and Baele et al., (2007). Diamond (1984) found that the banks use diversification of their portfolios to reduce costs of monitoring. Acharya et al., (2002) found that the diversification

in the loan portfolio could have a downside and result in decreasing bank returns while increasing the riskier loan portfolio, but their sample was based on Italian banks. Meanwhile, Hirtle and Stiroh (2007) report no benefits to diversification while Amidu and Wolfe (2013) argue that bank stability is affected by income diversification. To address the effects of diversification ($DIV1_{it}$) this study uses the ratio of net non-interest income scaled by net interest income. Positive coefficient for DIV_{it} would imply the benefits of diversification for banks while a negative coefficient would imply a reduction in efficiency resulting from relying heavily on income generated from fee-based activities.

5.4.4.3 Liquidity ($LIQUID_{it}$)

Liquidity of a bank/BHC is reflected in the ability of the bank/BHC to fund its short-term lending commitments through its current deposits. Iannotta et al., (2007) argue that liquidity reduces bank returns, for liquidity effects this study uses net loans and leases to deposits ratio ($LIQUID_{it}$). A negative relationship with efficiency is expected in line with Iannota et al., (2007).

5.4.4.4 Regulatory Capital Ratio - Total risk-based capital ratio (REG_{it})

Capital regulations were introduced to sustain the stability of the financial systems Allen et al., (2016). Furthermore, Barth et al., (2004), (2006), (2010); found that higher stringent regulations improve bank efficiency. Similarly, Beck et al. (2006) using a sample of 72 countries for the years 1997 to 2007 found that regulations improve efficiency. While Chortareas et al., (2012) found that cost efficiency is improved in the presence of stringent capital regulations using a sample of banks

from EU countries over the period 2000 to 2008. This study uses total risk-based capital ratio ($TRBCR_{it}$) as a regulatory measure and define it as follows:

$$REG_{it} = \frac{Tier1+Tier\ 2\ capital}{Total\ Risk\ weighted\ Assets} \qquad (5.3)$$

A positive relationship to efficiency is expected in line with Barth et al., (2010) who found a positive relationship between greater capital restrictions and efficiency.

5.4.4.5 Herfindahl – Hirschman's Index ($HERF_{it}$)

Chortareas et al., (2012) argue that the relationship between concentration, competition and bank efficiency is complex, using Herfindahl- Hirschman's index their results show that in countries with more developed systems larger banks are associated with higher efficiency levels. Casu and Girardone (2006) argue that Herfindahl-Hirschman's Index is a concentration measure and a poor proxy for market competition; they use the panzer H-statistic to measure bank competition. Phan et al., (2016) show that market competition decreases bank efficiency, however they use the Lerner's index to calculate market competition and their sample is based on Asian banks. This study uses Herfindahl-Hirschman's Index as a proxy for market competition in line with Chortareas et al., (2012) and expect a positive relationship with efficiency.

5.4.4.6 Effective federal funds reserve rate

Another important and significant determinant for bank performance is the variation in the interest Athanasoglou et al., (2008). Effective federal fund reserve rate ($EFFRR_{it}$) is used as proxy for interest rates to account for the impact of the variation in interest rates on efficiency. The sign of the coefficient for $EFFRR_{it}$ determines the effect of interest rates on efficiency of US BHCs

5.4.4.7 Macroeconomic covariates

Prudential regulation protects banking systems from financial crisis which ultimately end up affecting the entire economy, and budgetary consequences cannot be ignored as the costs of bailouts are ultimately borne by the governments Hellman, Murdock and Stiglitz (2000). Previous research using Gross Domestic Product as an indicator of business cycle includes studies by Berger et al., (2000), D'Souza and Lai (2003), Daly et al., (2004), Albertazzi and Gambaracorta, (2009), Laeven and Levine (2009), Albertazzi and Gambaracorta, (2009), Demirgüç-Kunt and Huizinga (2010), and Bushman and Williams (2012). The US is made up of 52 states, each state reports its GDP every year and the combined GDP of each state makes up the GDP of the country. However, there are variations in the GDP of each state due to the differences in the economic environment for each state. This study uses the gross state wise product growth rate ($GSPG_{it}$) as a proxy for fluctuations in the business cycle and for the overall economic condition in the state. $GSPG_{it}$ is also expected to account for the implications of operating in varying economic environments of each state, as the demand for a particular financial product is also dependent on the level of economic activity of each state.

Each state in the US reports the overall economic condition of how that states economy is performing which includes unemployment. I therefore use Unemployment growth rate ($UNEMP_{it}$) of each state in the US to measure the effect of unemployment on efficiency. Unemployment growth rate ($UNEMP_{it}$) of each of the states in the US and measures the effect of unemployment on efficiency. It is expected that higher unemployment rates will correlate to lower efficiency.

5.5 Data sources and descriptive statistics:

The data for the study is acquired from multiple sources discussed in chapter 4. Table 5.1 reports the descriptive statistics of each variable in the sample after correcting for possible outliers.

For the purposes of Table 5.1, the data are pooled across BHCs and also across years. The descriptive statistics highlights that BHCs in the sample on average represent 68 percent cost efficiency, a capitalization ratio of 14.90 and average stability score of 3.80 suggesting that BHCs are not only efficient but also are highly capitalized and stable for sample period. The ownership structure in the sample indicates a tilt towards the institutional ownership with majority toward the asset manager type of institutional investors with an average ownership stake of 19.23 percent.

Table 5.2 reports the correlation matrix. The associations between the covariates are generally in line with the expectations. The efficiency and stability measures are highly albeit inversely correlated suggesting that higher stability may leads to lower efficiency. Among other notables are the negative correlations are between efficiency and the total risk-based capital ratio, and government ownership. Since the correlation matrix identified one-to-one relationship, there is a need for more

Table 5.1: Descriptive statistics (Efficiency)

Variable		Obs	Mean	Std. Dev.	Min	Max
EFF_{it}	Efficiency - Non-interest expenses less the amortization of intangible assets as a percentage of net interest and non-interest income	4348	0.6825383	0.1396907	0.4042121	1.328387
STB_{it}	z_score of Return on Assets	4272	3.796903	1.348714	-0.5999277	9.001843
REG_{it}	Total Risk based capital scaled by the total risk weighed Assets	4186	14.8982	4.029366	8.79	35.16
FAM_{it}	Ownership by Individuals and Families	5353	0.5031324	1.67732	0	10.78606
$INST_{it}$	Ownership by Mutual fund, hedge, equity fund, Corporate and Trust fund companies	4835	19.23167	25.45226	0	92.48551
FI_{it}	Ownership by Banks, Investment banks, Insurance companies	5353	1.425078	2.745964	0	12.24452
GOV_{it}	Ownership by Government	4835	0.4977089	0.8927824	0	3.43847
$SIZE_{it}$	Size of Firm-Log of Total Assets	4348	14.20915	1.658234	11.77993	21.66825
DIV_{it}	Diversification 1- Net non-interest income scaled by net interest income	4348	0.1787587	0.1031292	-0.0061873	0.5419283
$LIQUID_{it}$	Liquidity - loans to deposit ratio	4348	0.8497568	0.2058259	0.24404	6.79127
$GSPG_{it}$	Growth rate of gross state-wise product	4835	0.0092717	0.0203446	-0.0618754	0.0582689
$UNEMPG_{it}$	Unemployment growth rate	4835	-0.0394901	0.1623218	-0.2484614	0.5247285
$HERF_{it}$	Herfindahl- Hirschman's index	5353	0.3907912	0.2872298	0	1
$EFFRR_{it}$	Effective Federal Fund reserve rate	4835	1.120031	1.67026	0.04	5.17

This table shows the descriptive statistics of the variables used in the study. Data is from 2004 to 2016

Table 5.2: Correlation Matrix

	EFF_{it}	STB_{it}	REG_{it}	FAM_{it}	$INST_{it}$	FI_{it}	GOV_{it}	$SIZE_{it}$	DIV_{it}	$LIQUID_{it}$	$GSPG_{it}$	$UNEMPG_{it}$	$HERF_{it}$	$EFFRR_{it}$
EFF_{it}	1													
STB_{it}	-0.3206	1												
REG_{it}	-0.1076	0.2244	1											
FAM_{it}	-0.0496	-0.0282	-0.0478	1										
$INST_{it}$	-0.1072	-0.2546	-0.1107	0.1915	1									
FI_{it}	0.0158	-0.1554	-0.0779	0.0527	0.408	1								
GOV_{it}	-0.1762	-0.1844	-0.105	0.1747	0.8238	0.2769	1							
$SIZE_{it}$	-0.1355	-0.2937	-0.1036	0.1896	0.6983	0.2812	0.8001	1						
DIV_{it}	0.0559	-0.1335	-0.0427	0.1559	0.3065	0.1071	0.3708	0.4827	1					
$LIQUID_{it}$	-0.0406	-0.1119	-0.3157	0.028	0.1504	0.0832	0.1214	0.1384	-0.0338	1				
$GSPG_{it}$	-0.1136	0.0151	0.0065	-0.0106	0.0099	0.0059	0.0188	0.0127	0.0269	-0.039	1			
$UNEMPG_{it}$	0.0504	-0.0187	-0.0548	0.0157	-0.0122	-0.0043	-0.0074	-0.027	-0.0274	0.0492	-0.6191	1		
$HERF_{it}$	-0.0279	-0.1686	-0.0493	-0.0051	0.162	0.0456	0.1714	0.22	0.0677	0.0109	0.007	-0.0044	1	
$EFFRR_{it}$	-0.1845	-0.0263	-0.1594	-0.0094	-0.0151	-0.0067	-0.0057	-0.081	-0.1182	0.1125	0.1681	-0.0983	0.0574	1

comprehensive empirical analysis. The following section presents the empirical results for the model developed in the above section.

5.6 Empirical Results and Discussion

Table 5.3 reports the regression results using estimation model based on dynamic panel data called the IV GMM model. Two sets of estimation results have been reported in table 5.3. Estimation 5.1 gives the first set and reports the results without interactive terms while the second set denoted as estimation 5.2 report the results with interactive terms. Panel A reports the estimation results that are based on GMM model, while Panel B reports diagnostic tests that indicate the model is appropriate for the study. The Hansen J-statistics identifies restrictions and tests the null hypothesis for validity of instruments; the insignificant value of J-statistics indicates instruments are valid in the system GMM estimations. This estimated coefficient of F-test is statistically significant at the 5% level, justifying the use of the instrument variable model.

Among the most notable results is the negative but statistically significant relationship between efficiency and stability measure suggesting that BHCs targeting for higher stability tend to be more efficient.

Among the institutional ownership categories, the coefficient of $INST_{it}$ is negative and significant suggesting that market discipline imposed by higher proportion of institutional investors comprising of mainly consisting of asset management companies enhances the efficiency of the US BHCs for the sample period used. Interestingly the other category of the institutional ownership, FI_{it} is not significant suggesting the divergent role of the two institutional investors.

In case of other categories of the ownership, GOV_{it} is positive and significant suggesting that higher government ownership adversely affects the efficiency of US BHCs. This result is in line with

Table 5.3: Regression results with efficiency as endogenous variable

VARIABLES	Expected sign	Estimation 5.1 EFF_{it}	Estimation 5.2 EFF_{it}
PANEL A:			
EFF_{it-1}		0.5155***	0.5894***
		(0.0546)	(0.0505)
STB_{it}		-0.1120***	-0.0977***
		(0.0115)	(0.0116)
REG_{it}	+	0.0020	0.0010
		(0.0018)	(0.0015)
FAM_{it}	+/-	0.0021	-0.0137**
		(0.0018)	(0.0057)
$INST_{it}$	+/-	-0.0007***	-0.0035***
		(0.0002)	(0.0007)
FI_{it}	+/-	-0.0007	-0.0157***
		(0.0014)	(0.0052)
GOV_{it}	+/-	0.0235***	0.0059
		(0.0078)	(0.0218)
FAM_{it} X STB_{it}			0.0039***
			(0.0015)
$INST_{it}$ X STB_{it}			0.0009***
			(0.0002)
FI_{it} X STB_{it}			0.0044***
			(0.0013)
GOV_{it} X STB_{it}			0.0019
			(0.0054)
$SIZE_{it}$	-	-0.0297***	-0.0224***
		(0.0064)	(0.0053)
DIV_{it}	+/-	-0.0751	-0.1084*
		(0.0686)	(0.0572)
$LIQUID_{it}$	-	-0.0764***	-0.0644***
		(0.0266)	(0.0202)
$GSPG_{it}$	+/-	-0.7551***	-0.7138***
		(0.1255)	(0.1245)
$UNEMPG_{it}$		-0.0184	-0.0045
		(0.0143)	(0.0139)
$HERF_{it}$	+	-0.0708***	-0.0559***
		(0.0249)	(0.0204)
$EFFRR_{it}$		-0.0083***	-0.0063***
		(0.0016)	(0.0013)
Constant		1.2750***	1.0681***
		(0.1381)	(0.1228)
PANEL B: Model fit			
F-TEST		F (14,366)56.32***	F (18, 366) 65.08***
AR (1) test stat		-5.42***	-5.74***
AR (2) test stat		0.24	0.13
Hansen J-stat		361.99	357.30
Observations		3,421	3,421
Number of ids		367	367

This table shows the estimation results of equations (5.1) and (5.2) are shown in estimation 1, and results for equations (5.3) and (5.4) are shown in estimation 2 using the dynamic panel data estimation IV GMM model. Dependent variable for efficiency is denoted as EFF_{it} and measures the efficiency of US bank holding companies in the sample. Sample period is from 2004-2016. Standard errors in parentheses. *** p<0.01, **p<0.05, * p<0.1

past literature that among the different ownership categories government owned banks are the least efficient (Bonin et al., 1998; and Micco et al., 2007). While the coefficient of FAM_{it} is statistically insignificant albeit positive.

The second set of results in table 5.3 introduces the interactive term of stability measure with that of proportionate ownership by categories to see whether higher stability coupled with higher ownership in specific categories of ownership help in improving the efficiency of BHCs. A unanimous result emerging from the interactive terms is that higher ownership in any category of the ownership coupled with higher stability of BHCs adversely affects efficiency. This decrease in efficiency is more pronounced in the case of both institutional ownership variables. The major difference in terms of the coefficients for individual categories of ownership is the change in significance level for the FI_{it} and GOV_{it} and in both sign and significance level of FAM_{it}. One possible explanation for significant FAM_{it} covariate in the second set of results is that BHCs with higher family ownership may tend to focus on stability and not efficiency as reported by Anderson and Reeb (2003).

Regarding bank specific control variables, the coefficient of $SIZE_{it}$ is negative and significant in both set of empirical results suggesting that size of banks improves the efficiency of BHCs. These results are consistent with Barth et al., (2013) who found larger banks tend to be more efficient. The coefficients of REG_{it} is positive albeit insignificant suggesting that the regulatory capital may not a relevant factor for determining the efficiency of BHCs during the sample period. In line with Ionnata (2007), the coefficient of $LIQUID_{it}$ is negative but significant suggesting that higher liquidity levels reduce the liquidity risk and improve efficiency.

The coefficient on DIV_{it} as an indicator for income diversification is not significant in first set of result however is negative and slightly significant in the case of second set of empirical results. This result is in contrast to Turkman and Yigit (2012) who suggest that higher diversification may

lead to cost inefficiencies while my results point towards benefits of diversification where non-traditional sources of income contribute to higher efficiency levels. However, Lee et al., (2014) cautioned that under different financial systems the relationship between diversification and bank performance may not be the same.

Among the macroeconomic control covariates, the coefficients of $GSPG_{it}$, $EFFRR_{it}$ and $HERF_{it}$ are negative and significant in both sets of results suggesting the efficiency of BHCs improves during the economic growth periods, lenient monetary economic environment and in concentrated markets.

5.7 Robustness checks

Although cost efficiency is a comprehensive accounting measure, but this may not be reflective of the opinion of shareholders. Since one of the aims of the study is to understand the impact of ownership structure on efficiency therefore as an alternate measure for efficiency the study uses revenue efficiency measure as given by return on equity (ROE_{it}). Hassan (2006) argue that as efficiency measures are correlated to return on assets (ROA) and return on equity (ROE_{it}) these can be used as alternative efficiency measures, however their sample was based on Islamic banks from 1995 to 2001. Bordo (1995) uses return on equity for comparing efficiency of US and Canadian banks.

The empirical results based on alternative efficiency measure have been reported in Table 5.4. No major difference in empirical results related to major variables of interest: stability and the ownership structure and their interactive terms was observed. The revised estimations validate previous findings as reported in table 5.3 that ownership structure affects the efficiency of BHCs. The market discipline imposed by proportion of institutional investors especially those with asset management orientation adversely affect the efficiency. The impact is more pronounced among those BHCs targeting for higher stability as indicated by the results from the interactive terms.

Table5.4: Robustness checks with ROE as endogenous variable

VARIABLES	Estimation 5.3 ROE_{it}	Estimation 5.4 ROE_{it}
PANEL A:		
ROE_{it-1}	0.6254***	0.6672***
	(0.0632)	(0.0602)
STB_{it}	-0.1226***	-0.0771***
	(0.0266)	(0.0213)
REG_{it}	-0.0067**	-0.0090***
	(0.0029)	(0.0026)
FAM_{it}	0.0019	-0.0144
	(0.0023)	(0.0109)
$INST_{it}$	-0.0015**	-0.0037*
	(0.0006)	(0.0022)
FI_{it}	-0.0016	-0.0187***
	(0.0017)	(0.0057)
GOV_{it}	0.0539***	0.0957
	(0.0195)	(0.0791)
$FAM_{it\ X}$ STB_{it}		0.0039
		(0.0029)
$INST_{it}$ X STB_{it}		0.0009
		(0.0006)
FI_{it} X STB_{it}		0.0050***
		(0.0014)
GOV_{it} X STB_{it}		-0.0183
		(0.0197)
$SIZE_{it}$	-0.0586***	-0.0422***
	(0.0136)	(0.0102)
DIV_{it}	0.2184***	0.1862***
	(0.0811)	(0.0525)
$LIQUID_{it}$	-0.0052	-0.0040
	(0.0447)	(0.0360)
$GSPG_{it}$	0.0957	0.2004
	(0.1339)	(0.1364)
$UNEMPG_{it}$	0.0117	0.0132
	(0.0280)	(0.0285)
$HERF_{it}$	-0.0168	-0.0229
	(0.0416)	(0.0312)
$EFFRR_{it}$	0.0224***	0.0229***
	(0.0019)	(0.0017)
Constant	1.5703***	1.1761***
	(0.3267)	(0.2676)
PANEL B: Model fit		
F-TEST	F (14,366)252.56***	F (18, 366)314.55***
AR (1) test stat	-1.87***	-1.88***
AR (2) test stat	0.95	0.77
Hansen J-stat	362.37	357.8
Observations	3,421	3,421
Number of ids	367	367

This table shows the estimation results of equations (5.1) and (5.2) as Estimation 5.3, and equations (5.3) and (5.4) as estimation 5.4 using the dynamic panel data estimation IV GMM model. Dependent variable for efficiency is denoted as ROE_{it} and measures the efficiency of US bank holding companies in sample. Sample period from 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5.5: Robustness check with efficiency as dependent variable bifurcating BHCs using asset size to classify BHCs in small and large size according to total assets.

	Estimation 5.5 EFF_{it}	Estimation 5.6 EFF_{it}	Estimation 5.7 EFF_{it}	Estimation 5.8 EFF_{it}
PANEL A:				
EFF_{it-1}	0.4545***	0.6465***	0.5113***	0.5960***
	(0.0553)	(0.0480)	(0.0578)	(0.0526)
STB_{it}	-0.1312***	-0.0818***	-0.1191***	-0.1004***
	(0.0128)	(0.0105)	(0.0125)	(0.0124)
REG_{it}	0.0026	0.0006	0.0024	0.0012
	(0.0019)	(0.0013)	(0.0020)	(0.0016)
FAM_{it}	0.0035	-0.0115**	0.0020	-0.0172***
	(0.0023)	(0.0056)	(0.0022)	(0.0060)
$INST_{it}$	-0.0003	-0.0032***	-0.0008***	-0.0037***
	(0.0002)	(0.0006)	(0.0002)	(0.0007)
FI_{it}	-0.0028**	-0.0136***	-0.0017	-0.0167***
	(0.0012)	(0.0052)	(0.0015)	(0.0055)
GOV_{it}	-0.0015	-0.0100	-0.0018	-0.0176
	(0.0067)	(0.0198)	(0.0066)	(0.0210)
$FAM_{it} \times STB_{it}$		0.0030**		0.0048***
		(0.0014)		(0.0016)
$INST_{it} \times STB_{it}$		0.0008***		0.0010***
		(0.0002)		(0.0002)
$FI_{it} \times STB_{it}$		0.0036***		0.0045***
		(0.0013)		(0.0014)
$GOV_{it} \times STB_{it}$		0.0005		0.0031
		(0.0049)		(0.0053)
$SIZESM_{it}$	-0.0000	-0.0000***		
	(0.0000)	(0.0000)		
$SIZELG_{it}$			-0.0000***	-0.0000***
			(0.0000)	(0.0000)
DIV_{it}	-0.0298	-0.1795***	-0.1894***	-0.1926***
	(0.0630)	(0.0489)	(0.0665)	(0.0533)
$LIQUID_{it}$	-0.0905***	-0.0763***	-0.0973***	-0.0783***
	(0.0212)	(0.0177)	(0.0294)	(0.0217)
$GSPG_{it}$	-0.6489***	-0.6953***	-0.7237***	-0.6866***
	(0.1524)	(0.1246)	(0.1246)	(0.1197)
$UNEMPG_{it}$	0.0057	0.0092	-0.0112	0.0018
	(0.0186)	(0.0135)	(0.0143)	(0.0136)
$HERF_{it}$	-0.0952***	-0.0654***	-0.0925***	-0.0727***
	(0.0267)	(0.0193)	(0.0274)	(0.0213)
$EFFRR_{it}$	-0.0054***	-0.0038***	-0.0071***	-0.0053***
	(0.0020)	(0.0012)	(0.0017)	(0.0014)
Constant	0.9322***	0.7034***	0.9496***	0.8060***
	(0.0825)	(0.0761)	(0.0938)	(0.0863)
PANEL B: Model fit				
F-TEST	F (14, 366)	F (18, 366)	F (14, 366)	F (18, 366)
	54.32***	83.83***	53.58***	66.20***
AR (1) test stat	-5.17***	-5.82***	-5.40***	-5.73***
AR (2) test stat	0.10	0.18	0.24	0.11
Hansen J-stat	347.34	357.31	360.02	357.85
Observations	3,421	3,421	3,421	3,421
Number of ID	367	367	367	367

This table shows the estimation results (5.5) and (5.7) for equations (5.1), (5.2), while estimation (5.6) and (5.8) is for equations (5.3) and (5.4) using the dynamic panel data estimation IV GMM model. The estimations (5.5) and (5.6) use only small size BHCs asset size up to $1,000,000M, estimations (5.7) and (5.8) are for large size BHCs with assets above 1,000,000M. Dependent variable for efficiency is denoted as EFF_{it} and measures the efficiency of US BHCs in the sample. Sample period is from 2004-2016. Standard errors in parentheses. *** p<0.01, **p<0.05, * p<0.1

Table 5.6: Robustness check with efficiency as dependent variable and using financial crisis dummy.

	Estimation 5.9 EFF_{it}	Estimation 5.10 EFF_{it}
PANEL A:		
EFF_{it-1}	0.5168***	0.5908***
	(0.0547)	(0.0501)
STB_{it}	-0.1109***	-0.0973***
	(0.0114)	(0.0117)
REG_{it}	0.0020	0.0010
	(0.0018)	(0.0015)
FAM_{it}	0.0021	-0.0136**
	(0.0018)	(0.0057)
$INST_{it}$	-0.0007***	-0.0035***
	(0.0002)	(0.0007)
FI_{it}	-0.0007	-0.0157***
	(0.0014)	(0.0053)
GOV_{it}	0.0233***	0.0058
	(0.0079)	(0.0217)
$FAM_{it} \times STB_{it}$		0.0038**
		(0.0015)
$INST_{it} \times STB_{it}$		0.0009***
		(0.0002)
$FI_{it} \times STB_{it}$		0.0044***
		(0.0013)
$GOV_{it} \times STB_{it}$		0.0020
		(0.0053)
$SIZE_{it}$	-0.0297***	-0.0225***
	(0.0064)	(0.0053)
DIV_{it}	-0.0758	-0.1104*
	(0.0687)	(0.0582)
$LIQUID_{it}$	-0.0760***	-0.0639***
	(0.0269)	(0.0204)
$GSPG_{it}$	-0.7427***	-0.7039***
	(0.1217)	(0.1205)
$UNEMPG_{it}$	-0.0151	-0.0017
	(0.0167)	(0.0180)
$HERF_{it}$	-0.0675***	-0.0546***
	(0.0247)	(0.0203)
$EFFRR_{it}$	-0.0082***	-0.0063***
	(0.0017)	(0.0014)
FC_{it}	-0.0027	-0.0017
	(0.0050)	(0.0050)
Constant	1.2699***	1.0668***
	(0.1400)	(0.1240)
PANEL B: Model fit		
F-TEST	F(15, 366)	F(19, 366)
	52.43***	62.52***
AR (1) test stat	-5.4***	-5.74***
AR (2) test stat	0.25	0.13
Hansen J-stat	358.72	357.69
Observations	3,421	3,421
Number of ids	367	367

This table shows the estimation results (5.9) for equations (5.1), (5.2), while estimation (5.10) is for equations (5.3) and (5.4) using the dynamic panel data estimation IV GMM model. Dependent variable for efficiency is denoted as EFF_{it} and measures the efficiency of US BHCs in the sample. Sample period is from 2004-2016. Standard errors in parentheses. *** p<0.01, **p<0.05, * p<0.1

Table 5.7: Robustness check using efficiency and subdividing dataset into pre and post crisis time periods

	Estimation 5.11 (2004-2007) EFF_{it}	Estimation 5.12 (2004-2007) EFF_{it}	Estimation 5.13 (2011-2016) EFF_{it}	Estimation 5.14 (2011-2016) EFF_{it}
PANEL A				
EFF_{it-1}	1.1912***	1.1949***	0.3399***	0.4350***
	(0.0524)	(0.0501)	(0.0628)	(0.0631)
STB_{it}	-0.0085	-0.0117*	-0.1464***	-0.1351***
	(0.0058)	(0.0060)	(0.0139)	(0.0153)
REG_{it}	0.0018**	0.0018**	0.0024	0.0019
	(0.0009)	(0.0008)	(0.0024)	(0.0021)
FAM_{it}	0.0006	0.0000	0.0028	-0.0152**
	(0.0007)	(0.0048)	(0.0023)	(0.0070)
$INST_{it}$	-0.0001	0.0000	-0.0008***	-0.0048***
	(0.0002)	(0.0011)	(0.0003)	(0.0009)
FI_{it}	-0.0003	-0.0070	-0.0004	-0.0184***
	(0.0009)	(0.0054)	(0.0017)	(0.0064)
GOV_{it}	0.0040	0.0165	0.0250***	-0.0051
	(0.0049)	(0.0248)	(0.0096)	(0.0265)
FAM_{it} X STB_{it}		0.0002		0.0043**
		(0.0013)		(0.0018)
$INST_{it}$ X STB_{it}		-0.0000		0.0013***
		(0.0003)		(0.0002)
FI_{it} X STB_{it}		0.0018		0.0052***
		(0.0013)		(0.0016)
GOV_{it} X STB_{it}		-0.0030		0.0062
		(0.0074)		(0.0066)
$SIZE_{it}$	0.0082**	0.0072**	-0.0377***	-0.0315***
	(0.0033)	(0.0032)	(0.0082)	(0.0071)
DIV_{it}	-0.2050***	-0.2102***	-0.0930	-0.1228*
	(0.0565)	(0.0526)	(0.0834)	(0.0709)
$LIQUID_{it}$	-0.0112	-0.0109	-0.0542*	-0.0455*
	(0.0187)	(0.0180)	(0.0304)	(0.0248)
$GSPG_{it}$	-0.2928**	-0.2871*	-0.7457***	-0.7271***
	(0.1486)	(0.1510)	(0.1570)	(0.1533)
$UNEMPG_{it}$	0.0363	0.0553*	-0.0408**	-0.0295*
	(0.0336)	(0.0328)	(0.0166)	(0.0159)
$HERF_{it}$	-0.0375**	-0.0418**	-0.0786**	-0.0570*
	(0.0147)	(0.0162)	(0.0357)	(0.0293)
$EFFRR_{it}$	-0.0024	-0.0026	-0.0058	-0.0197**
	(0.0017)	(0.0017)	(0.0079)	(0.0081)
Constant	-0.1492*	-0.1233*	1.6247***	1.4256***
	(0.0801)	(0.0747)	(0.1689)	(0.1593)
PANEL B: Model fit				
F-TEST	F(14, 298)	F(18, 298)	F(14, 357)	F(18, 357)
	144.95***	113.42***	32.74***	34.00***
AR (1) test stat	-1.06	-1.24	-4.72	-5.28***
AR (2) test stat	-	-	-0.12	-0.17
Hansen J-stat	121.63	152.66	347.94	346.71
Observations	873	873	2,548	2,548
Number of ids	299	299	358	358

This table shows the estimation results (5.11) and (5.13) for equations (5.1), (5.2), while estimation (5.12) and (5.14) is for equations (5.3) and (5.4) using the dynamic panel data estimation IV GMM model. The dependent variable for efficiency is denoted as EFF_{it} and measures the efficiency of US BHCs in the sample. Estimation 5.11 and 5.12 pertain to 2004 to 2007 and Estimation 5.13 and 5.14 pertain to 2011 to 2016 period. Standard errors in

parentheses. *** p<0.01, **p<0.05, * p<0.1

Table 5.8: Robustness checks using fixed effects model and efficiency as dependent variable

	Estimation 5.15	Estimation 5.16
	EFF_{it}	EFF_{it}
EFF_{it-1}	-0.200***	-0.200***
	(0.0163)	(0.0163)
STB_{it}	-0.142***	-0.141***
	(0.0131)	(0.0133)
REG_{it}	0.00275**	0.00281**
	(0.00123)	(0.00123)
FAM_{it}	0.00112	0.00419
	(0.00109)	(0.00517)
$INST_{it}$	0.000208*	0.000385
	(0.000122)	(0.000359)
FI_{it}	0.000530	0.00345*
	(0.000608)	(0.00200)
GOV_{it}	0.000676	-0.00307
	(0.00378)	(0.0121)
FAM_{it} X STB_{it}		-0.000824
		(0.00136)
$INST_{it}$ X STB_{it}		-5.75e-05
		(0.000103)
FI_{it} X STB_{it}		-0.000828
		(0.000538)
GOV_{it} X STB_{it}		0.00120
		(0.00345)
$SIZE_{it}$	0.0985***	0.0982***
	(0.00459)	(0.00463)
DIV_{it}	-0.588***	-0.587***
	(0.0351)	(0.0351)
$LIQUID_{it}$	-0.0953***	-0.0946***
	(0.0281)	(0.0281)
$GSPG_{it}$	-0.0800	-0.0792
	(0.0768)	(0.0768)
$UNEMPG_{it}$	0.0302**	0.0303**
	(0.0135)	(0.0135)
$HERF_{it}$	0.00912	0.0102
	(0.0212)	(0.0213)
$EFFRR_{it}$	-0.0141***	-0.0141***
	(0.00191)	(0.00191)
Constant	0.103***	0.102***
	(0.0177)	(0.0177)
Observations	3,054	3,054
Number of ids	361	361

This table shows the estimation results based on fixed effects model. Estimation 5.15 was run without interactive variables while estimation 5.16 was run with interactive variables. Dependent variable for efficiency is denoted as EFF_{it} and measures the efficiency of US BHCs in the sample. Sample period is from 2004-2016. Standard errors in parentheses. *** p<0.01, **p<0.05, * p<0.1

However, there are some differences in terms of bank specific control variables in both signs and significance. Among the most notables are the coefficients for the regulatory requirement (REG_{it}) that changed from positive but insignificant to negative and significant suggesting the higher capital requirement affect the income efficiency of BHCs' shareholders.

Further, in order to validate the results BHCs were bifurcated according to their asset size. BHCs with total assets up to $1,000,000 were classified as small, and for BHCs with assets greater than $1,000,000 as large. Estimation results from the regressions are presented in table 5.5. Estimations (5) and (7) are run without the interactive ownership structure variable while estimations (6) and (8) are run with interactive ownership structure variable. The estimates validate the results from table 5.3 and are consistent for small and medium size BHCs with the negative and statistically significant relationship between efficiency and stability measure suggesting that BHCs targeting for higher stability tend to be more efficient. As in the previous regressions in table 5.3 variables for interactive ownership variables are statistically significant for both small and large size BHCs. These estimates validate the previous results in table 5.3 and 5.4. The remaining variables are also in line with table 5.3. Finally, I also ran regressions using the fixed effects model and report the results in table 5.8.

5.8 Summary and Conclusion

The turmoil in the banking industry arising from the subprime crisis of 2008 put a question mark on stability of financial institutions. Attempts are made to curb excessive risk taking through regulatory measures on national and international levels however, the revised regulations might have unintended consequence for bank efficiency. The main focus of this essay was to investigate whether the nexus of regulatory capital requirement, desire for stability and ownership structure impact the

efficiency of BHCs. By using a sample of 553 US BHCs and hand collected data on ownership for the period 2004-2016, the empirical evidence shows that the desire for higher stability has an adverse consequence for the efficiency of US BHCs during the sample period. However, there is no evidence that BHCs while meeting the capital requirements compromised on their efficiency.

The most important and significant contribution made by this study is breaking down of institutional ownership in two broad categories. It is interesting to find that the market discipline imposed by higher proportion of institutional investors in the ownership structure of US BHCs especially those with asset management orientation adversely affect the efficiency. Furthermore, the impact is more pronounced among those BHCs targeting for higher stability as indicated by the results from the interactive terms. The empirical findings have important policy implications for stakeholders whether investors or regulators. There is a need for regulators to carefully design the regulations that not only protect the stability of financial system but provide enough incentives for shareholders in the form of ability to generate return on their investments. The relationship between bank efficiency and institutional shareholding warrants more research using the dynamic panel methodology for ownership in other countries especially emerging economies.

CHAPTER SIX

ROLE OF OWNERSHIP STRUCTURE AND BANK STABILITY IN DETERMINING FRANCHISE VALUE: EVIDENCE FROM THE US BANKING SECTOR.

6.1 Introduction

The exhaustive regulations after the global financial crisis (2007 – 2009) are geared towards enhancing the stability of financial institutions. However, the impact of these regulations and stability on the presumed franchise value (the ability to generate profit) of banks should also be taken into consideration. Furthermore, regulations while interacting with varying types and levels of shareholding, market competition, and the economic environment can potentially affect the franchise value of banks. From a policy point of view, it is imperative that a framework is devised by taking into consideration a holistic picture and addressing the intertwined relationship between Franchise value, risk-taking, stability, capital regulations and ownership structures. This study fills this gap by developing a dynamic model that not only consider the time variation but also the interaction among these variables.

Existing literature that focusses on possible relationship between stability and franchise value indicates the existence of a simultaneity bias where a specific level of stability and franchise value are jointly (simultaneously) determined. For instance, Marcus (1984) found that as a bank engages in higher risk the franchise value declines suggesting that the risk appetite of banks affects the franchise value. On the flipside, Martynova et al., (2014) provide evidence that the banks franchise value enhances its risk taking. While, Demsetz et al., (1996) suggest that a bank risk-taking is affected by its ownership as well as its franchise value and may be modeled jointly. Furthermore, there is evidence suggesting a significant relationship between the ownership structure and franchise value (Pathan et

al., 2015; Jiménez, 2013) and with stability (Laeven and Levine, 2009; Ashraf et al., 2016; Barry et al., 2008) of banks. Most of the previous research involving the impact of ownership structure on bank stability either consider only insider shareholding as a proxy for ownership structure (Demsetz et al., 1996; Pathan et al., 2015) or use cross-sectional data only if using type of shareholdings Leaven and Levine (2009), assuming no change in the ownership structure over time. However, bank ownership can experience a considerable change both in the ownership and its types and among the exceptions are Ashraf et al., (2016) but their sample consisted of banks in the GCC region.

This study thereby adds to the empirical literature by using the time series ownership structure data to better capture the impact of intertemporal changes on the franchise value using a sample of 553 US Bank Holding Companies (BHCs) from 2004 to 2016[15] employing the instrumental variable GMM model that allows simultaneous adjustment of both the franchise value as well as bank stability. This study is unique and different from the previous research conducted in the area in terms of sample coverage, methodology as well as the definition of the main variable of interest.

The empirical findings suggest a positive association between stability and franchise value after controlling for simultaneity bias suggesting that protection of higher franchise can act as a deterrent against pursuing riskier strategies. With regards to the ownership structure, this study found evidence that BHCs having higher levels of family ownership exhibit a lower franchise value indicating the existence of conflicts between family owners and managers. On the contrary, higher institutional ownership is found to be associated with a higher franchise value.

The results of this study indicate that maintenance of higher capital buffers alone did not have a significant impact on franchise value of BHCs. The analysis on whether relative capital stringency

[15] We focus on the 2004 – 2016 period because of the ownership structure data availability. Also, this period reflects relative stability, global financial crisis and recovery

as measured by the reported regulatory capital ratio and ownership concentration jointly affect the franchise value reveals interesting findings. An increase in capitalization moderates marginal effects of family and institutional ownership on franchise value. The negative association of family ownership and positive association of institutiona ownership is less pronounced among well-capitalized BHCs. Although results related to family ownership is plausible however findings related to the institutional ownership can be explained by the reasons that as capital buffer increases, the bank management pursues riskier strategies to satisfy the return requirements of the institutional owners in order to maintain the higher franchise values.

The findings of the paper shed light on ownership structure, bank risk-taking, regulations and franchise value nexus and have certain policy implications for bank managers, investors, and regulators. Possible negative externalities of family owner-manager conflicts can be restrained through higher levels of capitalization which can benefit all the stakeholders through higher franchise values of BHCs. Furthermore, capitalizations through institutional investors have its own cons and should be considered especially in terms of valuations. Regulators can also find these results valuable in understanding the risk appetites of family and institutional investors and their effects on franchise value of BHCs. Understanding of this ownership structure, capitalization, and franchise value nexus can be important for regulator especially at the macro level especially in framing regulations to check the risk-taking by banks.

6.2 Related Literature

Related literature has been discussed in Chapter 3, sec 3.2

6.3 Definition of variables

6.3.1 Franchise value (FV_{it})

De Jonghe and Vennet (2007) describe franchise value as the present value of the potential profits that a firm is expected to earn from its operations as a going concern. Accounting profit measures such as ROA and ROE are often used as a proxy for Franchise value. The empirical literature has identified several measures to compute franchise value of banks including Tobin's Q (Villalonga and Amit, 2006; Cronqvist and Nilsson, 2003; Laeven and Levine, 2009), Lerner's Index (Jiménez et al. 2007), and Sharpe ratio (Demirgüç-Kunt and Huizinga, 2010). For this study, in line with Jiang and Zhang (2017) and Li and Zhang's (2006) franchise value is defined as follows:

$$FV_{it} = \frac{1}{1+R_b}\left[ROE_{it} - R_c\right] \qquad (6.1)$$

FV_{it} is the franchise value of BHC *i* at time *t*, ROE_{it} refers to the return on equity before taxes for BHC *i* at time *t*; R_b refers to effective federal funds reserve rate as a proxy for the discount rate. The effective federal funds rate in the US is the rate charged by banks and depository institutions for lending their reserve balances on an overnight basis to other banks. R_c refers to the capital cost, this study uses prime rate as a proxy for the capital cost.

6.3.2 Stability (STB_{it})

The use of z-score is widely cited in empirical literature as measure of bank risk and stability see for example Leaven and Levine (2009) and Demirgüç-Kunt and Huizinga (2010), and Ashraf et al., (2016, 2017). As research on the calculation of z-score has evolved so, have different methodologies on its calculation. This research follows Lepetit and Strobel (2013) model and calculates our stability measure z_score (denoted by STB_{it}) as follows:

$$STB_{it} = \frac{\bar{r}_{it}+\mu_{it}}{\bar{\sigma}_{it}} \qquad (6.2)$$

where subscript *i* indicates bank and *t* indicate the time. μ_{it} gives the mean of returns on assets, $\bar{\sigma}_{it}$ is the volatility of the returns on assets while $\bar{r}_{it}$ is defined as the total equity capital divided by total assets. Lower value of our measure for STB_{it} of a BHC would point towards a higher probability of its failure and hence lower stability. Since previous literature reports that the z-score is highly skewed, so for all estimations use the logarithmic transformation of z-score, and this is in line with Leaven and Levine (2009), Schaeck and Cihák (2012) and Ashraf et. al., (2016).

6.3.3 Ownership structures (OWN_{ijt})

By using a dataset of 296 banks across 48 countries, Leaven and Levine (2009) seminal paper examined the relationship between risk, regulations and ownership structures set the stage for future research in this area. Micco et al., (2004) working with data on developing countries found a strong correlation between the ownership structure and performance. A review of the past literature indicates several categories of ownership, for example, Spong and Sullivan (2010), who used a sample of 270 US banks and focus on managerial ownership. Ashraf et al. (2,016) use a sample of banks from the GCC countries with institutional, individual, government and public shareholding categories.

Barry et al., *(*2008) studied the change in the ownership structures and found that as more and more of the common shares are being bought by institutional investors, there is a shift in corporate governance and risk-taking behavior by banks. Saghi-Zedec (2016) used a sample consisting of 710 commercial banks in Europe from 2002 to 2010 and found evidence linking institutional ownership with higher franchise values since institutional ownership due to having additional skills and expertise allowed banks to diversify resulting in higher franchise values.

Families can exploit their position as owners in a firm and extract the benefits often at the cost of other shareholder categories Shleifer and Vishny, (1986), furthermore this extraction of benefits by

family owners could also affect the overall value of the firm. Family ownership can instill a variety of goals both economic as well as noneconomic that would affect the franchise value, Claassen's et al., (2002) report an overall reduction in firm value in case of family ownership while Cronqvist and Nilsson (2003) results were inconclusive with regards to the effect of family ownership category on franchise value. Patel et al., (2017) found evidence that focus on family ownership on noneconomic goals reduces franchise value of the firms. Villalonga and Amit (2006) report evidence linking managerial ownership to franchise value in a sample Fortune-500 firms during 1994–2000. Their results indicated that family ownership could increase or decrease franchise value but was dependent on the how severe the agency problems in the firm were. Since there is a mixed consensus as to the effect of family ownership accordingly the sign for relationship between family ownership and franchise value could be either positive or negative. There were two distinct classes of ownership in the dataset at hand – Institutional owners and ownership by families and individuals. The Institutional owners vary from the banks, Investment Banks, insurance companies Mutual fund, hedge/Equity fund, corporations, government, sovereign, real estate, structured fund and Union fund companies, Trust and endowment companies. Since the ownership by families differs from institutional owners, therefore shareholding was divided into two categories, institutional ownership, and family ownership. The reason for this bifurcation was because the nature and constitution of institutional shareholders gives them access to information that other shareholders may not have. This coupled with the fact that the institutional shareholders would also have the necessary skills and thereby would be able to not only interpret but also carry out the required actions Barry et al. (2011) gives them an edge over the other ownership categories. The effect that Institutional shareholding has on the performance of financial and non-financial institutions has been analyzed in several studies like that of Pound (1988), Elyasiani and Jia (2008). However neither of these studies gave conclusive results. Barry et al., (2008) studied the change in the ownership structures and found that as more and more of

the common shares are being bought by Institutional investors, there is a shift in corporate governance and risk-taking the behavior of banks.

For the second ownership variable is ownership by families, in that families can use their position in the firm to push for policies of personal gain harming the other shareholders Shleifer and Vishny (1986), this extraction of benefits could result in affecting the overall value of the firm. Family ownership can infuse a variety of goals that could that impact the franchise value, Claassen's et al., (2002) report an overall reduction in firm value in case of family ownership while Cronqvist and Nilsson (2003) found that family ownership did not have a significant impact on the value of the firm.

This essay focuses on how the franchise value is affected by the risk-taking behavior, capital regulations together with the two categories of ownership i.e. institutional and family ownership. For ownership structure, previous research such as Laeven and Levine (2009) uses thresholds of ownership while this research uses percentages of the ownership held by a specific category, and denote the categories of family ownership and Institutional ownership as FAM_{it}, and $INST_{it}$, respectively and define them as follows:

i. $INST_{it}$ – comprising of Banks, Investment Banks, insurance companies Mutual fund, hedge/Equity fund, corporations, government, sovereign, real estate, structured fund and Union fund companies, Trust and endowment companies.
ii. FAM_{it} – Individuals and families.

By keeping focus on the percentage of ownership, this study hopes to identify the impact of shareholders on the bank franchise value.

Saghi-Zedec (2016) using 710 European commercial banks for the period 2002 to 2010 found evidence linking Institutional ownership with higher franchise values. Saghi-Zedec (2016) found that the additional skills and expertise of institutional ownership allowed banks to diversify resulting in higher franchise values. Patel et al., (2017) found evidence that focus on family ownership on noneconomic goals reduces franchise value of the firms. Villalonga and Amit (2006) found evidence linking managerial ownership to franchise value in a sample Fortune-500 firms during the years from 1994–2000. Their results indicated that family ownership could increase or decrease franchise value but was dependent on how severe the firm's agency problems were. Therefore, the sign for the relationship between family ownership and franchise value may be either positive or negative.

6.3.4 Regulatory capital ratio -Total risk-based capital ratio (REG_{it})

Martynova et al., (2014) argues that the effect of capital on bank performance is not conclusive. While Beltratti and Stulz (2012) and Berger and Bouwman (2013) report that higher capital resulted in better bank performance. To understand the impact of maintaining sufficient capital as buffer we use total risk-based capital ratio defined as

$$REG_{it} = \frac{Tier1+Tier\ 2\ capital}{Total\ Risk\ weighted\ Assets} \qquad (6.3)$$

This study uses total risk-based capital ratio in two ways. First as a proxy for regulatory effect on franchise value and denotes it by REG_{it}, secondly total risk-based capital ratio is used interactively with the ownership structure to see if capital regulations help in mediating or moderating the effect of ownership structure on the franchise value of US BHCs.

De Jonghe (2010) reports that higher capital levels reduce a banks' exposure to systemic risk making them more stable. Since maintaining higher capital would make BHCs more stable they would have higher franchise values, therefore this study introduces a new interactive variable by

coupling the ownership structure variable with regulatory capital. The regulatory capital measure $TRBCR_{it}$ is used as a moderator variable in this essay; a moderator variable is one that influences the strength of relationship between two other variables. The use of interactive variables will help in understanding whether the interactive variables increase or decrease franchise value of the US BHCs. A positive relationship between franchise value and the interactive variable for ownership and regulations will support the hypothesis that larger shareholder will be more risk averse and hence the higher franchise value may be due to other factors. Therefore, we use explanatory variables and control variables to study this impact. A negative relationship would support the hypothesis that higher capital regulations with a larger shareholder would result in BHCs taking on higher risk in order to get higher profits and to maintain the higher franchise value.

6.3.5 Bank specific determinants

6.3.5.1 Size ($SIZE_{it}$)

Among bank-specific variables there are conflicting views as to how bank size can affect franchise value, Patel (2017) found that the relationship between firm size and franchise value was an inverse one. Tan (2016) report that smaller banks tend to have higher franchise value. While Demsetz and Strahan (1997) found that banks that are larger in size tend to have higher franchise value. For measuring the effect of Bank size on Franchise value this research takes $SIZE_{it}$ as the natural logarithm of total assets (expressed in US$ bn), $SIZE_{it}$ will control for BHC size effects.

6.3.5.2 Liquidity ($LIQUID_{it}$)

Iannotta et al. (2007) argue that liquidity reduces bank returns, and lower returns translate into a lower franchise value. For measuring Liquidity ($LIQUID_{it}$), we use net loans and leases to deposits ratio. A negative relationship of $LIQUID_{it}$ with franchise value is expected.

6.3.5.3 Diversification effect (DIV_{it})

Banks act as financial intermediaries connecting the savers, and the borrowers, the shift from the traditional lending towards fee-based activities is called income diversification. Income diversification is brought on because financial institutions face regulatory pressures that limit their profits hence financial institutions use various diversification strategies to increase their profitability and income streams. Landskroner et al., (2005), Baele et al., (2007). Diamond (1984) argues that the banks use diversification of their portfolios to reduce costs of monitoring, while Tan and Floros (2012) found that engaging in a number of different businesses resulted in higher income levels. Amidu and Wolfe (2013) found that bank stability is affected by income diversification, Saghi-Zedec (2016) argue that diversification results in higher profitability, while studies by Acharya et al., (2002) and Hirtle and Stiroh (2007) found no evidence as to the benefits of diversification. Furthermore, Filson and Olfati (2014) found that after the Graham-Leach-Bliley Act (1999) the diversification strategies of US BHCs for the period 2001to 2011 into different arms such as investment banking, insurance, and securities brokerage resulted in higher value. Diversification (DIV_{it}) is defined as the total non-interest income scaled by total interest income this research uses diversification to see if franchise value of US BHCs is affected by diversification strategies used by BHCs.

6.3.5.4 Herfindahl-Hirschman's Index ($HERF_{it}$)

This research uses market concentration as a control variable and proxy it with the Herfindahl-Hirshman ($HERF_{it}$) index of the market, and calculates it using total bank assets as inputs and define $HERF_{it}$ as the ratio of total assets scaled by the square of total assets.

6.3.5.5 Efficiency (EFF_{it})

Furlong and Kwan (2006) found evidence that efficiency, market power and size are determinants of franchise value. Since the regulatory enforcement may also lead to a higher burden on operating revenue therefore EFF_{it} controls for bank efficiency and define it as below:

$$\mathrm{EFF}_{it} = \frac{\mathrm{NONIX}_{it} - \mathrm{AMINTASS}_{it}}{\mathrm{NII}_{it} + \mathrm{NNONII}_{it}} \qquad (6.4)$$

Where $NONIX_{it}$ is a total non-interest expense, $AMINTASS_{it}$ is amortization of intangible assets, NII_{it} is net interest income, and $NNONII_{it}$ is Net non-interest income. Accordingly, a positive relationship with franchise value is anticipated.

6.3.5.6 Dummy for Financial Crisis (FC_{it})

Finally, since the data set included the time period of the sub-prime mortgage crisis therefore a dummy variable was created to take into account the financial crisis from 2007 -2010. FC = 1 if the year is from 2007 to 2010 and 0 otherwise.

6.3.6 Country specific determinants

6.3.6.1 Gross state-wise product growth rate ($GSPG_{it}$)

A country's economic outlook affects the overall stability of its financial systems, GDP growth rate is associated with the general economic development of a country, its macroeconomic stability and the institutional framework as these factors would affect the performance of the banking system in the country. St. Clair (2004) found evidence linking GDP growth rate to franchise value. Since the US has data available on the GDP for each of its states, and because the gross state-wise product for each state is more representative to banks that operate in that state. Therefore, I use gross state product growth as a proxy for GDP growth to account for the effect macroeconomic

development of each state as well as for business cycle fluctuations. I calculate gross state-wise product growth ($GSPG_{it}$) as the annual growth rate of the gross state-wise product. During the periods of high GDP, growth, banks do abnormal and risky lending as the chances of portfolio losses are lower, and this is reflected in the franchise value of banks. Following this logic and applying it to the gross state-wise product (GSP), therefore, a negative relationship with franchise value is expected.

6.3.6.2 Unemployment growth rate ($UNEMPG_{it}$)

Finally, the unemployment growth rate of each state is taken as a control variable. As Unemployment growth rate increase banks do restrictive lending to improve their profitability retain the franchise value. Therefore, a positive relationship of $UNEMP_{it}$ with franchise value is expected.

6.4 Empirical Model for franchise value, risk-taking and ownership structures of US BHCs

While previous empirical literature considers the relationship between the franchise value and stability as unidirectional assuming that a desired level of stability is a function of the franchise value, compliance with capital regulations and ownership structure. However, maintaining the desired level of franchise value is a function of its stability hence there exists a simultaneity bias and must be accounted in modeling the nexus of franchise value and stability.

Since ordinary least squares does not take into account the panel nature of the dataset, this study follows Magalhaes et al., (2010) methodology which is justified due to the specific characteristics of the database on hand constituting of dynamic accounting and ownership structure data of US BHCs that depends on past realizations over time. Secondly, the bank specific variables like size and liquidity are suspected of being endogenous or not strictly exogenous. Third, the panel data under this study has few time periods as compared to the number of observations. Fourth, due to the presence of endogeneity concerns and simultaneous feedback the instrument variable generalized method of moments (IV GMM) model used by Arellano and Bover (1995) and also by Blundell and

Bond (1998) was adopted to compute both sets of equations Eq (6.1), Eq (6.1A) and Eq (6.2), Eq (6.2A). Finally, it is assumed that there is presence of heteroscedasticity and autocorrelation within bank holding companies, but not across them. Under the GMM IV methodology two equations are used simultaneously for each of the two models – the original equation and the transformed equation. This study used the two-step method for estimation with finite-sample correction of the standard errors that produce less biased coefficients with lower standard errors following Windmeijer (2005). All regressions include the lag of the dependent variables, and for the instrument variables the study uses lag of the dependent variable, ownership structure variable alongwith control variables such as size, diversification and liquidity that are suspected of not being strictly exogenous. Finally, the model presented as below:

$$STB_{it} = \alpha_0 + \alpha_1 FV_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \varphi X_{it} + E_{it} \quad \text{Eq (6.1)}$$

$$FVIT_{it} = \beta + \beta_1 FV_{it-1} + \beta_2 S\check{T}B_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \quad \text{Eq (6.1A)}$$

$$STB_{it} = \alpha_0 + \alpha_1 FV_{it} + \alpha_2 REG_{it} + \vartheta OWN_{ijt} + \omega OWN_{ijt} \times STB_{it} + \varphi X_{it} + E_{it} \quad \text{Eq (6.2)}$$

$$FVIT_{it} = \beta + \beta_1 FV_{it-1} + \beta_2 S\check{T}B_{it} + \beta_3 REG_{it} + \vartheta OWN_{ijt} + \omega OWN_{ijt} \times STB_{it} + \wp Y_{it} + \lambda_t + \tilde{\varepsilon}_{it} \quad \text{Eq (6.2A)}$$

FV_{it} is the franchise value of the US BHCs calculated using Jiang and Zhang (2017) and Li and Zhang's (2006) measure while STB_{it} measures stability for each BHC *i* with ownership type j at time *t*. The value of the discretionary FV_{it-1} in equation (6.1) and (6.2) depends on true value of the variable for stability (STB_{it}), which however is un-observable. Nevertheless, the observed level of franchise value (FV_{it}) in equation (6.1a) and (6.2A) of the US BHCs is driven by an adjustment in the stability ($\widetilde{STB_{it}}$) which is endogenously determined. The vectors X_{it} are observable bank related variables while vector Y_{it} are observable country/State-specific control variables explaining the variation in stability and franchise value. λ_t are the (unobserved) individual as well as the time-

specific effects reflecting on the panel nature of the data. Finally, $\tilde{E}_{it}$ and it $\tilde{\varepsilon}_{it}$ are the idiosyncratic error terms varying over time and between BHCs.

6.5 Descriptive statistics

Description of the data sources is presented in Chapter 4, section 4.1. Table 6.1 reports the descriptive statistics of each variable in the sample after correcting for possible outliers; the data is pooled across BHC and across years. The descriptive statistics highlight that BHC in the sample, on average, represent a negative mean for franchise value at 0.06% percent, a capitalization ratio of 14.90, and have an average stability score of 3.80 suggesting that BHC are highly capitalized and stable during the sample period. The ownership structure in the sample indicates a tilt towards institutional ownership with the majority toward the asset manager-type of institutional investor with an average ownership stake of 21.18% percent.

Table 6.2 reports the correlation matrix. The associations between the covariates are generally in line with expectations based on previous literature. The relationship between franchise value and the total risk-based capital ratio is positive signifying that regulatory measures help in increasing franchise value of US BHCs, among other variables it is of interest to note that institutional shareholding has a negative relationship with franchise value. Since the correlation matrix identified a one-to-one relationship, there is a need for more comprehensive empirical analysis. The following section presents the empirical results for the model developed in the above section.

6.6 Empirical estimation and results

The regression results for Eq (6.1) and (6.1A) are reported in table 6.3 as Estimation 6.1 and for Eq (6.2) and (6.2A) as Estimation 6.2 using the IV GMM dynamic panel data estimation

methodology. Panel A reports the estimation results for the IV GMM model, while Panel B reports the diagnostic

Table 6.1: Descriptive Statistics (Franchise value)

Variable	Variable Definition	Obs	Mean	Std. Dev.	Min	Max
FVit	Franchise value	4348	-0.06	0.22	-0.51	0.29
Z_scoreit	Z-score of Return on Assets	4272	3.80	1.35	-0.60	9.00
TRBCRit	Total Risk based capital scaled by the total risk weighed Assets	4186	14.90	4.03	8.79	35.16
FAMit	Ownership by Individuals, Familiies, Family Trust & Endowment fund companies	5353	0.50	1.68	0.00	10.79
INSTit	Banks, Investment banks, Insurance companies, Mutualfund,hedge fund companies	5353	21.18	27.66	0.00	99.05
SIZEit	Size of Firm-Log of Total Assets	4348	14.21	1.66	11.78	21.67
DIVit	Diversification 1- total non-interest income scaled by total interest income	4348	0.18	0.10	-0.01	0.54
LIQUIDit	Liquidity - loans to deposit ratio	4348	0.85	0.21	0.24	6.79
GSPGit	Gross State Product Growth = Log(Gross State Product in period n/Gross state product in period n-1)	4835	0.01	0.02	-0.06	0.06
UNEMPGit	Unemployment Growth = ln(Unemployment rate in period n/Unemploymentrate in period n-1)	4835	-0.04	0.16	-0.25	0.52
HERFit	Herfindahl index	5353	0.39	0.29	0.00	1.00
EFFit	Efficiency - Non-interest expenses less the amortization of intangible assets as a percent of net interest and non-interest income	4348	0.68	0.14	0.40	1.33

Table 6.2: Correlation matrix (Franchise value)

	FV_{it}	STB_{it}	REG_{it}	FAM_{it}	$INST_{it}$	$SIZE_{it}$	DIV_{it}	$LIQUID_{it}$	$GSPG_{it}$	$UNEMPG_{it}$	$HERF_{it}$	EFF_{it}
FV_{it}	1.00											
STB_{it}	0.00	1.00										
REG_{it}	0.08	0.22	1.00									
FAM_{it}	0.00	-0.03	-0.05	1.00								
$INST_{it}$	-0.03	-0.26	-0.11	0.19	1.00							
$SIZE_{it}$	0.04	-0.29	-0.10	0.19	0.70	1.00						
DIV_{it}	0.12	-0.13	-0.04	0.16	0.31	0.48	1.00					
$LIQUID_{it}$	-0.10	-0.11	-0.32	0.03	0.15	0.14	-0.03	1.00				
$GSPG_{it}$	-0.23	0.02	0.01	-0.01	0.01	0.01	0.03	-0.04	1.00			
$UNEMPG_{it}$	0.16	-0.02	-0.05	0.02	-0.01	-0.03	-0.03	0.05	-0.62	1.00		
$HERF_{it}$	-0.06	-0.17	-0.05	-0.01	0.16	0.22	0.07	0.01	0.01	0.00	1.00	
EFF_{it}	0.23	-0.32	-0.11	-0.05	-0.11	-0.14	0.06	-0.04	-0.11	0.05	-0.03	1.00

tests indicating appropriateness of the model for this study including the Hansen J-statistics. Hansen J-statistics is a test for identifying the restrictions and testing the validity of instruments under the null hypothesis; my regression results show an insignificant J-statistics which indicates validity of instruments under the system GMM estimations. Furthermore, we also ran the estimations again using a dummy for the financial crisis and report them under Table 6.4

The relationship between franchise value of BHCs and variable for Stability (STB_{it}) was statistically significant and positive relationship at 1%, suggesting that the more stable a BHC, the higher its franchise value of BHC. The results hold for both estimations 6.1 and 6.2 as reported in table 6.3.

The effect of capitalization on franchise value is insignificant for both estimations with and without the interactive variables. There is a negative albeit statistically insignificant relationship between the family ownership category and franchise value for the first estimation while the relationship is negative and significant at 1% for the second estimation. The results reported are consistent with research by Shleifer and Vishny (1986) who hold that families can exploit their position in the firm and gain benefits at the cost of other shareholders and this can affect the franchise value of firms. The result is also consistent with Claassen's et al., (2002) who report an overall reduction in firm value in case of family ownership as family ownership can force goals both of economic and noneconomic nature that affect the franchise value. Patel et al., (2017) also report the same results for family ownership on franchise value. However, when family ownership is used interactively with the regulatory variable total risk-based capital ratio the sign changes from negative to positive and is also highly significant. These results show that for banks that are well capitalized negative marginal effect of family ownership on bank franchise value is moderated and that well-capitalized banks with higher

family ownership

Table 6.3: Regression results with franchise value as endogenous variable (without the dummy for financial crisis)

VARIABLES	Expected sign	Estimation 6.1 FV_{it}	Estimation 6.2 FV_{it}
Panel A:			
FV_{it-1}	+	0.7673***	0.7765***
		(0.0089)	(0.0101)
STB_{it}	+	0.0101***	0.0103***
		(0.0024)	(0.0025)
REG_{it}	+	-0.0003	0.0008
		(0.0007)	(0.0011)
FAM_{it}	-	-0.0011	-0.0257***
		(0.0009)	(0.0053)
$INST_{it}$	+/-	-0.0001	0.0018***
		(0.0001)	(0.0007)
FAM_{it}*REG_{it}			0.0016***
			(0.0003)
$INST_{it}$*REG_{it}			-0.0001***
			(0.0000)
$SIZE_{it}$	+/-	0.0106***	0.0108***
		(0.0024)	(0.0025)
DIV_{it}	+/-	-0.0131	-0.0069
		(0.0295)	(0.0300)
$LIQUID_{it}$		0.0016	0.0004
		(0.0117)	(0.0115)
$GSPG_{it}$	-	-1.7579***	-1.7741***
		(0.1538)	(0.1548)
$UNEMPG_{it}$	+	0.4452***	0.4491***
		(0.0161)	(0.0165)
$HERF_{it}$	-	-0.0907***	-0.0888***
		(0.0209)	(0.0213)
EFF_{it}	+	0.2621***	0.2660***
		(0.0413)	(0.0405)
Constant		-0.2840***	-0.3066***
		(0.0618)	(0.0616)
Panel B: Model fit			
F (14, 366)		1076.78***	922.26***
AR (1) test stat		9.91***	9.74***
AR (2) test stat		-7.86***	-7.39***
Hansen J-stat		364.62	363.63
Observations		3,421	3,421
Number of ids		367	367

This table shows results of equations (6.1) and (6.1A) as estimation 6.1 and Equation (6.2) and (6.2A) as estimation 6.2 using the dynamic panel data estimation IV GMM model. The dependent variable for franchise value is FV_{it} and measures the franchise value of US bank holding companies in the sample. The sample period is from the year 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

increase franchise value of US BHCs.

In case of institutional shareholding, the relationship with franchise value is negative and insignificant for the first estimation. In the second estimation, the relationship becomes highly significant and positive, but the interactive term shows that the moderating role of capital regulations decreases the franchise value of US BHCs. This can be due to the fact that as capital regulations increase, institutional owners would push for riskier loans to generate higher profits in order to maintain the higher franchise values.

The results for size of the BHCs is positive and highly significant at 1%. This result is consistent with the phenomenon of "too big to fail." In line with Acharya et al. (2002) and Hirtle and Stiroh (2007) there was no evidence as to the benefits of diversification. The variable for business cycle fluctuations and macroeconomic development $GSPG_{it}$ shows a negative and highly significant relationship with franchise value. This may be because in periods of high GDP growth (in this case the GSP growth) banks do abnormal and risky lending is consistent with the notion of higher portfolio losses reflected in the lower franchise value.

The results for unemployment growth rate of each state suggest that as unemployment growth rate increases banks do restrictive lending to improve their portfolios and in the surviving banks the franchise value increases. If the two macro-economic variables are taken together it is evident that they support each other. Low GSP growth rate along with high unemployment create an environment of restrictive lending by banks, resulting in low risk and high stability and hence the higher franchise value. In periods of high GSP growth and low un-employment, banks do risky lending to earn higher profits but ultimately bank stability is affected, and franchise value is decreased.

The variable for market concentration HH Index is negative and significant at 5%. High market concentration would increase franchise value of US BHCs. Finally, as anticipated the results for efficiency are positive and significant at 1%, showing that as a BHC gets more efficient its franchise value increases.

6.7 Robustness and Endogeneity Checks

In order to check for the robustness of the model the study used Tobin's q in place of franchise value as the dependent variable and report the results in Table 6.4. I then ran the model using a dummy for the financial crisis and report the results in Table 6.5 and 6.6 for both franchise value and Tobin's Q as the endogenous variables.

For the first robustness check I use Tobin's Q, and calculate it as the log of the market value of equity and liabilities divided by the booked value of equity and liabilities. Estimated results from the regressions using Tobin's Q as the endogenous dependent variable are reported in table 6.4. Like in the case of franchise value the estimations were run twice, first without the interactive ownership and regulatory variables and then with the interactive variables. The results for STB_{it} were consistent for both the dependent variables for franchise value i.e. FV_{it} and $TOBINQ_{it}$, further the relationship between stability and Tobin's q was found to be statistically significant and positive relationship at 1% suggesting that a more stable BHC would have a higher franchise value. Similarly, the effect of capitalization on franchise value is insignificant for both estimations with and without the interactive variables.

To check for the effect of the financial crisis Eq (6.1) and (6.1A) was re-estimated using dummy for financial crisis, the estimation results are reported in table 6.5. I also tested my model

Table 6.4: Robustness Check with TOBIN'S Q as endogenous variable

VARIABLES	Expected sign	Estimation 6.5 $TOBINQ_{it}$	Estimation 6.6 $TOBINQ_{it}$
$TOBINQ_{it-1}$	+	0.7398***	0.7351***
		(0.0218)	(0.0250)
STB_{it}	+	0.0475***	0.0431***
		(0.0161)	(0.0154)
REG_{it}	+	0.0008	0.0098
		(0.0048)	(0.0086)
FAM_{it}	+/-	0.0082**	0.0437**
		(0.0038)	(0.0185)
$INST_{it}$	+/-	0.0006	0.0037
		(0.0006)	(0.0032)
FAM_{it}*REG_{it}			-0.0022*
			(0.0012)
$INST_{it}$*REG_{it}			-0.0002
			(0.0002)
$SIZE_{it}$	+/-	0.0106	0.0135
		(0.0114)	(0.0116)
DIV_{it}	+/-	0.5508***	0.5246***
		(0.1033)	(0.1128)
$LIQUID_{it}$	-	-0.1385*	-0.1253
		(0.0798)	(0.0812)
$GSPG_{it}$		0.7066	0.9234
		(0.6412)	(0.6813)
$UNEMPG_{it}$		-0.1199	-0.1002
		(0.1283)	(0.1289)
$HERF_{it}$		0.0364	0.0178
		(0.0726)	(0.0791)
EFF_{it}		-0.8318***	-0.8393***
		(0.1675)	(0.1460)
FC_{it}		-0.1273***	-0.1273***
		(0.0238)	(0.0240)
Constant		0.9721***	0.8318***
		(0.2761)	(0.2688)
Panel B: Model fit			
F (13,188)		289.9***	250.92***
AR (1) test stat		-5.38***	-5.38***
AR (2) test stat		-3.16	-3.12
Hansen J-stat		175.82	172.23
Observations		1,249	1,249
Number of ids		189	189

This table shows results of equations (6.1) and (6.1A) as estimation 6.5 and Equation (6.2) and (6.2A) as estimation 6.6 using the dynamic panel data estimation IV GMM model. The dependent variable for franchise value is $Tobinsq_{it}$ and measures the franchise value of US bank holding companies in the sample. The sample period is from the year 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6.5: Robustness check with franchise value as endogenous variable and using dummy for financial crisis

VARIABLES	Expected sign	Estimation 6.7 FV_{it}	Estimation 6.8 FV_{it}
FV_{it-1}	+	0.7627***	0.7704***
		(0.0083)	(0.0087)
STB_{it}	+	0.0090***	0.0089***
		(0.0024)	(0.0026)
REG_{it}	+	0.0001	0.0012
		(0.0006)	(0.0010)
FAM_{it}	-	-0.0017*	-0.0204***
		(0.0009)	(0.0052)
$INST_{it}$	+/-	-0.0001	0.0016***
		(0.0001)	(0.0006)
FAM_{it}*REG_{it}			0.0012***
			(0.0003)
$INST_{it}$*REG_{it}			-0.0001***
			(0.0000)
$SIZE_{it}$	+/-	0.0110***	0.0111***
		(0.0024)	(0.0025)
DIV_{it}	+/-	0.0364	0.0409
		(0.0308)	(0.0312)
$LIQUID_{it}$	-	-0.0250**	-0.0253**
		(0.0113)	(0.0121)
$GSPG_{it}$	-	-2.3869***	-2.3984***
		(0.1581)	(0.1590)
$UNEMPG_{it}$	+	0.1641***	0.1673***
		(0.0182)	(0.0183)
$HERF_{it}$	-	-0.1148***	-0.1137***
		(0.0152)	(0.0155)
EFF_{it}	+	0.2303***	0.2313***
		(0.0367)	(0.0370)
FC_{it}		0.1317***	0.1318***
		(0.0037)	(0.0038)
Constant		-0.2830***	-0.3027***
		(0.0571)	(0.0580)
Panel B: Model fit			
F (15, 366)		1299.71***	1147.17***
AR (1) test stat		-8.94***	-9.09***
AR (2) test stat		-1.97	-1.91
Hansen J-stat		364.19	365.02
Observations		3,421	3,421
Number of BHCs		367	367

This table shows results of equations (6.1) and (6.1A) as estimation 6.7 and Equation (6.2) and (6.2A) as estimation 6.8 after adding dummy for financial crisis to both sets of equations using the dynamic panel data estimation IV GMM model. The dependent variable for franchise value is FV_{it} and measures the franchise value of US bank holding companies in the sample. The sample period is from the year 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6.6: Robustness check using franchise value as dependent variable and bifurcating BHCs using asset size to classify BHCs as small and large size according to total assets.

VARIABLES	Estimation 6.9 FV_{it}	Estimation 6.10 FV_{it}	Estimation 6.11 FV_{it}	Estimation 6.12 FV_{it}
FV_{it-1}	0.7462***	0.7559***	0.7370***	0.7556***
	(0.0085)	(0.0089)	(0.0090)	(0.0088)
STB_{it}	0.0043*	0.0042*	0.0083***	0.0059***
	(0.0023)	(0.0024)	(0.0023)	(0.0023)
REG_{it}	0.0002	0.0017*	0.0004	0.0016*
	(0.0006)	(0.0010)	(0.0006)	(0.0009)
FAM_{it}	-0.0014	-0.0204***	-0.0020**	-0.0214***
	(0.0008)	(0.0048)	(0.0009)	(0.0049)
$INST_{it}$	0.0001	0.0022***	-0.0000	0.0023***
	(0.0001)	(0.0006)	(0.0001)	(0.0006)
FAM_{it}*REG_{it}		0.0012***		0.0013***
		(0.0003)		(0.0003)
$INST_{it}$*REG_{it}		-0.0002***		-0.0002***
		(0.0000)		(0.0000)
$SIZESM_{it}$	-0.0000***	-0.0000***		
	(0.0000)	(0.0000)		
			0.0000	0.0000*
$SIZELG_{it}$			(0.0000)	(0.0000)
DIV_{it}	0.0892***	0.0970***	0.2492***	0.0983***
	(0.0248)	(0.0250)	(0.0397)	(0.0254)
$LIQUID_{it}$	-0.0244**	-0.0250**	-0.0098	-0.0222*
	(0.0106)	(0.0117)	(0.0140)	(0.0115)
$GSPG_{it}$	-2.1978***	-2.2009***	-2.1533***	-2.2071***
	(0.1554)	(0.1547)	(0.1529)	(0.1529)
$UNEMPG_{it}$	0.1772***	0.1827***	0.1739***	0.1812***
	(0.0177)	(0.0178)	(0.0175)	(0.0175)
$HERF_{it}$	-0.1009***	-0.0971***	-0.0897***	-0.0945***
	(0.0143)	(0.0146)	(0.0142)	(0.0143)
EFF_{it}	0.1838***	0.1839***	0.2196***	0.1907***
	(0.0339)	(0.0340)	(0.0333)	(0.0334)
FC_{it}	0.1291***	0.1290***	0.1305***	0.1285***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)
Constant	-0.0953**	-0.1205***	-0.1893***	-0.1418***
	(0.0387)	(0.0409)	(0.0440)	(0.0395)
Panel B: Model fit				
F-TEST	F (13, 366)	F (15, 366)	F (13, 366)	F (15, 366)
	1166.44***	1046.54***	1121.28 ***	1060.16***
AR (1) test stat	-8.73***	-8.85***	-8.94***	-8.86***
AR (2) test stat	-2.05***	-2.02***	-2.08***	-1.97***
Hansen J-stat	365.18	364.46	364.51	363.83
Observations	3,421	3,421	3,421	3,421
Number of BHC's	367	367	367	367

This table shows results of equations (6.1) and (6.1A) as estimation (6.9) and (6.11) and Equation (6.2) and (6.2A) as estimation (6.10) and (6.11) using the dynamic panel data estimation IV GMM model. The dependent variable for franchise value is FV_{it} and measures the franchise value of US bank holding companies in the sample. The sample period is from the year 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6.7: **Robustness check using franchise value as dependent variable and subdividing dataset into pre and post crisis time periods**

Sub period analysis	Estimation 6.13 (2004 to 2007)	Estimation 6.14 (2004 to 2007)	Estimation 6.15 (2011 to 2016)	Estimation 6.16 (2011 to 2016)
VARIABLES	FVit	FVit	FVit	FVit
FV_{it-1}	-0.1685***	-0.1417***	1.2019***	1.2297***
	(0.0280)	(0.0319)	(0.2165)	(0.2019)
STB_{it}	0.0036	0.0036	-0.0016	-0.0019
	(0.0059)	(0.0072)	(0.0020)	(0.0019)
REG_{it}	-0.0033	0.0019	-0.0003	0.0022**
	(0.0029)	(0.0037)	(0.0011)	(0.0009)
FAM_{it}	-0.0025	-0.0882***	-0.0000	-0.0028
	(0.0028)	(0.0216)	(0.0006)	(0.0070)
$INST_{it}$	-0.0003	0.0084***	0.0002***	0.0035***
	(0.0004)	(0.0027)	(0.0001)	(0.0012)
FAM_{it}*REG_{it}		0.0060***		0.0002
		(0.0016)		(0.0004)
$INST_{it}$*REG_{it}		-0.0007***		-0.0002***
		(0.0002)		(0.0001)
$SIZE_{it}$	0.0279***	0.0234**	-0.0035	-0.0038
	(0.0079)	(0.0096)	(0.0042)	(0.0040)
DIV_{it}	-0.2311**	-0.1551	-0.0081	-0.0022
	(0.1157)	(0.1178)	(0.0264)	(0.0289)
$LIQUID_{it}$	0.0489	0.0507	-0.0388***	-0.0415**
	(0.0587)	(0.0603)	(0.0144)	(0.0174)
$GSPG_{it}$	-1.2725***	-1.1616**	-0.2396***	-0.2392**
	(0.4320)	(0.4776)	(0.0873)	(0.0938)
$UNEMPG_{it}$	0.7441***	0.7475***	-0.1682***	-0.1601***
	(0.0821)	(0.0928)	(0.0188)	(0.0178)
$HERF_{it}$	-0.2228***	-0.2175***	-0.0052	0.0063
	(0.0562)	(0.0620)	(0.0211)	(0.0235)
EFF_{it}	0.4913***	0.5170***	-0.0605	-0.0501
	(0.1383)	(0.1373)	(0.0395)	(0.0423)
Constant	-0.9857***	-1.0225***	0.0677	0.0199
	(0.1800)	(0.2026)	(0.0867)	(0.0778)
Panel B: Model fit				
F-TEST	F (12,298)	F (14,298)	F (12,352)	F (14,352)
	41.69***	30.28***	78.45***	68.66***
AR (1) test stat	-8.84***	-7.26***		
AR (2) test stat	-0.02	-0.09	-1.16*	-1.74*
Hansen J-stat	255.71***	241.48***	-0.92	-1.07
			342.96***	332.93***
Observations	873	873	1,645	1,645
Number of ids	299	299	353	353

This table shows results of equations (6.1) and (6.1a) and Equation (6.2) and (6.2a) using the dynamic panel data estimation IV GMM model. The dependent variable for franchise value is FV_{it} and measures the franchise value of US bank holding companies in the sample. The estimations are run based on sub sample from year 2004 to 2007 and from 2011 to 2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6.8: **Robustness checks using fixed effects model and franchise value as dependent variable**

Dependent Variables	Estimation 6.15 FV_{it}	Estimation 6.16 FV_{it}
FV_{it-1}	0.245***	0.245***
	(0.0124)	(0.0124)
STB_{it}	-0.153***	-0.153***
	(0.0135)	(0.0136)
REG_{it}	5.04e-05	-4.26e-05
	(5.14e-05)	(0.000100)
FAM_{it}	-0.000284	-0.00101
	(0.000767)	(0.00107)
$INST_{it}$	1.66e-05	-6.14e-06
	(9.75e-05)	(0.000100)
FAM_{it} X REG_{it}		4.66e-05
		(4.83e-05)
$INST_{it}$ X REG_{it}		2.52e-07
		(6.31e-07)
$SIZE_{it}$	0.147***	0.148***
	(0.00990)	(0.00993)
DIV_{it}	0.159***	0.160***
	(0.0287)	(0.0287)
$LIQUID_{it}$	0.178***	0.177***
	(0.0267)	(0.0267)
$GSPG_{it}$	-0.175**	-0.178**
	(0.0727)	(0.0728)
$UNEMPG_{it}$	0.281***	0.280***
	(0.0122)	(0.0122)
$HERF_{it}$	-0.0626***	-0.0628***
	(0.0211)	(0.0211)
$EEFFR_{it}$	0.0200***	0.0200***
	(0.00210)	(0.00210)
Constant	-1.517***	-1.528***
	(0.0137)	(0.0137)
Observations	3,054	3,054
Number of ids	361	361

This table shows results of Fixed effect model, Estimation 6.15 is run without the interactive variables and estimation 6.16 is run with interactive variables The dependent variable for franchise value is FV_{it} and measures the franchise value of US bank holding companies in the sample. The sample period is from the year 2004-2016. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

by bifurcating data into small and large BHCs based on asset size and report the results in table 6.6. To see if the crisis period had an effect, I re-estimated my model using pre crisis and post crisis period and report the results obtained in table 6.7. Overall the results for the estimations are consistent with table 6.3 where the entire sample was run without the bifurcations, indicating that the more stable a BHC the higher its franchise value. With a few slight variations the results are consistent with Claassen's et al., (2002) who report an overall reduction in firm value in case of family ownership as family ownership can force goals both of economic and noneconomic nature that affect the franchise value. Patel et al., (2017) also report the same results for family ownership on franchise value. In case of Institutional shareholding, the moderating role of capital regulations increase the franchise value of US BHCs as the Institutional shareholding increases the franchise value decreases. These results can be explained due to the fact that as capital regulations increase, institutional owners would push for riskier loans to generate higher profits in order to maintain the higher franchise values. Finally, I ran robustness checks based on fixed effects model after running Hausman's tests for suitability regarding fixed and random effects and report the results from estimations in table 6.8.

6.8 Summary and conclusions

Since the sub-prime crisis of 2008 regulators and researchers alike have been looking for ways to identify a crisis before it happens, have come up with regulations to prevent it, and used stress testing to ensure that the new regulations work. This intense focus on reducing risk through excessive regulations has however resulted in an erosion of banks franchise value. This research found compelling evidence that the more stable a Bank, the higher is its franchise value. Using z-score to measure bank stability, the study focused on the effect of stability, regulations

and ownership structure on the franchise value of the US BHCs. The findings are that in order for a bank to have higher franchise value it would be desirable to have higher level of stability.

Also, in the context of risk, competition, and regulation nexus results indicate that ownership structure plays an important and significant role in affecting franchise value of BHCs. The results indicated that that family ownership, when coupled with regulations, results in a higher franchise value of BHCs mainly because the regulations help in curbing the excessive risk associated with family shareholders. The results for Institutional ownership when used interactively with regulations show that while regulations are helpful in curbing the risk-taking, too many regulations would ultimately increase risk as the institutional shareholders would push for riskier loans in order to get higher returns.

The study also identifies a future area that needs to be explored: Will these results hold in the case of emerging economies and Islamic banks? Furthermore, the relationship between franchise value and Institutional ownership warrants more research as each type of institutional investor may have different objectives for investing and the impact of each category of Institutional shareholding may be different from other categories falling under Institutional ownership.

CHAPTER SEVEN

BANK RISK, DERIVATIVE USAGE AND OWNERSHIP: AN EMPIRICAL INVESTIGATION OF US BHCS

7.1 Introduction

In a recent strand of literature[16], it has been argued that ownership structure of banks can influence their risk-taking behavior. Although findings from these studies are not unanimous; however, there are some general inferences such as banks having concentrated ownership structure are riskier than banks having a dispersed ownership structure due to access to insider information (Laeven and Levine, 2009; Beltratti and Stulz, 2012; Ashraf et al., 2016; Auvray and Brossard, 2012). Regarding the type of ownership, it is found that government-owned banks have a higher risk-aversion as compared to those banks having higher institutional investors (Ghosh and Chatterjee, 2018; Bouvatier et al., 2014; Ashraf et al., 2016).

The ownership structure of banks and BHCs in the US sector is mostly dispersed, and a majority of the shareholdings lies with institutional investors. As sophisticated investors, institutional investors not only hold better analytical skill but also have incentives to monitor and influence management decisions regarding risk-taking. It is essential to consider that the different categories of institutional investors may not have similar motivations, especially for monitoring and evaluation of the management for risk-taking (Cheng et al., 2011). In terms of their modus operandi, we can categorize the institutional investors into two major groups. First, are those institutional investors that are managing assets on behalf of their customers. These may include mutual funds, hedge/equity fund, trust, and endowments while other institutional

[16] see Bouvatier et al., 2014; Laeven and Levine, 2009; Bolton et al., 2011; 2010; Magalhaes et al., 2010; Ashraf et al., 2016; Beltratti and Stulz, 2012; Battaglia and Gallo, 2017; Switzer et al., 2018.

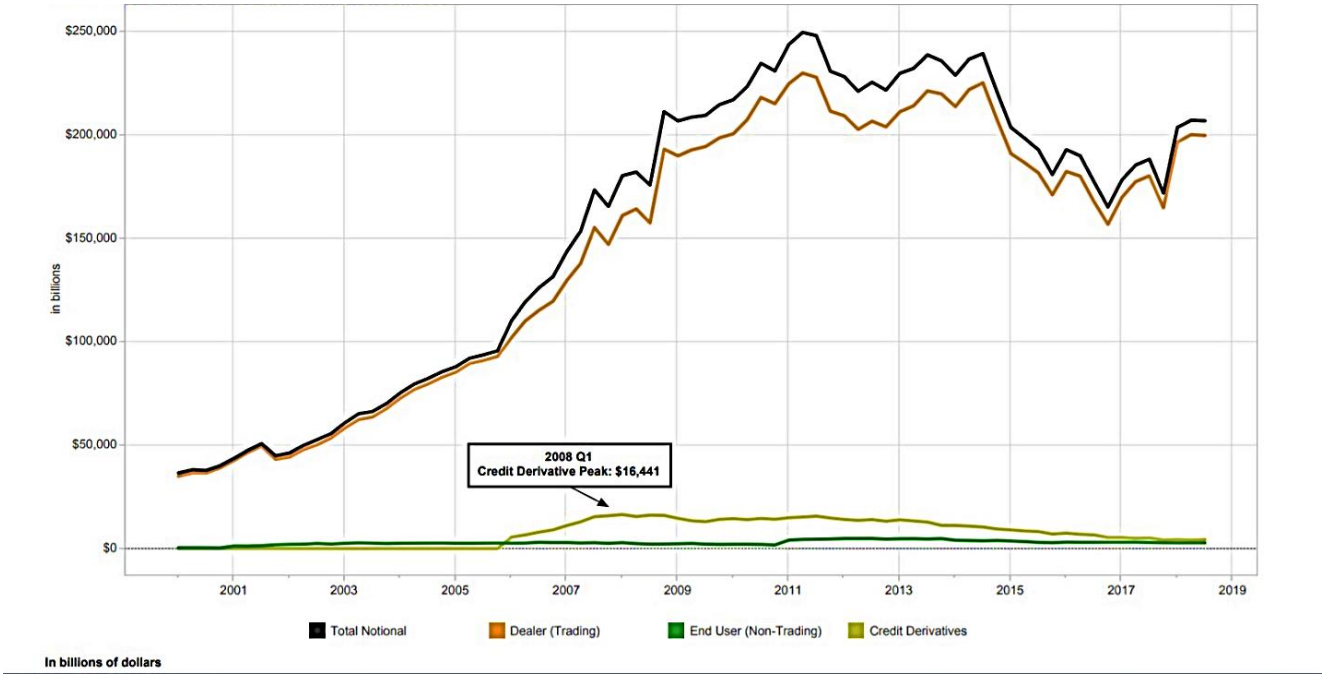
investors include those financial institutions managing assets for their own portfolio and may include banks, investment banks, and insurance companies. One of the significant shortcomings in studies exploring the relationship between insolvency risk and ownership structure is that it assumes institutional investors as a single homogenous group (Switzer et al., 2018; Ashraf et al., 2016).

Furthermore, most of the studies use cross-sectional ownership data (single observation for time series analysis) that does not consider the change in ownership structure over time (Laeven and Levine, 2009; Barry et al., 2008; Battagila and Gallo, 2017). This study fills this gap by categorizing the institutional investor in two distinct categories and using the time series data to capture the change in the ownership structure of BHCs in the US.

This essay examines the possible association between ownership structure and the stability of BHCs in the US. The sample consists of 553 BHCs for the period 2004-2016. Two important aspects characterize this period. The first is that it was the beginning of the global financial crisis, and second is the exponential growth in the use of derivatives for trading purposes. Figure 7.1 reports the notional amounts of outstanding derivative contracts that are held by insured U.S. commercial banks and saving associations. The trend highlights that a tiny fraction (<5 %) of the outstanding notional amounts are held for non-trading purposes since 2004 while the bulk of the derivatives are used for trading purposes.

Banks are profit-maximizing entities where decisions concerning risk, pricing, compliance to regulations are taken simultaneously (Graddy and Kyle, 1979). The decision to use derivatives has a direct consequence on the stability of banks, whether for trading or hedging purposes requiring the banks to take both decisions as to the derivative usage and the level of risk- taking simultaneously. Previous studies regarding a bank's decision to trade in derivatives have not

Figure 7.1: US Banking Sector (Insured commercial banks and savings institutions): Derivatives notional amount[17]



considered the nature of the relationship between stability and assume the decision to trade in derivatives in a single equation framework and thus suffer simultaneity bias (Ghosh, 2017). We examine the relationship between the decision to transact in derivatives and the stability of US BHCs using a simultaneous equation model that would allow for simultaneity between the stability of BHCs and derivative usage. The main contribution of this study is developing a model based on the assumption that the decision to transact in derivatives and assuming a particular level of stability are taken simultaneously by banks.

The sample for this study consists of 553 BHCs from the US for the period from 2004 to 2016[18]. Moreover, using the two stage probit least squares (2SPLS) model based on the

[17] Source: Quarterly Report on Bank Trading and Derivatives Activities: Q3-2018. Office of the Comptroller of the Currency.

relationship for decision to transact in derivatives and stability of US BHCs, the results for the study indicate that transacting in derivatives is positively associated with the stability of BHCs, especially for the credit derivatives. However, in the case of interest rate and foreign exchange derivatives, the results showed the relationship was reversed suggesting that transacting in interest rate derivatives and foreign exchange derivatives, which form a significant portion of outstanding derivatives, was to diversify revenue streams lending support to the substitution hypothesis.

Regarding the ownership structure, the empirical findings suggest that higher level of institutional ownership where institutional investors are managing assets on behalf of their customers such as mutual funds, hedge funds, and endowments is negatively associated with the stability of BHCs in the sample. The negative relationship can be attributed to the focus of these investors on short term returns and their ability to offload their positions quickly hence forcing the management to meet their expectations. For the other category of institutional investors, we do not find a statistically significant association with the stability of banks. However, for the higher level of government ownership, we find a positive and significant association with the level of stability suggesting that government as a shareholder exhibits a risk-averse behavior.

Besides the application of a 2SPLS model that reflects the simultaneity among the stability and derivative usage, this study makes several contributions to a rich and continuously growing literature on the relationship of bank stability, its ownership structure and governance mechanism. Other significant contributions include sub-categorization of the institutional ownership based on their main stakeholders and use of a time-series ownership structure data. Findings of these studies highlight the difference in the behavior of institutional investors, especially those holding diversified portfolios such as mutual funds.

7.2 Related literature:

[18] The rationale for choosing the period is due to relative stability, global financial crisis, and recovery period.

Related literature is discussed in Chapter 3, sec 3.2.

7.3 Empirical model for risk-taking, derivative usage and ownership structures of US BHCs:

Graddy and Kyle (1979) argue that profit-maximizing entities such as banks take the decisions concerning risk, pricing, and compliance to regulations simultaneously. This essay, therefore, develops a simultaneous equation model where the possible relationships between the decision concerning the stability level and the use of derivatives are considered as below:

$$STB_{it} = \gamma_1 DER_{it} + \beta_1' X_{it} + u_{it} \qquad \text{Eq (7.1)}$$

$$DER_{it}^{*} = \gamma_2\, z\_score_{it} + \beta_2' Y_{it} \qquad \text{Eq (7.2)}$$

where STB_{it} is the measure for stability of a BHC i in the year t, and DER^{*}_{it} is the latent unobserved variable determining the probability of BHC i transacting in derivatives in year t; while X_{it} is a vector of covariates for my first equation with BHC stability as the dependent variable; and Y_{it} gives covariates for the second equation regarding derivative usage. The equation for the decision regarding the use of derivatives is modeled as below:

$$DER_{it} = 1 \; if \; DER_{it}^{*} + v_{it} > 0 \; and \; DER_{it} = 0 \; if \; DER_{it}^{*} + v_{it} < 0$$

where DER_{it} = 1 if BHC i transacts in derivatives for year t and DER_{it} = 0 if BHC i did not transact derivatives in year t. The disturbance terms are $u_{it} \sim N(0, \sigma_{it}^2)$ and $v_{it} \sim N(0,1)$.

The composite null hypothesis in this instance is that the decision for a target stability level and decision to transact in derivatives are independent of each other or γ_1=γ_2=0, and the outcome on the decision to transact derivatives has no effect on the BHCs stability level. If null hypothesis is rejected, then sign of the coefficient determines the nature of association between the stability level and the decision to transact derivatives. If the decision to transact derivatives

increases the stability then this higher stability would encourage the derivative usage for the risk management purposes, and in this case both $\gamma_1$and $\gamma_2$will be greater than 0. A positive association would imply the support for hedging hypothesis where a decision to transact in derivatives is influenced to mitigate the insolvency risk. However, substitution between stability and the decision to transact derivatives could be reflected in negative co-efficients in both equation 7.1 and 7.2 whereby both $\gamma_1$and $\gamma_2$will be less than 0 and a negative association would support the substitution hypothesis where banks transact in derivatives to increase their income leading to lower stability levels. The use of the simultaneous equation model has the flexibility to accommodate both aspects of the relationship described above between stability and the decision of a BHC to use derivatives.

Due to the nature of the relationship between STB_{it} and DER_{it} being simultaneous, direct application of the standard techniques for estimation produce biased and inconsistent results. Therefore, the use of OLS for Eq (7.1), and probit or logit for Eq (7.2), would result in biased inconsistent estimates for the coefficients. Further, the presence endogeneity between STB_{it} and DER_{it} would violate the classical assumption of zero covariance between STB_{it} and DER_{it} and the two disturbance terms u_{it} and v_{it}. The endogeneity issue can be circumvented by using a simultaneous equation model and an estimation procedure such as the two stage least squares regression (2SLS) but both STB_{it} and DER_{it} would have to be continuous variables. In this instance, DER_{it} is a binary variable which makes it necessary to use a different version of the 2SLS technique, commonly referred to as the two stage probit least squares methodology or 2SPLS (Maddala, 1983).

The details of the 2 stage probit least squares or the 2SPLs are given below. In the first stage the reduced form of the model is estimated as:

$$STB_{it} = \pi_2' Z_{it} + \varepsilon_{it} \qquad \text{Eq (7.3)}$$

$$DER_{it}^{**} = \pi_2' Z_{it} \qquad \text{Eq (7.4)}$$

where Z_{it} denotes a vector for all exogenous variables in X_{it}, Y_{it} or both. DER_{it}^{**} being a latent variable where DER_{it} =1 if $DER_{it}^{**} + v_{it} > 0$ and DER_{it} = 0 if $DER_{it}^{**} + v_{it} < 0$. Further ε_{it} ~ N (0, σ_{ε}^2) and v_{it} ~ N (0,1) are the disturbance terms and Eq (7.3) is estimated using the first stage or the reduced form while Eq (7.4) has been estimated using probit model.

In the second stage of estimation of the 2SPLS model the fitted values of the dependent variables from the first- stage estimations of Eq (7.3) and Eq (7.4) are substituted and denoted by $\widehat{STB}_{it}$ and $\widehat{DER}_{it}^{**}$ respectively, for z_score_{it} in Eq (7.2) and DER_{it} in Eq (7.1) as below:

$$STB_{it} = \gamma_1 \widehat{DER}_{it}^{**} + \beta_1' X_{it} + u_{it} \qquad \text{Eq (7.5)}$$

$$DER_{it}^{*} = \gamma_2 \widehat{STB}_{it} + \beta_2' Y_{it} \qquad \text{Eq (7.6)}$$

where DER_{it} =1 if $DER_{it}^{**} + v_{it} > 0$ and DER_{it} = 0 if $DER_{it}^{**} + v_{it} < 0$. Now since $\widehat{DER}_{it}^{**}$ is function of Z_{it} only hence $\widehat{DER}_{it}^{**}$ is not correlated to v_{it} and Eq (7.5) can be estimated using OLS. Likewise, Eq (7.6) could now be estimated by using the probit model, as $\widehat{STB}_{it}$ is now a linear function of Z_{it}, also there is no correlation between $\widehat{STB}_{it}$ and v_{it}. The adjusted standard errors however are still required for the estimated coefficients for both Eq (7.5) and Eq (7.6), the unadjusted standard errors being based on $\widehat{DER}_{it}^{**}$ and $\widehat{STB}_{it}$ instead of DER_{it}^{*} and $\widehat{STB}_{it}$.

Section 7.6 presents the results from Eq (7.1) and Eq (7.2) using total derivative usage as the dependent variable. In the sections 7.7, we report results from three separate versions of the model, having three distinct definitions for the dichotomous dependent variable. For the first model total derivative usage is taken as the dichotomous variable denoted by DER_{it}, with DER_{it}

= 1 if BHC i used any derivative instrument in the year t, and 0 otherwise. For the second model, DERit is replaced by $INTR_{it}$, and define it in the same way for interest rate derivatives; and in the third model, DERit has been replaced by FOR_{it}, for foreign exchange derivatives; while in the last model, DER_{it} is replaced by CDX_{it} for credit derivatives. The differences between the four estimated models should reveal interesting patterns for each of the derivative instrument used.

7.4 Definition of variables:

7.4.1 Stability measure (STB_{it})

Z-score has been extensively used as a proxy for insolvency risk and stability[19] measure with many variations in its calculations (Leaven and Levine, 2009; Demirgüç-Kunt and Huizinga, 2010; Lepetit and Strobel, 2013; Berger et al., 2016; Ashraf et al., 2016 and 2017; Aziz et al.,2016). This research follows the methodology used by Lepetit and Strobel (2013) and calculates z-score as:

$$STB_{it} = \frac{\bar{r}_{it}+\mu_{it}}{\bar{\sigma}_{it}} \qquad (7.1)$$

where subscript *i* indicates BHC and *t* indicates the time. μ_{it} gives the mean of returns on assets, $\bar{\sigma}_{it}$ is the volatility of the returns on assets while $\bar{r}_{it}$ is defined as ratio of total equity capital and total assets. Lower value for stability (STB_{it}) of a BHC would point towards a higher probability of its failure and lower stability. While a higher value for stability (STB_{it}) implies lower insolvency risk and a greater stability level. Previous literature (Leaven and Levine, 2009; Schaeck and Cihák, 2012; and Ashraf et al., 2016) reports that the z-score is highly skewed, so for all our estimations we used the logarithmic transformation of z-score, and this is in line with Leaven and Levine (2009). Lepetit and Strobel (2013) support the log-transformed z_score is

[19] This research uses z-score as a proxy for stability, however it is pertinent to point out that z-score is also an insolvency risk measure and therefore a higher value of z-score points towards low insolvency risk and high stability levels while a lower z-score value points towards higher risk of a BHC going insolvent and lower stability.

proportional to the log odds of insolvency, and thus, the log of z-score is not only our stability measure but also measures the insolvency risk.

7.4.1.1 Determinants of Stability

A cursory review of literature with regards to determinants of insolvency risk albeit stability reveals several variables as that could be included in $X_{it,}$ discussed below:

7.4.1.1.1 Size ($SIZE_{it}$): $SIZE_{it}$ measures the effect of size on insolvency risk of US BHCs and define it as the natural logarithm of total assets (expressed in US$ bn), $SIZE_{it}$ will control for the bank size effects.

7.4.1.1.2 Ownership structure (OWN_{ijt}): Since various type of shareholders may have different investment objectives and that can potentially affect the stability of BHCs. The shareholders can be broadly categorized four major groups: family ownership, government ownership, and two categories of institutional ownership. As pointed out in the literature review that one of the vital shortcomings in banking literature is that institutional investors are considered as a homogeneous or similar group in terms of their risk-taking behavior. However, institutional investors can be easily divided into two sub categories based on whether they were managing the assets on behalf of their customers such as mutual funds, hedge/equity fund, real estate, structured fund, union fund and trust and endowment funds or if they were managing assets on their own behalf such as banks, investment banks and insurance companies. To capture the impact of various categories of shareholders in the ownership structure of BHCs, we use the percentages of ownership held by a specific category of shareholders as below:

I. FI_{it} – comprising of banks, investment banks and insurance companies

II. $INST_{it}$ – comprising of mutual fund, hedge/equity funds, real estate, structured fund and Union fund companies, trust and endowment companies

III. FAM_{it} – individuals and family.

IV. GOV_{it} – Government shareholding.

One of the most important contributions of this paper is sub-categorization among institutional investors based on their mandate for asset management.

7.4.1.1.3 Loan growth ($LGROW_{it}$): Growth in the traditional bank lending function results in higher returns for the stakeholders, accordingly we use loan growth ($LGROW_{it}$) and define it as the ratio between loan growth and total assets.

7.4.1.1.4 Effect of capital regulations (RWA_{it}): Stability is affected by capital regulations limiting ability of banks to increase their earnings due to lower levels of capital available for investment and lending purposes, ultimately this can cause contraction of the economy (Estrella et al. 2000). Jokipii and Milne (2011) argue that capital requirements act as a cushion in economic downturns as well as a deterrent to taking on higher risk. Furthermore, the importance of compliance with BASEL directives towards regulatory capital requirements cannot be undermined and for compliance to capital regulations this study uses use the ratio of risk weighted assets to total assets denoted by RWA_{it}. A lower value for RWA_{it} would indicate higher stability. Therefore, in order for a bank to increase stability they can either raise new capital in which case the total assets would be higher, or they can reduce the size of their risky portfolio which would translate into lower level of risk weighted assets. Ashraf and Goddard (2012), have also use used the ratio of risk weighted assets to total assets in their research but as a bank specific determinant for loan growth.

7.4.1.1.5 Quality of loan portfolio ($LNLOSS_{it}$): The quality of loan portfolio of a BHC reflects on its capacity to generate returns from its lending decisions and popular measures include the loan loss provisions, allowances and charge offs. To capture the impact of that the quality of loan portfolio may have, this study uses loan loss provision ratio ($LNLOSS_{it}$) and define it as the rate of change in the loan loss provision annually. Loan loss provision ratio is calculated using the change in provision for loan loss reserves scaled by total loans. This is in line with Shrieves and Dahl (1992), Foos et al., (2010), and Ashraf and Goddard (2012). Ashraf et al., (2016) found that a positive relationship with risk would point towards income smoothing while a negative one would point towards a deteriorating loan portfolio quality.

7.4.1.1.6 Return on Assets (ROA_{it}): Several variables in banking literature qualify for measuring competition for example Lerner's Index, Herfindahl- Hirschman index and return on assets. Carbó et al. (2009) argue that Lerner's Index and Herfindahl-Hirschman Index both fail in capturing competition in the non –traditional business lines, this essay uses returns on assets (ROA_{it}) which captures the effect of both traditional and non-traditional business lines defined as net income scaled by total assets and anticipate a positive relationship with stability (STB_{it}).

7.4.1.1.7 Gross state-wise product growth rate ($GSPG_{it}$): Ashraf and Goddard (2012) used employment growth rate and the GSP growth rate as indicators of economic conditions. While Laeven and Levine (2009), Albertazzi and Gambaracorta (2009), Demirgüç-Kunt and Huizinga (2010), and Bushman and Williams (2012) have used GDP as indicators of business cycle. This study uses Gross state product growth rate

to account for fluctuations in the business cycle and the prevalent economic condition in each state. $GSPG_{it}$ is expected to capture the implications for stability that arise from operating in the different economic environments of every state.

7.4.1.1.8 Bank prime rate (PR_{it-1}): Since banks and BHCs are exposed to the interest rate risk having a tendency to borrow in the short run and lend in the long run, therefore the variation in the interest rates is an important determinant of bank performance. Purnanandam (2007) found that when banks face a higher probability of incurring a loss, they counter through aggressive management of their interest rate risk through the use of derivatives and conservative asset-liability management policies. Traditionally, income from lending activities tends to be more stable than non – traditional fee-based income, therefore this study includes the impact of bank prime rate on the stability of BHCs in the STB_{it} equation. PR_{it-1} is the previous year's prime rate for lending. Higher interest rates act as a deterrent to borrowers that have better than average credit scores and quality of the loan portfolio would suffer ultimately decreasing the stability of the bank holding companies.

7.4.2 Determinants of derivative usage

Previous literature on the determinants of derivative usage by suggests a few important variables that can be included in Y_{it} in eq (7.2) pertaining to the derivative usage.

7.4.2.1 Size ($SIZE_{it}$): Previous research indicates that entry barriers would need to be overcome before a bank can deal in derivatives**.** Pennacchi (1988), Minton (2005) Ashraf et al. (2008) find that the derivative usage is more likely in banks that are larger

in size. Ashraf and Goddard (2012), Brewer et al. (2000), Shyu and Reichart (2002) found that apart from expertise in the areas of finance, capital and humans, banks would require a sophisticated internal control system and a relatively high franchise value for overcoming the entry barriers. The covariate that controls barriers to entry is $SIZE_{it}$ and defined as the natural log of the total assets; for $SIZE_{it}$ a positive coefficient is anticipated.

7.4.2.2 Liquidity ($LIQUID_{it}$): Liquidity of any financial institutions including banks and BHCs is reflected in their ability to fund their short-term lending commitments through current deposits. Ashraf and Goddard (2012) found that, as the derivatives are mainly instruments driven by particular events maintaining additional liquidity could serve as a buffer against unexpected losses. This study uses $LIQUID_{it}$ as a measure of liquidity in Eq (7.2) the derivative equation and define it as the ratio of loans scaled by total deposits.

7.4.2.3 Regulatory capital measures (RWA_{it}): Ashraf and Goddard (2012) argue that one of the motives to use derivative instruments is compliance with regulatory capital requirements; this study has used risk-weighted assets scaled by total assets denoted by RWA_{it} regulatory effect. A positive coefficient of RWA_{it} would indicate likelihood of a bank towards using derivatives while a negative one would likely suggest a motive for hedging when unable to achieve compliance.

7.4.2.4 Net interest margin (NIM_{it}): The growing competition in the traditional lines of business has led banks to move towards a diversification in the earnings portfolio by engaging in earnings from activities that are fee-based alongwith contracting derivatives. Net interest margin (NIM_{it}) is the net interest income scaled by total

assets. Negative coefficient for NIM_{it} would concur with the perception that the use of derivatives can be a substitute of traditional lending activities.

7.4.2.5 Loan performance ($LNLOSS_{it}$): Finally, the decision of a BHC to transact derivatives could be influenced by its approach towards managing changes in loan performance. A positive coefficient on $LNLOSS_{it}$, would suggest that BHCs use derivatives as a hedging strategy to protect against unexpected loan losses. $LNLOSS_{it}$ is defined as the annual rate of change in the provision for loan loss reserves scaled by total loans.

7.4.2.6 Herfindahl-Hirschman's Index ($HERF_{it}$): Finally, Herfindahl-Hirschman Index is used to control for bank concentration for the decision to transact in derivatives equation. Herfindahl-Hirschman Index is defined as square of total assets scaled by the sum of total assets.

7.5 Data sources and descriptive statistics:

Details of the sources of data are presented in chapter 4. Table 7.1 and 7.2 give the descriptive statistics and correlation matrix.

Table 7.3 compares the difference in the overall stability of BHCs in the sample by year and the numbers of BHCs that did and did not transact in derivatives. An interesting trend emerges from this table is the lower stability of banks that transact in derivatives irrespective of the year. The derivative user banks showed the lowest stability levels corresponding to the global financial crisis period 2007-09. However, during the same period, non-user banks remained resilient. The lower stability scores during the crisis period may highlight the impact of the crisis on the overall stability of derivative user banks.

Table 7.4 provides the complete list of covariates used alongwith with brief definitions for each, alongwith with the t-statistics for differences in means analysis for the BHCs that use derivatives and the ones that don't. The descriptive statistics have been calculated by pooling data across the BHCs and the years. Besides the lower stability levels of BHCs that are derivative users, the differences-in-means analysis has also indicated significant differences in characteristics of the average derivative user and derivatives non-user BHCs. More generally, table 2 indicates that the average derivative user BHC is larger in size, owned mainly by asset manager type institutional investors and are less profitable as compared with nonuser BHCs.

Table 7.1: Descriptive Statistics (Stability and derivative usage)

Variable	Variable Definition	Obs	Mean	Std. Dev.	Min	Max
STB_{it}	z-score of return on assets	4739	3.699048	1.424915	-2.46572	9.001843
$SIZE_{it}$	Size of Firm-Log of Total assets	4839	14.16024	1.633148	11.72393	21.66825
FI_{it}	Ownership by banks, investment banks and Insurance companies	5980	1.34423	2.668347	0	11.83264
$INST_{it}$	Ownership by comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies	5953	18.36022	24.91739	0	92.05874
FAM_{it}	Ownership by Individuals, Families.	5980	0.458809	1.663646	0	10.86702
GOV_{it}	Ownership by Government					
$LGROW_{it}$	loan growth / Total assets	5953	0.459122	0.853604	0	3.3633
RWA_{it}	Regulatory capital ratio	4390	0.036054	0.075591	-0.17596	0.336488
$LNLOSS_{it}$	Annual rate of change in the provision for loan loss reserves scaled by total loans	4654	0.706811	0.119663	0	1.200306
ROA_{it}	Return on assets	4388	7.693066	25.54328	-37.037	145.15
$GSPG_{it}$	Gross state wise product growth rate	4839	0.007371	0.00781	-0.0345	0.020094
PR_{it-1}	Prime rate for lending at end of previous year	5380	4.37976	1.740583	3.25	8.05
$LIQUID_{it}$	Liquidity - loans to deposit ratio	4839	0.848812	0.202543	0.24404	6.79127
NIM_{it}	BHCs net interest income scaled by its average earning assets.	4839	0.033303	0.006442	-0.0296	0.071388
$HERF_{it}$	Herfindahl-Hirschman's index	5980	0.424028	0.274295	0	1

Table 7.2: Correlation matrix (Stability and derivative usage)

	STB_{it}	$SIZE_{it}$	FI_{it}	$INST_{it}$	FAM_{it}	GOV_{it}	$LGROW_{it}$	RWA_{it}	$LNLOSS_{it}$	ROA_{it}	$GSPG_{it}$	PR_{it-1}	$LIQUID_{it}$	NIM_{it}	$HERF_{it}$
STB_{it}	1.00000														
$SIZE_{it}$	-0.30640	1.00000													
FI_{it}	-0.13670	0.28050	1.00000												
$INST_{it}$	-0.25290	0.68540	0.42190	1.00000											
FAM_{it}	-0.01270	0.17060	0.04780	0.19040	1.00000										
GOV_{it}	-0.18730	0.78270	0.28720	0.81700	0.17610	1.00000									
$LGROW_{it}$	-0.03900	0.15890	0.07960	0.11610	0.02820	0.06760	1.00000								
RWA_{it}	-0.21510	0.03430	0.07110	0.06250	-0.01880	0.06760	0.01980	1.00000							
$LNLOSS_{it}$	-0.13100	0.07920	0.03490	0.03710	-0.01370	0.01610	0.39230	0.10060	1.00000						
ROA_{it}	0.41470	-0.00830	-0.04680	-0.02030	0.03990	0.04380	0.24090	-0.08320	-0.21890	1.00000					
$GSPG_{it}$	0.02890	0.02480	0.00580	0.01350	0.01010	0.01170	0.11620	-0.07200	-0.20520	0.25540	1.00000				
PR_{it-1}	-0.03970	-0.06550	0.00660	-0.00840	0.00720	0.00490	0.03790	0.23720	0.27260	-0.02560	-0.27270	1.00000			
$LIQUID_{it}$	-0.13850	0.14140	0.07690	0.13980	0.02990	0.14410	0.20520	0.55650	0.17140	-0.03870	-0.08820	0.20610	1.00000		
NIM_{it}	0.18870	-0.37940	-0.09220	-0.22280	-0.05680	-0.23460	-0.11500	0.23060	-0.03870	0.23920	0.03810	0.05400	0.01240	1.00000	
$HERF_{it}$	-0.13870	0.19400	0.06350	0.14080	-0.02080	0.15050	0.02680	0.08470	0.03210	-0.00250	-0.00550	0.03800	-0.00060	0.11580	1.00000

Table 7.3: Year wise mean of Stability (STB_{it}) of all derivative user and derivative non-user BHCs.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mean of Stability (*STAB*)													
Derivative users	3.46	3.38	3.13	3.15	3.00	3.10	3.19	3.29	3.39	3.47	3.57	3.54	3.55
Derivative non-users	4.03	4.12	4.17	4.24	4.25	4.57	4.56	4.84	4.72	4.78	4.69	4.33	4.33
Total	3.63	3.61	3.62	3.61	3.55	3.58	3.62	3.69	3.73	3.79	3.84	3.84	3.84
Number of banks													
Derivative users	222	223	174	192	192	227	235	259	290	308	317	261	265
Derivative non-users	93	101	154	142	149	112	107	91	99	98	100	162	157
Total number of banks	315	324	328	334	341	339	342	350	389	406	417	423	422

Table 7.4: ttest for difference in means.

Variable	Variable Definition	Derivative user BHC	Non- use BHC	tstat for difference in means
STB_{it}	z-score of Return on assets	3.349	4.402	(1.053) ***
$SIZE_{it}$	Size of Firm-Log of total assets	14.760	13.017	1.743***
FI_{it}	Ownership by banks, investment banks and Insurance companies	1.920	0.692	1.228***
$INST_{it}$	Ownership by comprising of mutual fund, hedge/equity fund, corporations, real estate, structured fund and Union fund companies, trust and endowment companies.	29.035	6.160	22.876***
FAM_{it}	Ownership by Individuals, Families.	0.761	0.117	0.645***
GOV_{it}	Ownership by Government	0.788	0.084	0.704***
$LGROW_{it}$	Total loan / Total assets	0.047	0.016	0.031***
RWA_{it}	Regulatory capital ratio	0.707	0.706	0.001***
$LNLOSS_{it}$	Annual rate of change in provision for loan loss reserves scaled by total loans	9.893	3.637	6.255***
ROA_{it}	Return on assets	0.007	0.008	(0.001) ***
$LIQUID_{it}$	Liquidity - loans to deposit ratio	0.859	0.829	0.030***
NIM_{it}	Net interest income scaled by average earning assets as a percentage.	0.032	0.035	(0.003) ***
$HERF_{it}$	Herfindahl- Hirschman's Index	0.430	0.417	0.012***

7.6 Empirical estimations and results:

This section presents and also interprets the estimation results from the simultaneous equations model for stability and the use of derivatives. Before we present the estimation result, it is pertinent to see whether the use of 2SPLS model is appropriate for the empirical estimations. Following Brewer et al., (2000) and Ashraf et al., (2012), we perform a simple test. Under the null hypothesis, if derivative usage decreases the stability levels, then a single equation model would over-predict the stability of BHCs that did not use derivatives. Similarly, the model would underpredict the stability level of BHCs that use derivatives.

In order for me to test the null hypothesis, I created two sub-samples for which all 13-year time series observations were available. Sub-sample 1 consisting of all those BHCs that transacted in derivative for all years from 2004 to 2016 and sub-sample 2 consisting of non-derivative user BHCs during the same period. For each of these sub-samples, then I ran a regression of STB_{it} our variable for insolvency risk with $SIZE_{it}$, FI_{it}, $INST_{it}$, FAM_{it}, GOV_{it}, $LGROW_{it}$, RWA_{it}, $LNLOSS_{it}$, ROA_{it}, $GSPG_{it}$, PR_{it-1}, $LIQUID_{it}$, NIM_{it}, and $HERF_{it}$. The model estimated using sub-sample 1 with only derivative user BHC showed mean fitted value of 3.22 while actual mean of STB_{it} in subsample 2 was 5.37 suggesting that this formulation under predicts the stability levels of BHCs transacting in derivatives. Similarly, the mean fitted value of STB_{it} for sample 2 was 5.39 while actual mean value of subsample 1 was 3.22 showing that a single equation model would over predict the value of STB_{it} for BHCs that did not use derivatives. Hence suggesting the appropriateness of using a simultaneous equation model.

Table 7.5 reports the first-stage or the reduced form estimations for both dependent variables, estimation 7.1 for STB_{it} and estimation 7.2 for DER_{it} have been modeled to include all the exogenous variables appearing in the 2SPLS model. However, the first-stage equation for derivative usage (DER_{it}) has been estimated using probit regression. The table 7.5 offers

informal indication of explanatory powers of instrumental variables that were used for first-stage estimations for STB_{it} and DER_{it} the endogenous variables in the model. I find that the signs and significance of most of the covariates are in line with theoretical expectations. To avoid redundancy, discussion of the results of 2SPLS model in detail below.

Table 7.6 gives estimation results of the full 2SPLS model, the upper section of the table shows the estimated stability equation, while the lower section of the table shows the estimated use of derivatives equation for our model. Regarding the association between STB_{it} and transacting in any derivative instrument, the coefficient is positive and statistically significant, which would suggest that participation in derivative activities do help towards achieving better stability. The result is in line with Ghosh (2017), who report that the decision to use derivatives by banks is to reduce the insolvency risk arising from operational activities.

Among the ownership variables, the coefficient of $INST_{it}$ is negative and significant, which suggests that a higher percentage of asset-management type institutional investor in the ownership structure of BHCs adversely impact the stability of banks. This relationship can be attributed to the focus of these investors on short term returns and their ability to offload their positions quickly hence forcing the management to assume higher risk-taking to meet their return expectations. The result is in line with Barry et al., (2011) suggesting that institutional investors hold diversified investment portfolios and have a higher incentive to take on greater risk.

Regarding other categories of the ownership structure, we find a positive and significant relationship of stability with government ownership. This finding is in line with the existing literature (Ghosh and Chatterjee, 2018; Bouvatier et al., 2014; Ashraf et al., 2016) suggesting the risk-averse nature of these shareholders help in elevating the stability of BHCs in the sample. The results do not indicate a significant effect of financial institution type institutional investors, (FI_{it},) and family/individual (FAM_{it}) shareholdings on the stability of BHCs during the sample period.

Among the other covariates in the equation for STB_{it} in table 7.6, the negative and significant coefficient of $SIZE_{it}$ with stability suggest that BHCs larger in size are less stable (Altunbas et al. ,2011; Köhler, 2012; Demirgüç-Kunt and Huizinga, 2010; and Ghosh, 2017). The coefficient for the ratio of gross loan to total assets ($LGROW_{it}$) is also negative and significant suggesting that BHCs, on average, with more substantial loan's exposures may face higher insolvency risk leading to the lower stability of BHCs during the sample period. Ghosh (2017) report similar results for the loan to asset ratio for the commercial banks in the US.

The coefficient of regulatory capital ratio (RWA_{it}) is significant but negative, suggesting that BHCs with higher capital buffers are less stable. This implies that BHCs with higher capital buffer may assume higher risk level due to the perceived safety associated with lower leverage. Koehn and Santomero (1980), and Kim and Santomero (1988) report similar results with higher regulatory capital standards causing banks to engage in risky behavior. The coefficient for the quality of loan portfolio ($LNLOSS_{it}$) is positive and significant, suggesting that BHCs aggressive in holding higher provisioning for loan losses are more stable as compared with those BHCs holding conservative reserves. Similarly, our profitability measure ROA_{it} has a positive coefficient, showing a higher return on assets would decrease the insolvency risk and increase stability.

Among the covariates related to the business cycle, we find the coefficient of gross statewide product growth rate ($GSPG_{it}$), as negative and significant in line with Khan et al., (2017) suggesting that during the economic growth periods and in concentrated markets BHCs take on higher risk making them less stable. Our results for market concentration (HERF) are in line with Berger et al., (2009) and Boyd et al., (2006) who found that risk of bank failure rises is higher in concentrated markets. While the lagged effect of the bank prime rate (PR_{it-1}) having a negative coefficient suggests that stability is sensitive to the cost of borrowing and that banks would be

Table 7.5: First stage (reduced form) estimation results for stability and derivative usage.

Dependent variable	Estimation 7.1 STB_{it}	Estimation 7.2 DER_{it}
$SIZE_{it}$	-0.2756***	0.930564***
	(0.019568)	(0.037199)
FI_{it}	0.00424	-0.00261
	(0.007328)	(0.010709)
$INST_{it}$	-0.00936***	7.50.012353***
	(0.001311)	(0.002233)
FAM_{it}	0.015097	0.080579***
	(0.009978)	(0.019335)
GOV_{it}	0.321111***	-0.49234***
	(0.04148)	(0.069105)
$LGROW_{it}$	-1.66886***	1.652246***
	(0.298675)	(0.424837)
RWA_{it}	-2.25848***	0.706471
	(0.19567)	(0.288795)
$LNLOSS_{it}$	0.002052	0.002271
	(0.000867)	(0.001245)
ROA_{it}	77.94168***	-18.789***
	(2.80495)	3.679839
$GSPG_{it}$	-4.88782***	-0.16384
	(0.874647)	(1.166323)
PR_{it-1}	-0.03321**	-0.07388***
	(0.011411)	(0.01509)
$LIQUID_{it}$	0.289854**	-0.74603***
	(0.135591)	(0.19832)
NIM_{it}	5.697954	3.493454
	(3.481174)	(4.78969)
$HERF_{it}$	-0.35473***	-0.51742***
	(0.070273)	(0.093509)
constant	13.45982***	-11.6885***
	(0.942343)	(1.309704)
Number of Observations	4168	4241
R square	0.3259	
Pseudo R Square		0.3798

Note:The sample period is from the year 2004-2016. Standard errors in parentheses. ***Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

Table 7. 6: 2SPLS estimation results for stability and derivative usage

Dependent variable	Estimation 7.3 STB_{it}
$\hat{DER}^{**}_{it}$	0.307035***
	(0.116927)
$SIZE_{it}$	-0.56396***
	(0.103665)
FI_{it}	0.00548
	(0.007366)
$INST_{it}$	-0.01318***
	(0.001944)
FAM_{it}	-0.00706
	(0.013932)
GOV_{it}	0.475041***
	(0.069141)
$LGROW_{it}$	-2.03817***
	(0.331405)
RWA_{it}	-2.04754***
	(0.158588)
$LNLOSS_{it}$	0.001568*
	(0.000897)
ROA_{it}	84.98987***
	(3.480939)
$GSPG_{it}$	-5.00805***
	(0.875594)
PR_{it-1}	-0.00916
	(0.014947)
	DER_{it}
STB_{it}	-0.31574***
	(0.04579)
$SIZE_{it}$	0.821241***
	(0.030674)
$LIQUID_{it}$	-0.63847***
	(0.19042)
RWA_{it}	-0.24411
	(0.316697)
NIM_{it}	4.508532
	(4.79637)
$LNLOSS_{it}$	0.002884***
	(0.001039)
$HERF_{it}$	-0.61749***
	(0.095401)

Note: The sample period is from the year 2004-2016. Standard errors in parentheses. ***Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

likely to engage in riskier projects with higher yields to offset the negative effects that lower interest rates would have on profits Buch et al., (2014).

In table 7.6 with regards to the results for the decision to transact in derivatives, the likelihood of a BHC using derivatives of any kind is positively related to its size, larger the size of a BHC the higher is its likelihood to use derivatives. These results signify that entry barriers can have an impact on the decision of a BHC to engage in derivatives. A negative significant coefficient for the variable for liquidity ($LIQUID_{it}$) indicates that BHCs engaging in derivatives tend to hold lower levels of liquid assets. The variable for the loan loss provision ($LNLOSS_{it}$) has a negative coefficient which suggests that the BHC decision to engage in derivatives depends on current-year loan loss position but at very low levels.

In summary, the empirical results indicate that decision of a BHC to transact derivatives is correlated to higher stability and supports the hedging hypothesis, the results were consistent for credit derivative usage reported in table 7.7 estimation 7.6. However, the association reversed for interest rate derivatives and foreign exchange derivatives often used for trading (table 7.7 estimation 7.4 and 7.5). The results also show that ownership structure affects the stability of BHCs, especially those institutional investors that manage assets on behalf of their clients such as mutual fund, hedge/equity fund, trust and endowment funds. A higher ownership concentration of these institutional investors is associated with lower stability as compared with those BHCs with a higher level of the second category of institutional investors including banks, investment banks and insurance companies as well as for government shareholdings.

7.7 Robustness checks

The main objective of this essay is to investigate the relationship between the decision to transact in derivatives and the stability of US BHCs. For robustness checks, we re-estimated

three separate versions of the 2SPLS models using interest rate derivatives ($INTR_{it}$), foreign exchange derivatives (FOR_{it}), and credit derivatives (CDX_{it}). A comparison between different type of derivative activities helps in better understanding of the motivations for using these instruments by BHCs. Table 7.7 reports the results for the three separate 2SPLS models. One of the significant differences in the results presented in tables 7.6 and 7.7 is that the relationship between different categories of transacting in derivatives is not constant among all derivative activities. The coefficients of derivative activities are negative and significant for the interest rate. Interest rate derivatives are most often used for the trading purpose by banks. While the trading in credit derivative is restricted to only handful BHCs with strong market power and access sophisticated analytical tools (Ashraf et al., 2007). The empirical findings for interest rate derivative usage support the substitution hypothesis and is in line with Ashraf and Goddard (2012) who report that trading in derivatives serves as an important substitute for the traditional lending by BHCs and is also becoming an increasingly popular alternative source of revenue for them. While the coefficient for transacting foreign exchange, derivative is insignificant. The variable for credit derivative usage carries a positive and significantly significant co-efficient supporting the hedging hypothesis.

With regards to ownership, the variable for Institutional ownership $INST_{it}$ has a negative coefficient, in other words, higher levels of ownership by mutual funds, hedge/equity funds, real estate investment funds, structured funds, and union fund companies, trust and endowment fund

companies are associated with a lower stability level of the BHCs. The variable for government ownership is positive and highly significant, showing that higher level of ownership by government decreases insolvency risk and makes of US BHCs more stable. Our variable for family ownership FAM_{it} has mixed results – we found a positive coefficient for estimation 7.5 consistent with Barry et al.,

Table7. 7: Robustness checks using individual categories of derivatives, 2SPLS estimation results

Dependent variable	Estimation 7.4 STB_{it}	Estimation 7.5 STB_{it}	Estimation 7.6 STB_{it}
$\widehat{INTR}_{it}^{**}$	-0.63777***		
	(0.172991)		
$\widehat{FOR}_{it}^{**}$		-0.0033222	
		(0.0261349)	
$\widehat{CDX}_{it}^{**}$			0.561014***
			(0.102658)
$SIZE_{it}$	0.024833	-0.2933242***	-0.35689***
	(0.088952)	(0.0282749)	(0.021429)
FI_{it}	0.008089	0.004173	-0.00064
	(0.00742)	(0.0073568)	(0.00738)
$INST_{it}$	-0.00865***	-0.0094064***	-0.00519***
	(0.001329)	(0.001317)	(0.001522)
FAM_{it}	0.016219	0.0181498*	-0.02636**
	(0.009998)	(0.0102533)	(0.0129)
GOV_{it}	0.316141***	0.3292552***	0.221642***
	(0.041677)	(0.0418953)	(0.045922)
$LGROW_{it}$	-1.40868***	-1.625984***	-0.45588
	(0.294704)	(0.3025061)	(0.3583)
RWA_{it}	-1.34886***	-2.015724***	-1.55477***
	(0.240119)	(0.1582588)	(0.178805)
$LNLOSS_{it}$	0.002977***	0.0022116**	0.0051***
	(0.000886)	(0.000864)	(0.001009)
ROA_{it}	77.88165***	79.10983***	78.27879***
	(2.677226)	(2.665307)	(2.656034)
$GSPG_{it}$	-2.22001*	-4.962263***	-1.49869
	(1.152161)	(0.8929674)	(1.081268)
PR_{it-1}	-0.03294***	-0.034202	0.024776
	(0.011383)	(0.0118007)	(0.015713)
	$INTR_{it}$	FOR_{it}	CDX_{it}
STB_{it}	0.022893	-0.0492857	0.001945
	(0.075663)	(0.1138747)	(0.040604)
$SIZE_{it}$	0.478808***	0.8011998***	0.151966***
	(0.029208)	(0.0569081)	(0.019491)
$LIQUID_{it}$	0.008355	-4.620244***	0.354088**
	(0.27406)	(0.5567208)	(0.163646)
RWA_{it}	1.249364***	3.951754***	-1.52402***
	(0.443824)	(0.7205872)	(0.279574)
NIM_{it}	-15.2781*	-0.1820006	16.11186***
	(8.17056)	(13.64918)	(4.360825)
$LNLOSS_{it}$	0.00082	-0.0000628	-0.0084***
	(0.00152)	(0.0023241)	(0.00086)
$HERF_{it}$	0.241247	-1.018952***	-0.57984***
	(0.173198)	(0.281119)	(0.088028)

Note: The sample period for robustness check is from the year 2004-2016. Standard errors in parentheses.
*** Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

(2011) who report that family-owned firms take on less risk but are also less profitable, but the variable is insignificant for estimation 7.4. In the case of estimation 7.5, we found that the ownership by individuals and family is negative and significant making the BHC more unstable consistent with Laeven (1999) who found banks with higher family ownership were among the riskiest.

Among the other covariates in eq (7.1) for STB_{it} reported in table 7.7, the negative coefficients on $SIZE_{it}$ show BHCs larger in size have lower stability, the result is consistent for estimation 7.5 and 7.6, however in estimation 7.4 where interest rate derivatives are used for estimations the result is positive though insignificant. The results for regulatory capital ratio (RWA_{it}) are negative and highly significant for all three estimations 7.4, 7.5 and 7.6, consistent with estimation 7.3 for total derivative usage. This indicates that BHCs with higher capital buffer may assume higher risk-taking due to the perceived safety associated with a lower leverage and is in line with Koehn and Santomero (1980), and Kim and Santomero (1988). The ratio of loan to total assets ($LGROW_{it}$) has a negative coefficient for estimation 7.4, and 7.5 showing that the higher loan to total assets ratio in a BHCs portfolio increases insolvency risk making the BHC less stable, and this result is consistent with Ghosh (2017). The results for the quality of loan portfolio ($LNLOSS_{it}$) is positive and significant for all estimations 7.4,7.5 and 7.6 which suggests that BHCs that are holding a higher provisioning for loan losses are more stable. Similarly, our profitability measure ROA_{it} has a positive coefficient, showing a higher return on assets would increase stability. Although our variable for gross state wise product ($GSPG_{it}$), is negative but it is significant for estimations 7.4 for interest rate derivatives and 7.5 for foreign exchange derivatives and negative but insignificant for estimation 7.6 in respect of credit derivatives. This result is consistent with 7.6.1 for total derivatives and in line with Khan et al., (2017) who found that during the economic growth periods and in concentrated markets BHCs take on higher risk making them

Table 7. 8: Robustness checks using dummy for financial crisis, 2SPLS estimation results

Dependent variable	Estimation 7.7 STB_{it}
$D\hat{E}R_{it}^{**}$	0.2998442***
	(0.1165853)
$SIZE_{it}$	-0.557467***
	(0.1032132)
FI_{it}	0.0055643
	(0.0073489)
$INST_{it}$	-0.013194***
	(0.0019379)
FAM_{it}	-0.007161
	(0.0139144)
GOV_{it}	0.4717554***
	(0.0688529)
$LGROW_{it}$	-1.714408***
	(0.3447701)
RWA_{it}	-2.055436***
	(0.1582082)
$LNLOSS_{it}$	0.0008248
	(0.0009175)
ROA_{it}	85.99901***
	(3.462687)
$GSPG_{it}$	-4.048042***
	(1.074791)
$UNEMPG_{it}$	0.0720254
	(0.1483139)
PR_{it-1}	-0.041603**
	(0.0175068)
FC_{it}	0.2115463***
	(0.0645261)
	DER_{it}
STB_{it}	-0.296759***
	(0.04496)
$SIZE_{it}$	0.8216545***
	(0.0306044)
$LIQUID_{it}$	-0.629672***
	(0.1908698)
RWA_{it}	-0.105869
	(0.3179369)
NIM_{it}	3.085449
	(4.78718)
$LNLOSS_{it}$	0.0035359***
	(0.0010717)
$HERF_{it}$	-0.603694***
	(0.095301)
FC_{it}	-0.135605***
	(0.0541999)

Note: The sample period is from the year 2004-2016. Standard errors in parentheses. ***Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

Table7. 9: Robustness checks using Fixed effects model using stability as dependent variable

Dependent variables	Estimation 7.8 STB_{it}
DER_{it}	-
$SIZE_{it}$	0.164***
	(0.0116)
FI_{it}	-0.00309**
	(0.00140)
$INST_{it}$	-0.000216
	(0.000269)
FAM_{it}	0.000811
	(0.00222)
GOV_{it}	0.00288
	(0.00785)
$LGROW_{it}$	-0.0720
	(0.0552)
RWA_{it}	0.183***
	(0.0620)
$LNLOSS_{it}$	7.48e-05
	(0.000134)
ROA_{it}	9.336***
	(0.529)
$GSPG_{it}$	0.473***
	(0.145)
$UNEMPG_{it}$	0.0864***
	(0.0202)
PR_{it-1}	-0.0191***
	(0.00308)
$LIQUID_{it}$	0.401***
	(0.0597)
NIM_{it}	4.336***
	(1.218)
$HERF_{it}$	0.0680
	(0.0590)
Constant	-0.348***
	(0.0387)
Observations	2,393
Number of ids	316

Note: The sample period is from the year 2004-2016. Standard errors in parentheses. ***Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

Table7. 10: Robustness checks subdividing dataset into pre and post crisis time periods

Dependent variable	Estimation 7.9 STB_{it}	Estimation 7.10 STB_{it}
$\hat{DER}_{it}^{**}$	0.647826	0.08508
	(0.438295)	(0.152112)
$SIZE_{it}$	-0.90598**	-0.36402
	(0.393508)	(0.135861)
FI_{it}	0.005638	0.009146
	(0.016137)	(0.011269)
FAM_{it}	-0.04545	0.014007
	(0.045799)	(0.016783)
$INST_{it}$	-0.01637***	-0.01062***
	(0.00426)	(0.002749)
GOV_{it}	0.715152***	0.331407***
	(0.216722)	(0.092747)
$LGROW_{it}$	-3.24007***	-1.85433***
	(0.815736)	(0.806864)
RWA_{it}	-3.19548***	-1.15209***
	(0.357831)	(0.240957)
$LNLOSS_{it}$	-0.00391	0.010331***
	(0.002422)	(0.002295)
ROA_{it}	59.98533***	88.80606***
	(10.45474)	(5.651251)
$GSPG_{it}$	1.41822	-6.5518*
	(2.834193)	(1.988168)
$UNEMPG_{it}$	-1.09841	-0.33719
	(0.675599)	(0.460807)
PR_{it-1}	0.161427*	-0.10038
	(0.647826)	(0.260821)
	DER_{it}	DER_{it}
STB_{it}	-0.63758***	-0.31546***
	(0.166216)	(0.070098)
$SIZE_{it}$	0.62664***	0.895629***
	(0.06271)	(0.049037)
$LIQUID_{it}$	-0.50979	0.185459
	(0.388949)	(0.284658)
RWA_{it}	-1.8658**	-0.86704**
	(0.901962)	(0.426579)
NIM_{it}	10.03132	10.34863
	(10.09558)	(8.061388)
$LNLOSS_{it}$	-0.00243	-0.00011
	(0.002665)	(0.00214)
$HERF_{it}$	-0.51284**	-0.61027***
	(0.200767)	(0.151618)

Note: The sample period is from the year 2004-2016. Standard errors in parentheses. ***Denotes coefficient statistically different from zero, 1% level, two-tailed test; **5% level; *10%

less stable. The lagged effect of the bank prime rate (PR_{it-1}) having a negative co-efficient suggests that stability is sensitive to the cost of borrowing.

I also ran regressions using dummy for financial crisis , the results are reported in table 7.8. The results reported do not suggest any significant divergence from the results that were run without the dummy for financial crisis as in table 7.6.

Finally, as part of robustness checks I ran regressions based on the fixed effects effect model, the results are reported in table 7.9, since derivative usage was a dichotomous variable the methodology was not suited and hence the use of the 2SPLS methodology is the more suitable for this research. I also ran tests for the pre and post financial crisis time period and report the results in table 7.10. the results do not show a significant difference from our overall results suggesting robustness of our main model apart from the significant effect of derivative usage on stability of BHCs in table 7.6.

7.8 Summary and conclusions:

The most recent financial crisis set the stage for researchers and regulators alike to identify signs that a crisis may happen. In the aftermath of the sub-prime crisis, there was an intense focus on capital regulations as a mean to restrict banks from assuming higher risk. In this research, the effect of ownership structure and the use of derivatives on the stability of US BHCs was investigated. The sample period consisted of both pre-crisis period from 2004 to 2007 and post-crisis period from 2011 to 2016.

We found compelling evidence that the propensity to use derivatives decreases the insolvency risk of US BHCs. Our results for overall derivative usage and credit derivatives usage, in particular, support the hedging hypothesis that derivative is used as a means to mitigate risk and make US BHCs more stable. Meanwhile, the use of foreign exchange derivatives and

interest rate derivatives decrease the stability of US BHCs, in line with the substitution hypothesis whereby BHCs would use derivative trading as a means to increase their income streams. The estimation results also suggest that a higher level of institutional owners and family ownership categories were more likely to engage in derivatives as opposed to government ownership category.

In the context of stability and ownership structure, we find ownership plays a vital role in determining the stability of US BHCs. The empirical results suggest that higher levels of Institutional ownership (comprising of mutual fund, hedge/equity fund, government, corporations, real estate, structured fund and Union fund companies, trust and endowment companies) are associated with lower stability of the US BHCs due to the fact that institutional investors hold diversified investment portfolios and are concerned mainly about the expected return (Barry et al., 2011). Besides, the negative association can be attributed to the focus of these investors on short term returns and their ability to offload their positions quickly hence forcing the management to meet their expectations. We also found that higher levels of government ownership are associated with a higher risk aversion and greater stability. Our results also show that BHCs that were larger in size were less stable and maintaining higher capital ratios resulted in lower stability. Finally, BHCs larger in size are more likely to engage in derivatives than BHCs that are smaller in size.

The findings reported should pique interest of banking academics, investors, and policymakers. The past few decades have seen a rapid expansion in the size of the derivative markets globally. In order to transact in any derivative products, BHCs need not only substantial resources ranging from financial, human, to intellectual and capital resources, alongwith strong internal control systems. When used as an instrument for hedging, derivatives offer greater potential towards improving the stability and resilience of the financial markets. Derivative usage also provides an alternate source of income and provide an opportunity for BHCs diversify

their revenue streams. However, as a note of caution there is a need for regulatory scrutiny as well as greater transparency in reporting towards ensuring that these instruments do not jeopardize the financial stability. For the shareholders and investors investing in the BHCs, this study should be of interest as having stable BHCs would mean that the returns on their investment were safeguarded against excessive risk-taking behaviors. For banking academics, this study provides a future research area on whether there exists an optimal structure for ownership and since this research was based on US BHCs in a conventional and single country setting and it would be interesting to see whether the results will hold in the case of emerging economies and Islamic banks.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

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Since the sub-prime crisis of 2008 regulators and researchers alike have been looking for ways to identify a crisis before it happens, have come up with regulations to prevent it, and use stress testing to ensure how the new regulations would work.

At the macro level understanding the relationship between risk and stability when framing future regulations to check the risk-taking by banks is important since the regulations can only be effective when the regulator has an understanding of what these two variables represent and when taken in the context of ownership how they jointly affect efficiency and franchise value of financial institutions. The final section provides an overview of the major findings of this study and overall the results suggest that stability, bank risk, capital regulations and ownership jointly determine the efficiency and franchise value of US BHCs.

8.2 Conclusions

This thesis is based on a series of three essays and the first essay analyzes the impact of ownership structures on bank efficiency, the most interesting finding of this essay is that the market discipline imposed by higher proportion of institutional investors in the ownership structure of US BHCs especially those with asset management orientation improve efficiency of

US BHCs. The impact is more pronounced among those BHCs targeting for higher stability. Apart from ownership, stability was found to play a significant role in shaping the efficiency of BHCs. The results showed that while meeting the capital requirements US BHCs did not compromise their efficiency.

The findings from the second essay indicate the possible negative externalities of family owner-manager conflicts which can be restrained through higher levels of capitalization benefiting all the stakeholders through higher franchise values of BHCs. The results for institutional ownership show that while regulations are helpful in curbing excessive risk-taking and promote higher stability but cause a decrease in the franchise value of US BHCs. The lower franchise value would in turn encourage institutional shareholders to opt for riskier portfolios to generate higher returns and achieve higher franchise value but at the cost of increased instability and higher risk.

This recent financial crisis set the stage for researchers and regulators to identify signs that a crisis may happen with an intense focus on capital regulations as a mean to restrict banks from assuming higher risk. The results from the third essay indicate towards compelling evidence that the propensity to use derivatives increases stability of US BHCs. The results for overall derivative usage and credit derivatives usage, in particular, support the hedging hypothesis, while the use of interest rate derivatives and foreign exchange derivatives decrease the stability of US BHCs in line with the substitution hypothesis. The estimation results also suggest that a higher level of institutional owners and family ownership categories were more likely to engage in derivatives as opposed to government ownership category.

In the context of stability and ownership structure, it was found that ownership plays a vital role in the determination of the stability of US BHCs. The higher levels of Institutional ownership

of Asset management type are associated with lower stability of the US BHCs. Besides, the negative association can be attributed to the focus of these investors on short term returns and their ability to offload their positions quickly hence forcing the management to meet their expectations. Higher levels of government ownership are associated with a higher risk aversion and greater stability. The results also show that BHCs that were larger in size were less stable and maintaining higher capital ratios resulted in lower stability.

In conclusion, there is compelling evidence supporting the significance of ownership structures and stability on efficiency, franchise value of US BHCs and these results will help regulators, policy maker and shareholders in decisions regarding future policies for regulators and policy makers and investment strategies for the shareholders. Furthermore, ownership structure is found to play a significant role in the determination of stability of US BHCs and in their decision to transact derivatives. There are implications for the concerned parties, and these are discussed in section 8.3.

8.3 Implications of findings

The policy implications of this research are significant as is the threat to the fragility of overall banking system in the US as evidenced by the sub-prime mortgage crisis. It is important that a framework be devised for balance and control of ownership vis-à-vis stability and risk-taking. The findings of this thesis shed light on ownership structure, capital regulations and their effects on the stability, efficiency and franchise and decision to transact in derivatives. These findings also have significant implications for all stakeholders i.e. regulators, policy makers, and different categories of owners.

Regulators can also find these results valuable in understanding how the risk appetites of different shareholders affects the efficiency and franchise value of BHCs while framing regulations to check the risk-taking by banks. The regulators and policy makers would have to carefully design the regulations that not only protect the stability of financial system but provide enough incentives for shareholders in the form of ability to generate return on their investments. Regulators can also find these results valuable in understanding the risk appetites of family and institutional investors and their effects on franchise value of BHCs and can provide a course of action for the future whereby ownership structure can be taken into consideration while framing new regulatory measures. In general, the effect of ownership structure should be accounted for in all regulatory and policy matters not just for US BHCs but from all over the world.

For shareholders it will help in their investment decisions concerning shareholdings in US BHCs. The interest of the owners or shareholders is in maximizing their returns and an insight and understanding of how their decisions to maximize their returns would impact the efficiency and franchise value would be helpful in keeping the risk appetite of the BHCs in check.

The findings of the third essay would pique interest of banking academics with respect to the expanding derivatives markets and the current size of the derivative markets globally as compared to a decade ago. Transacting in any type of derivatives would involve BHCs to invest substantially in the financial, and human resource fields, alongwith intellectual capital resources, and would also mean developing stronger internal control systems. Finally, as instruments for hedging, derivatives have the capacity to improve the stability and resilience of the financial markets. Derivative usage also provides an alternate source of income and provide an opportunity for BHCs diversify their revenue streams.

However, on a note of caution, there appears to be a greater need for cautious regulatory oversight with more scrutiny and transparency in reporting to ensure that financial stability is not jeopardized by the use of these instruments. Furthermore, the decision to transact in derivatives as an alternate source of revenue came about because of shrinking profit margins of banks from higher capital regulations and stringent risk management policies. Therefore, the decision to use derivatives comes with its own vices and alongside ownership structures are found to be significant determinants of bank stability and risk.

In short, this thesis supports the notion that ownership structure, risk appetite, capital regulations, the propensity to use derivative instruments, efficiency and franchise value are all interconnected and deserve careful consideration by policy makers and regulators when framing future policies and regulations for the banking sector.

8.4 Limitations and possible future research directions.

The study used a comprehensive dynamic panel data with regards to financials and the combined dataset that included ownership structure consisted of 553 BHCs from the year 2004 to 2016. As with any research this research has its limitations, since this dataset is based on US BHCs only, in order for the results to be generalized we recommend that future research be conducted in a multi country setting. It would also be interesting to include banks and financial companies in the analysis to determine if the results hold for all types of banks and financial institutions.

Another related future research area for studies involving ownership structure and stability would be for emerging economies and Islamic banks. It would be an interesting exercise to check if the same results hold in the case of emerging economies and especially for Islamic

banks where the capital structure is different from conventional banks.

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