

THE PENNSYLVANIA STATE UNIVERSITY  
SCHREYER HONORS COLLEGE

DEPARTMENT OF ECONOMICS

WAR AND PEACE: INVESTMENT BANKS UNDER DODD-FRANK

WEI LUO  
SPRING 2014

A thesis  
submitted in partial fulfillment  
of the requirements  
for a baccalaureate degree  
in Economics  
with honors in Economics

Reviewed and approved\* by the following:

Stephen Yeaple  
Professor of Economics  
Thesis Supervisor

David Shapiro  
Professor of Economics  
Honors Adviser

\* Signatures are on file in the Schreyer Honors College.

## ABSTRACT

Going back to 2007, when the sudden meltdown of U.S. investment banks triggered the global financial crisis, the deregulation problem of the opaque industry was brought into the spotlight. As a compelling one of the solutions, the Dodd–Frank Wall Street Reform and Consumer Protection Act, commonly referred to as the Dodd-Frank Act, was created to change the financial landscape by improving banking supervision and regulation. Up to date, the Dodd-frank Act has been around for three years. Has it effectively prevented banks from gambling with depositors’ money? Have investment banks increased liquidity and decreased leverage? To answer the questions, this paper examines and compares the risk management of banks within three periods — before, during and after the 2007-2009 financial crisis. In order to study the changing business model and risk strategies of major investment banks, which result from the post-crisis financial reform, the research introduces two controlling groups, composed of middle sized U.S. banks and foreign-based global investment banks. Considering a fundamental goal of the Dodd-Frank Act is to watch and monitor the biggest investment banks in the United States, bringing an end to the “too-big-to-fail”, the contrast helps shed light upon the exclusive perspective of the Dodd-Frank Act.

## TABLE OF CONTENTS

List of Figures .....	iii
List of Tables .....	iv
Acknowledgements.....	v
Chapter 1 Introduction .....	1
Chapter 2 Literature Review .....	7
The Financial Crisis .....	7
Preliminary Implementation of Dodd-Frank .....	9
Effective Risk Measurement of Banks.....	12
Chapter 3 Model and Data .....	15
Introduction to Variables and Samples.....	15
Regression Design.....	20
Model Adjustment.....	23
Chapter 4 Results and Analysis .....	28
Implications of Regression Results .....	28
Comparisons across Industry .....	36
Chapter 5 Conclusion.....	42
Appendix A Table of Annual TCE/RWA of Banks.....	43
Appendix B Graph of TCE/RWA Comparison.....	44
Appendix C Change of Average TCE/RWA.....	45
Appendix D Annual P/E Ratios Comparison .....	46
Appendix E Variables Summary .....	47
Appendix F Regressiona Results Summary .....	48
BIBLIOGRAPHY .....	49

**LIST OF FIGURES**

Figure 3.1: Tier 1 Capital Ratio % .....	26
Figure 4.1: Regression Results of U.S. Big Banks .....	29
Figure 4.2: Regression Results of U.S. Mid-Sized Banks .....	32
Figure 4.3: Regression Results of Foreign-Based Banks.....	34
Figure 4.4: The Percentage of Derivatives in Total Asset .....	37
Figure 4.5: The MBS Ratio .....	38
Figure 4.6: Debt-to-Equity Ratio.....	39
Figure 4.7: Employee Compensation Policies.....	40

**LIST OF TABLES**

Table 3.1: Means and Standard Deviations of TCE/RWA .....	24
Table 4.1: Average P/E (TTM) Ratios .....	31

## ACKNOWLEDGEMENTS

I would like to thank my thesis supervisor, Prof. Stephen Yeaple, and my honors adviser, Prof. David Shapiro for their strong support and generous help throughout my thesis research. Special thanks to Prof. James Tybout who provided valuable advice and guidance to me as I worked on the project, and business liaison librarian Lauren Reiter, who kindly offered assistance in my data research. I would also love to express my gratitude for all the faculty and staff members in the Department of Economics, for their outstanding work to teach and help students gain the knowledge and skills that I have applied to this research. Finally, I'd like to extend my thanks to my family and friends for their love and encouragement throughout my entire academic career as well as this project.

## **Chapter 1**

### **Introduction**

The 21<sup>st</sup> century is a dramatic era of investment banking. Around the globe, we have seen the rise and fall of the investment banking industry, coinciding with the overall economy. Traditionally in the financial market, investment banks bridge corporations and other banks that seek capital resources with capital owners who pursue high returns on investment. By generating capital flows in the process, investment banks could benefit all three entities and improve the efficiency of the financial system. However, the financial crisis of 2007-2009 revealed the very dark side of investment banking and raised the question that whether investment banks are panning “gold” in the capital market, or digging a hole in the economy.

Despite the complexity and multiplicity of the formation of 2007-2009 financial crisis, it's largely agreed that the excessive risk speculation of shadow banking, or non-bank financial intermediaries operating in a deregulated financial market, was one of the root causes of the catastrophe. The enormous credit or debt market that was built in the hands of risk-taking investment bankers through speculative financial instruments, such as mortgage-backed security (MBS) and collateralized debt obligation (CDO), eventually pushed the shadow banking system to collapse. CDO, for instance, was designed to exploit the value of credit backed by subprime mortgages. Investment banks, by cutting CDO packages into three or more tranches with various risk exposures and selling them

to different buyers, made a fortune on investors who bought safe tranches for high yields, as well as unqualified borrowers who took the risky tranches for “free money”. The federal government, though being aware of the existing risk, did not realize its potential threat to the whole economy and encouraged the growth of the subprime mortgage market, in hopes of increasing the percentage of families owning homes (William Poole, 2009). As a consequence, when the unqualified borrowers failed to pay back the loans and defaulted, housing price dropped, leading more to default. The risk expanded to safer tranches and finally, the whole CDO package became an extremely risky bomb. As people stopped paying, the investment banks which were heavily involved in the trading of such financial instruments went into an explosion.

In response to the financial crisis, a series of financial reforms was carried out on the Wall Street by regulators. On July 21, 2010, President Obama signed the Wall Street Reform and Consumer Protection Act into law, now commonly referred to as the Dodd-Frank Act, after its chief sponsors Chris Dodd and Barney Frank (Maramba, 2013). The Act’s fundamental purpose was described as “to promote the financial stability of the United States” (McCoy, 2013). In summary, it aims to achieve the goal by creating consumer protection agencies, advancing regulatory framework, promoting transparency of banking management and managing the invention and transaction of “exotic” financial instruments. Unlike previous regulatory laws that outlined specific rules for banks and other financial institutions, such as the Federal Reserve Act of 1913 and the Glass Steagall Act of 1933. Dodd-Frank does not force financial entities to follow certain rules; rather, it serves as a general guideline for regulators to gain an insight into the banking

industry, in order to create appropriate rules to oversee financial institutions in the country (Maramba, 2013).

Consisting of a variety of provisions that address the most controversial issues in the banking industry, the Dodd-Frank Act is regarded as the most comprehensive and influential financial regulatory reform since the Great Depression. The Act attempts to bring significant changes to corporate governance in terms of banking activities, including securities, over-the-counter derivatives, speculative trading, private funds and compensation policies. In doing so, the Dodd-Frank Act created the Financial Stability Oversight Council (FSOC) to manage financial institutions in order to, like its name implies, maintain financial stability in the financial services market. The basis of FSOC aligns with the primary target of the Dodd-Frank Act to protect the rights and profits of consumers and clients of investment banks. Nevertheless, there are critics drawn on its feasibility that the prudential regulations and penalties of Dodd-Frank gives the council no control over the investment banking industry and thus would not succeed in preventing potential financial meltdowns or banking bailouts in the future.

On the contrary, facing these new rules and mostly restrictions, the bankers on the Wall Street have broadly shown disagreements and concerns that the Act would hinder banks from recovering and hurt the U.S. economy down the road by forcing the banks to be too conservative and risk-averse. It might be true as observed in major investment banks in the U.S. that there has been a trend of modest recovery in revenues and global development, after discernable modifications in banks' business models and trading portfolios.

The influence of the recent financial reforms remains unclear as the legislation process has not yet been finalized or fully implemented. In my research, I choose to use a sample of the biggest investment banks or banks with a substantial private investment sector to test the correlation between the risk strategies present in those banks and the five key changes made to the industry by the Dodd-Frank Act, which relate to mortgage backed securities, over-the-counter derivatives, Tier 1 capital requirement, speculative trading activities and compensation policies. Under Dodd-Frank, banks which tend to hide the risky investment in off-balance-sheet entities would have no room for opportunism because the changes, once put into effect on the Wall Street, would deliberately help the regulatory agencies recognize and handle the risk of banking management.

In an effort to define the practical impacts of the Dodd-Frank Act, this research firstly looks for an accurate methodology of risk measurement. Recent researchers have found TCE/RWA ratio, dividing tangible common equity by risk weighted assets, to be a credible measure of the risk and degree of financial distress banks bear during the crisis (Buehler, 2013). A brief explanation of why TCE/RWA ratio is currently seen as the most helpful ratio to evaluate banking risk is covered in the literature review. In this paper, the TCE/RWA ratio is a side indicator of banking risk, which tests the degree of risk-taking behaviors of banks. In the regression model, I use the Price/Earnings ratio trailing 12 months, quoted as P/E (TTM), as the dependent variable to represent the risk of the investment banking business. I run the regression on P/E ratio rather than TCE/RWA because the former explicitly shows the market expectation of a company's performance, which is based largely on its risk strategies.

In the literature review of Chapter 2, I discuss the background and information of the financial crisis, the preliminary implementation of the Dodd-Frank Act and previous research on banking risk evaluation in more details. Many of the research have inspired me to study the financial reform on banking regulation, by showing that the cost of a banking crisis has often been strikingly high to an economy. The 2007-2009 financial crisis was an evident warning to investment banks and the government that there is an urgent need for effective regulation to watch banking risk and reduce the distress banks endure under a financial crisis.

Chapter 3 is an introduction to the regression model and data. I mostly collected data from three sources: GuruFocus, a value investing company specialized in stocks tracking and screening with an A+ rating accredited by Better Business Bureau (BBB), Bank Reg Data, which consolidates data directly from the SEC calling reports, and the Wharton Data Services that covers data on and off the balance sheet of banks. In the chapter, I also explain my choices of the regression variables.

Chapter 4 presents the regression results and analysis of the research. I find that the Dodd-Frank Act has changed the risk management models of investment banks through more stringent regulations on securities, derivatives, speculative trading activities and capital requirements. In line with the principle of Dodd-Frank to prevent “too-big-to-fail” banks from failing the market, the regulatory reform has mainly influenced big banks rather than mid-sized banks. The foreign-based global investment banks, which were discovered to be much more risk-averse and careful in trading, on the other hand, have begun to carry more risk compared to the U.S. investment banks. It’s also

interesting to notice that on average, they have offered higher salaries and benefits to their U.S. full-time employees over the course of a decade.

## **Chapter 2**

### **Literature Review**

#### **Sub-Chapter 1: The Financial Crisis**

Data has shown that the seed of the financial crisis was sown early in 2004. Whereas, a clear signal of the banking meltdown and market deregulation didn't fully turn up until March 2008, when the government bailed out Bear Stearns, once the nation's fifth-largest investment bank.

Tracing back to 2005, when investment banks like Bear Stearns increased their risk exposure to gain greater returns and alleviate preceding losses (McCoy, 2013), a list of dangerous financial tools, especially mortgage-backed securities such as CDOs, had been bound to hurt the economy and consumers in the capital market. When those loans deteriorated, the value of billions of dollars immediately dropped. Bear Stearns was deeply involved in the trading of subprime mortgages, a type of risky lending to low-credit borrowers with relatively high interest rates. The subprime mortgage was invented to offer an opportunity to more borrowers for home purchase, but turned into a gamble of banks with their depositors' money for profits.

The deteriorated trading activities spread over the Wall Street as housing price remained strong in the following couple of years. Banks kept carrying more and more risk through subprime mortgages until the housing bubble burst in 2007. Bear Stearns promptly became unable to meet its obligations and suffered a huge loss. Seeing the tip of

the iceberg, the government then decided that Bear Stearns was too big to fail and compelled the fire sale of Bear Stearns to JP Morgan, allowing JP Morgan to absorb the good part of the business and get rid of the rest (Maramba, 2013). Despite of the Fed's effort to stabilize the market with a few adjustments of interest rates, investors still began to panic and pulled out their money.

The U.S. government was left with more bailouts to go. In September 2008, it placed the Federal Home Loan Mortgage Corporation (Freddie Mac) and the Federal National Mortgage Association (Fannie Mae) into conservatorship (Jost, 2012). The two U.S. government-sponsored enterprises had been highly leveraged, particularly during the housing boom from 2004 to 2006. The original plan of the U.S. government to increase American home ownership by investing in mortgages had grown into the climbing prices of housing in the hands of irrational buyers. In 2006 particularly, both Freddie Mac and Fannie Mae actively engaged in subprime mortgage loans to attract consumers who, in many cases, couldn't afford the houses, in order to increase their profits. They together lost \$30 billion in those risky investments, as well as the ability to perform in duties and were bailed out with \$400 billion later (Maramba, 2013).

In the same month, the Fed made another rough decision to let the fourth-largest investment bank Lehman Brothers fail, whose bankruptcy declaration made a tipping point of the global economy. As one of the major players in investment banking industry, Lehman Brothers' demise devastated the financial market. Consumer confidence and market expectation fell significantly. If the fire sale of Bear Stearns marked the beginning of credit squeeze, Lehman Brothers marked the beginning of credit frozen, as creditors all stopped lending and depositors lined up in banks to withdraw their money

(Brunnermeier, 2009). Investor revenues declined everywhere not only on the Wall Street but in the global financial market, as Lehman's "fiduciary presence had been ubiquitous in the larger market" (Maramba, 2013). All the shareholders and credit owners of Lehman's suffered a loss, including other major investment banks.

The credit frozen was followed by a severe economic downturn. Soon after the dysfunction of the credit market and failure of the government regulators, the money market experienced a freefall in stocks, housing and asset prices. Needless to say, the public felt an urgent need to improve the regulation of the financial market in the shocking year. With the backdrop of continuous institutional failings and insider crime, both of the government and financial leaders reached an agreement in 2009 and started working on the vital financial reform, which later gave birth to the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act.

## **Sub-Chapter 2: Preliminary Implementation of Dodd-Frank**

Financial reforms and crisis analysis have long been critical and popular topics of financial research, regardless of the opaque nature of the banking industry. Many researchers paid special attention to the risk management of eminent banks such as Goldman Sachs and JP Morgan Chase, which were fined billions of dollars for illegal trading and failure to provide valid information to regulatory agencies. Some financial factors, such as capitalizations, liquidity and bank reserves, have been frequently studied and a number of them have offered an insight into the causes of various banking crises.

However, as banks intentionally control the capital and liquidity ratios, knowing that the book values are being closely watched, it has been harder for regulators to really understand the risk by looking at the balance sheet.

The Dodd-Frank Act can serve as a concrete reference book for regulatory agencies to overcome the difficulty. Over 2,000 pages long, the Dodd-Frank Act focusses on four priorities: protecting consumers, promoting transparency of the over-the-counter (OTC) derivatives market, minimizing risk to the financial system and enhancing capital standards and regulation of big banks (KPMG, 2012). Since the Dodd-Frank Act was put into effect in 2010, the preliminary implementation has been slowly processed. According to Kevin McCoy (2013), 279 deadlines for finalized rules of the Dodd Frank Act, which contains roughly 1,500 provisions, including about 398 rule-making requirements, had passed as of June 3, 2013. Nearly 63% of those deadlines were missed, while just over 37% were met with finalized rules, according to the law firms. The update also shows that regulators haven't issued proposals for 64 of the 175 rules with missed deadlines. In general, half of the Act has been implemented, but the impacts of those provisions have not been clearly revealed.

The generic expectation of the financial reform under Dodd-Frank is mediocre. Economists believe that certain rules and provisions in the Dodd-Frank Act will urge the U.S. investment banks to modify their business models and risk management, and the influence may expand to non-US financial institutions (KPMG, 2012). To study the relationship between business models and criteria of risk assessment, Altunbas, Manganelli and Marques-Ibanezthey (2011) compare different banking models tied to significantly reduced risk and find that a strong deposit base and greater income

diversification account for most of the positive effect. On the contrary, institutions with higher risk exposure have less capital, larger size, greater reliance on short-term market funding, and aggressive credit growth. In this paper, capital reserve, banking size and trading activities are included in the regression model and the results jibe with their conclusion.

As a guideline to enhance the banking regulation, the Dodd-Frank Act is expected to be capable of altering the current “defected” business models of banks, which lacks stability and accountability, into a generally accepted, better-regulated and risk-friendly model. Dodd-Frank has shown clarity in the regulation or restriction on banking activities, given the example from the claim of Volcker Rule: “A banking entity may make and retain an investment in a fund that the banking entity organizes and offers; provided, that, it seeks unaffiliated investors for the fund; within one year of a fund’s start date, the banking entity’s investments shall not exceed more than 3% of the total ownership interests in such fund; and the aggregate of investments in all such funds does not exceed 3% of the banking entity’s Tier 1 capital” (Morrison & Foerster, 2010). The statement precisely defined the sort, range and amount of banks’ investment in a fund, which would effectively reduce the risk involved in banks’ funding structure. Other than funding structure, the capital structure, asset structure and income structure of banks are all addressed in the Dodd-Frank Act. Likewise, I include ratios that speak of all of the four financial structures.

Nonetheless, some banking professionals do not see the Dodd-Frank Act as a big game-changer. Oliver Wyman consultants Lester and Bovenzi (2010), for instance, states that it “will shift, but not fundamentally alter the industry’s economics”. A lower level of

legitimate leverage for most large institutions probably benefit consumers in the market, but the government certainly doesn't want to hurt the banking industry permanently. It's up to the policymakers that how long and to what extent many provisions of Dodd-Frank would take effect. Some major issues, such as the fate of Fannie Mae and Freddie Mac, are left to future lawmaking (Lester and Bovenzi, 2010).

Moreover, the influence of the Dodd-Frank Act on foreign banks that operate in the U.S. is ambiguous. The Dodd-Frank rules on capital apply to foreign lenders, but they have much more flexibility than domestic banks in terms of public filing and legal status. It's recently observed that Barclays and Deutsche Bank have changed the legal status of their American counterparts by moving units out of their holding companies to less intensely regulated structures so that they could remain untouched by parts of the Dodd-Frank (Peter Eavis, 2014). Otherwise, they would have to raise a large amount of capital to legally operate in the U.S. which means costly capital transfer from Europe.

### **Sub-Chapter 3: Effective Risk Measurement of Banks**

There are a wide variety of methods used by researchers to assess the risk of banks. Most of them have emphasized capitalization ratios, which mainly indicate the funding structure of banks. However, it's argued by Buehler, Mazingo and Samandari (2010) that the leverage ratios offered little help to measure the risk of banks. They look at financial support, systematic risk and Central Bank liquidity demand for risk assessment, and find weak correlation between those commonly-used capital ratios and

the bank risk variables. Whereas, there is one capital ratio — the ratio of tangible common equity (TCE) to risk-weighted assets (RWA) — that outperforms all others as a predictor of future bank distress. Consistent with the findings, Sonali Das and Amadou (2012) claims in their paper that banks with higher risk-weighted assets performed worse during the severe phase of the crisis, from July 2007 to September 2008, and a similar result is found in the European crisis. In measuring the risk embedded in banks' portfolios, the capital ratio of TCE/RWA seems to be the best.

More specifically, 33% of banks with a TCE/RWA ratio of less than 6.5% experienced financial distress when the crisis hit. The percentage of banking distress declined to 25% when the TCE/RWA ratio rose above 6.5% and below 7.5%. It was lowered again to 15% when the TCE/RWA ratio set between 7.5% and 10%. Banks with a TCE/RWA ratio greater than 10% stayed really strong in the financial crisis and experienced no obvious distress, which was defined into scenarios such as bankruptcy, merger under duress, government conservatorship and bailout (Buehler, Samandari and Mazingo, 2009). Generally speaking, the likelihood of banks getting into distress would reduce sharply as the TCE/RWA ratio rises above 10%, while below that level, banks would face a range of probabilities of getting into trouble.

While evaluating the data of risk measurement, researchers have utilized diverse angles. Acharya and Steffen (2013) look at the European banks and read the banking risk during the crisis period as a reflection of carry-trade behavior. They find that carry-trade behavior is stronger in the form of risk-taking by large, under-capitalized banks, with low Tier 1 capital ratios and high risk-weighted assets. PwC Consulting (2013) looks into swap or Security Based Swap (SBS) transactions before and during the financial crisis

and speaks highly of the Dodd-Frank's effort to strengthen the swap data reporting process of banks. They expect Dodd-Frank to provide regulators with more valid information on the trade and transactions of banks, which will be very helpful to prevent banks from taking too much risk at the expense of consumers' benefits.

Taking analogous research into account, this paper, rather than addressing reporting regulation and carry-trade prohibitions, mainly discusses the difference and changing business models of banks' risk management, in order to find statistical evidence to support the idea of the Dodd-Frank reform.

## **Chapter 3**

### **Model and Data**

#### **Sub-Chapter 1: Introduction to Variables and Samples**

As previously mentioned, my regression model is focused on six important variables or determinants of banks' risk management: the Price/Earnings ratio, mortgage-based securities ratio, debt to equity ratio, Tier 1 capital ratio, the percentage of derivatives in total assets and the employee compensations.

The Price/Earnings ratio, or P/E (TTM), calculated as the stock market price to the earnings per share over the past 12 months, is arguably the most widely used ratio in the valuation of stocks. The value of P/E (TTM) can be viewed as “the number of years it takes for the company to earn back the price you pay for the stock” (GuruFocus, 2014). For example, if Apple earns \$50 per share every year and you spent \$500 for a share, it will take 10 years for Apple to earn back the money you paid. When the company's earnings rise, the P/E ratio will decrease.

P/E ratio is highly valued because it comprehensively reflects market expectation and consumer confidence of a company. Stock price, as a forward-looking number, captures all the available information in an efficient market; while the earnings per share, as a back-looking number, honestly show the company's profitability and financial growth. They both greatly relate to the risk assessment of the company. If the market believes that the company is bearing too much risk, investors will discount the stream of

earnings, leading to a rise of the P/E ratio. Given the same example, as Apple is entering the low-price market, where it doesn't have a comparative advantage, the market concerns that Apple has made a risky move and thus discounts its earnings per share from \$50 to a lower value. The decrease of expected earnings would drive up the P/E ratio of Apple's stocks. Contrariwise, if the company is viewed as a prudential decision-maker, people tend to have more confidence in the stability of its future earnings, which will lower the P/E ratio by a greater percentage. Compared to capital ratios such as TCE/RWA, P/E ratio better signals the market risk a business faces and potentially explains its risk strategies, which is why I choose P/E ratio to be the dependent variable of the regression model.

The data of P/E ratio comes from GuruFocus, ranging from 2003 to 2013. It's worth mentioning that the some of the P/E ratios are 0, especially in 2008 and 2009. It may represent a negative P/E ratio. In fact, a P/E ratio can be negative mathematically, if the denominator earnings per share (EPS) is negative when a company is losing money. However, negative EPS are usually reported as "not applicable" for quarters in which a company reported a loss (GuruFocus, 2014). When a P/E ratio falls below zero, it's recorded as 0.

My independent variables are directly picked from the Dodd-Frank Act. The mortgage-backed security (MBS) is one of the center issues that the law deals with. A MBS is a pool of mortgages that can be securitized to multiple tranches by banks and sold to investors. Complicated MBS such as collateralized debt obligations (CDOs) and collateralized mortgage obligations (CMOs), once packaged as subprime loans, are very risky and dangerous investments. Subprime MBSs issued by investment banks are

seriously responsible for the 2007-2009 financial crisis. The Dodd-Frank Act states that up to 5% of credit risk is retained by the securitizer and the risk retention also applies to CDOs (Morrison & Foerster, 2010). It limits the proportion of CDOs and MBSs an investment bank is able to sell, especially the most risky tranches. To simplify the model, I use the MBS ratio, determined by dividing mortgage-based securities by the total securities, as a proper indicator of the banks' engagement in security trading and the capacity of managing the risk of MBS. There is no certain constraint or best level of the MBS ratio, though many suspect that a high MBS ratio implies extra credit risk in a bank's portfolios.

Debt to equity (DTE) ratio is a very familiar ratio used in financial analysis and forecast. It is calculated as total liabilities divided by total shareholders' equity. According to the Dodd-Frank Act, financial institutions with total consolidated assets equal to or greater than \$50 billion will be subject to a maximum debt-to-equity ratio of 15-to-1 (Morrison & Foerster, 2010). Such a capital requirement is necessary, considering how much excessive debt of a big bank can damage the credit market. Banks, as the most significant financial institutions in the modern society, have been endorsed with much elasticity in the choice of the mixture of debt and equity, which is matter of distribution between creditors and shareholders. Capital has a cost and the financial managers of a bank would certainly prefer the least expensive sources of capital, which, in many cases, come from debt. Given the example of Lehman Brothers, which needed to have a quarter of a trillion dollar worth of financial instruments to pay off its debt just before its bankruptcy, the lesson should be learnt that a balanced funding structure with a debt to equity ratio less than 15 is necessary to keep the market safe.

The Tier 1 capital ratio, denoted by CAP in the model, divides Tier 1 capital by total assets. The Volcker Rule of Dodd-Frank, which contains regulation of speculative trading activities, prohibits proprietary trading of a “banking entity”, and its investment funds cannot exceed 3% of the banking entity’s Tier 1 capital. Tier 1 capital is the core capital of a business, composed primarily of common stock and retained earnings. Compared to Tier 2 capital, which can hardly absorb any losses if the bank doesn’t stop trading, Tier 1 is more significant in terms of risk bearing (Buehler, 2010).

Derivatives may be the most opaque business of investment banking. It’s a conspicuous part of the Dodd-Frank Act, as the deregulation of over-the-counter derivatives, especially credit default swap is found to be a major cause of the 2007-2009 financial crisis. In Warren Buffett’s words, derivatives are “financial weapons of mass destruction” that derive from underlying assets such as a mortgage or credit card debt, and the market is enormous, roughly \$1.4 quadrillion (Summers, 2010). Title VII of Dodd-Frank Act exclusively addresses the regulation of derivatives, including the clearing and trading requirements, such as mandatory clearing and trade execution, and regulation of swap dealers and participants (Morrison & Foerster, 2010). In the regression model, I include a ratio dividing derivatives by total assets, represented by DER.

Compensation policy is another key issue of the financial crisis and is addressed in the Dodd-Frank Act. Concerns arose around the compensation rate or salary level of executives of the big banks, as well as the compensation for proxies. It’s generally seen by the public that the compensation expenses of banks are way too much than what is appropriate. To test the change of compensation rate of banks, I calculate the employee compensation as salary and benefits over the number of full-time employees. It’s referred

to as PAY in the regression equation. All the calculation methods, abbreviations, and implications related to the Dodd-Frank Act of these variables are summarized into a table included in the appendix.

The sample of banks consists of three groups: the largest U.S. investment banks, middle-sized U.S. banks and foreign-based global banks. The model will compare big banks with smaller banks to see if the Dodd-Frank financial reform has had different impacts on banks' risk management based on their sizes. Each group contains six banks. The big U.S. banks sampled Goldman Sachs, Citibank, JP Morgan & Chase, Bank of America Merrill Lynch, PNC bank and Wells Fargo. The six middle-sized U.S. banks are Huntington Bancshares, Northern Trust, Comerica, Stifel Bank & Trust, M&T Bank and KeyBank. Foreign-based investment banks are Bank of Montreal, Deutsche Bank, UBS Bank, BNP Paribas, HSBC Holdings and Toronto-Dominion Bank.

Some of the banks are not strictly investment banks, such as Wells Fargo and PNC bank, but they have substantial investment banking subsidiaries or services: Wells Fargo has Wachovia and PNC owns Harris Williams. Relatively speaking, banks within the same group all share similarities in total asset values, revenues and stock prices. So do the largest U.S. and foreign banks. In other words, they are competitors of each other.

The financial information and data of these banks are from the Bank Reg Data, a banking research service site that collates financial data from SEC reports, and Wharton Data Services, which provides the bank regulatory information from 1976 to 2013. All the data is updated quarterly. The annual data is calculated to be the average of quarter values, except P/E (TTM) that is built on EPS over the past year.

## Sub-Chapter 2: Regression Design

The evaluation of banking risk is based on the following equation:

$$\text{risk}_{i,t} (P/E_{i,t}) = \beta_0 + \beta_1 \text{der}_{i,t} + \beta_2 \text{ser}_{i,t} + \beta_3 \text{cap}_{i,t} + \beta_4 \text{dte}_{i,t} + \beta_5 \text{pay}_{i,t}$$

The dependent variable  $\text{risk}_{i,t}$  measured by the P/E ratio, represents the risk that bank  $i$  carries in period  $t$ , or better stated as the distress bank  $i$  would have experienced in period  $t$ . Recall that a banking distress is defined into scenarios such as bankruptcy, merger under duress, government conservatorship and bailout (Buehler, Samandari and Mazingo, 2009). There are three periods in the analysis: 0, 1 and 2. The crisis period 1 goes from 2007Q4 to 2009Q4. Pre-crisis period 0 is from 2004Q3 to 2007Q3, and post-crisis period 2 is from 2010Q1 to 2013Q4, as data allows.

Independent variables, as previously introduced, are MBS ratio, debt to equity ratio, Tier 1 capital ratio, percentage of derivatives and employee compensations. In the regression, the pre-crisis period 0 serves to understand the risk generated by banks before the crisis, and minimize short-term distortions in risk measurement. By combining the information from both of the pre-crisis period 0 and crisis period 1, we can examine whether some medium or long-term banking characteristics in the pre-crisis period can be systematically linked to the risk that “exploded” during the financial crisis. It draws a bigger picture on how and why the financial reform ought to take place in the post-crisis period 2, and whether the Dodd-Frank Act has helped to solve the risk management problems.

The regression model tests two hypotheses. First, with a 5% significance level, has the Dodd-Frank Act changed the degree of distress a bank would experience during a

financial crisis, which is denoted by *risk*? The null hypothesis implies that the five key factors of the Dodd-Frank make no significant difference in the banking industry. The testing of the first hypothesis is based on the numeric values and p-values of the coefficients of independent variables. In this research, the regression result itself is not the final illustration of Dodd-Frank's influence. It is the cross-group comparison of time trend that tell the story.

To eliminate some effects of exogenous variables such as other government policies or economic environment, I add a control group of foreign-based global banks to the regression. It can't completely remove the externalities, regarding that parts of the Dodd-Frank Act still apply to foreign banks. Compared to their American-owned peers, though, foreign-based banks are at least less influenced by the Act. Moreover, they were hit by the 2007-2009 financial crisis just as much and many of their U.S. units received support from the U.S. government as well. The test of the first hypothesis is the major concern of this research.

The second hypothesis examines whether the Dodd-Frank would have a more substantial influence on big banks than relatively smaller banks. When the Dodd-Frank Act was signed, it aimed to deal with the "too-big-to-fail" banks, which undoubtedly included the six largest U.S. banks in the sample. If the goal is to be achieved, we should observe greater improvement in those targeted big banks like JP Morgan and Citibank. The public worries that in reality, smaller banks are getting hurt as a side-effect, due to a slow recovery of the financial industry related to financial reforms. Four years after the Dodd-Frank, people need to see if the financial reforms like Dodd-Frank have been too costly for mid-sized and small-sized banks.

R-squared is another statistic that shows how effectively the five key factors of Dodd-Frank Act change the P/E ratio of banks. I expect the R-squared to be greater in pre-crisis period  $t$  and decrease in the following periods, because of the time trend impact. Specifically, the financial crisis and regulatory reforms have weakened the economy, causing the stock market to stumble. For this generic reason, the progress of banks cutting risky investments and accumulating capital is not timely or accurately shown by the change of stock prices. More or less, the correlations are undermined due to the financial crisis. Additionally, I expect that in the same period, the R-squared of big banks would be greater than that of small banks, since big banks are more involved in risky investments such as complex MBS and derivatives trading.

### Sub-Chapter 3: Model Adjustment

Other than the P/E ratio, I use TCE/RWA ratio as a side indicator of banking risk. As discussed in the literature review, the TCE/RWA ratio is viewed as a very efficient factor that captures the degree of stress a bank is likely to endure, or the probability of a bank asking for a government bailout in a financial crisis.

The tangible common equity (TCE), which excludes preferred equity and intangible assets, mainly consists of Tier 1 capital, for it enables the bank to eliminate payments or at least to defer payments in order to reduce the financial distress in cases of capital shortage (Buehler, Mazingo and Samandari, 2010). The calculation of TCE and TCE ratio varies. To simplify the model, I adopt a straightforward method from Wikipedia (2011):

$$\text{TCE} = \text{total equity} - \text{intangible assets} - \text{goodwill} - \text{preferred stock}$$

The denominator, RWA, is a concept of risk exposure based on off-balance sheet statistics and was suggested by the Basel committee as a preferred methodology for capital management. According to the Basel II Capital Accord (2006), “a bank’s total risk-weighted assets would be the sum of its credit risk-weighted assets and risk-weighted assets for operational risk, minus the sum of its excess eligible credit reserves”. For convenience, the model in this paper will not address the calculation of RWA, and the focus is to assess the risk for operation.

Table 3.1: Means and Standard Deviations of TCE/RWA

TCE/RWA	0 (2004Q3 - 2007Q3)		1 (2007Q4 - 2009Q4)		2 (2010Q1 - 2013Q4)	
	Mean	SD	Mean	SD	Mean	SD
<b>US BIG BANKS</b>						
1 Goldman Sachs	256.125	149.666	14.098	3.748	17.604	1.539
2 Citibank	7.872	0.721	10.212	3.233	15.593	0.943
3 Bank of America Merrill Lynch	7.763	0.272	7.747	0.860	11.420	1.201
4 JPMorgan Chase & Co.	7.059	0.154	7.798	0.581	9.420	0.744
5 PNC Bank	5.138	0.770	6.009	2.436	10.897	0.625
6 Wells Fargo	4.936	1.099	6.135	2.051	9.205	0.354
AVERAGE	48.149	25.447	8.667	2.152	12.357	0.901
<b>US MID-SIZED BANKS</b>						
1 Huntington Bancshares	4.552	0.241	5.125	0.932	8.887	1.139
2 Northern Trust	8.943	0.447	9.582	1.141	11.543	0.511
3 Comerica	7.635	0.466	7.406	0.682	9.804	0.269
4 Stifel Bank & Trust	17.618	4.071	14.325	3.249	12.277	1.918
5 M&T Bank	6.671	0.165	6.341	0.477	8.929	0.702
6 KeyBank	5.739	0.112	7.552	1.698	11.712	1.195
AVERAGE	8.526	0.917	8.389	1.363	10.525	0.956
<b>FOREIGN-BASED BANKS</b>						
1 Deutsche Bank	33.875	2.656	30.192	3.987	33.223	3.244
2 UBS Bank	21.015	3.290	14.693	1.239	15.383	0.694
3 Toronto-Dominion Bank	16.298	16.912	10.256	2.224	14.549	1.465
4 BNP Paribas	10.586	0.433	9.983	0.411	14.901	0.555
5 Bank of Montreal	8.809	0.256	10.114	0.704	16.637	1.578
6 HSBC Holdings	8.321	0.599	8.073	1.342	14.819	2.205
AVERAGE	16.484	4.024	13.885	1.651	18.252	1.624

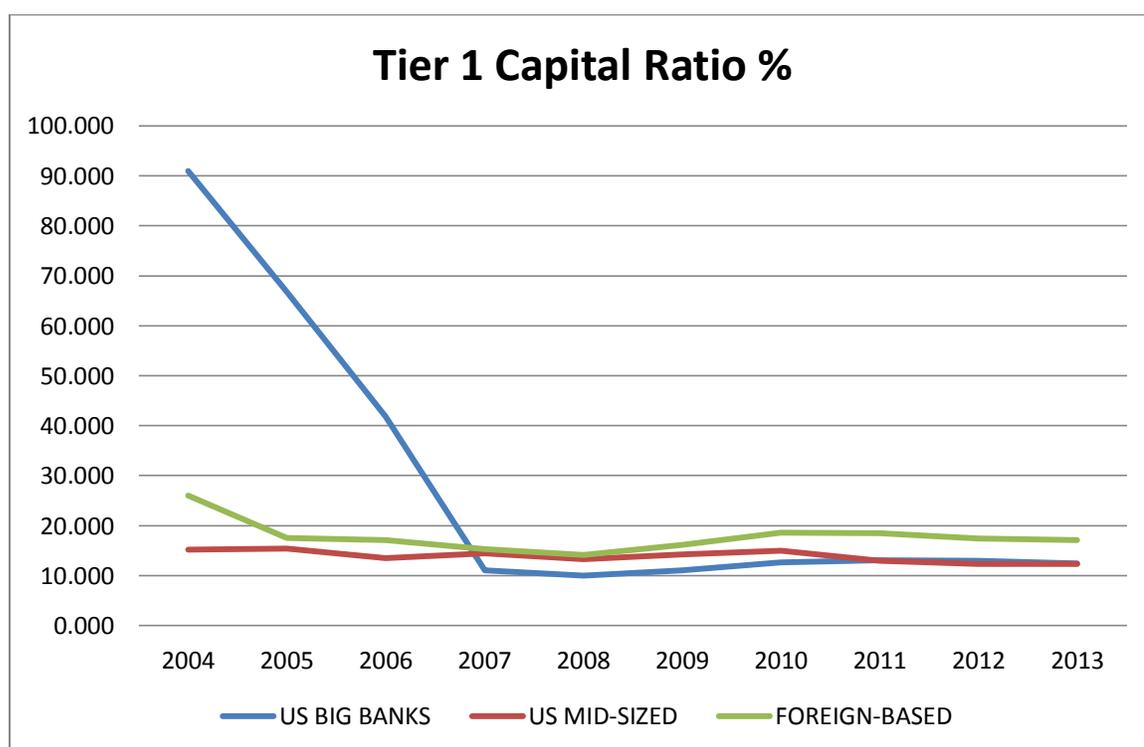
Table 3.1 shows the means and standard deviations of TCE/RWA ratios for all the sample banks. A graph of the means is also included in the appendix. It's clear to see that in the pre-crisis period, Goldman Sachs had a huge average TCE/RWA ratio of 256.125, even more than the value of all the other sample banks combined. Deutsche Bank is also robust in terms of capital adequacy with a TCE/RWA ratio of 33.875. Different from

Goldman Sachs, which dramatically increased investment spending and lowered its TCE/RWA ratio by 94.5% during the crisis, Deutsche Bank maintained a high TCE/RWA ratio in all three periods. The pattern can be observed in almost all of the six foreign-based large banks and the average TCE/RWA ratio in post-crisis period has risen above the pre-crisis level.

If the TCE/RWA truly is an insightful indicator of banking risk as many research have found it to be, the rising TCE/RWA ratios of foreign banks signal a healthy trend, especially for Deutsche Bank and Bank of Montreal. On the contrary, U.S. banks are generally keeping the TCE/RWA ratio low and reducing the volatility of its change, as seen in the dropping standard deviations. It's counterintuitive that before the crisis, banks such as PNC and Wells Fargo, which are more of commercial banks than investment banks, were taking more risk than Goldman Sachs and Citibank. It might be that commercial banks were less active in hiding their risk-taking investment through securitization. The risk assessment of Citibank is a bit surprising to me as I was expecting something worse. Citibank is known to have gone through a series of troubles during the financial crisis and received government bailout in November 2008, as a result of its defective mortgage purchase during the housing bubble. A possible explanation might be that the data, taken from the financial statements and reports of Citigroup, reflect the operation status of other sectors of the huge financial services corporation and the government rescue. Overall, banks are more risk-averse after the financial crisis, probably affected by the financial reform.

The risk associated with mortgage-backed securities, derivatives and the liabilities can also be examined separately from the P/E ratio or TCER/RWA ratio. Based on years,

banking groups, I filter the data by each independent variable in the regression model and create graphs to study the changing trend of the industry. The findings of the annual models demonstrate the development and variation of the market, by comparing the means of the three banking groups, and further explain the values of coefficients of independent variables in the regression.



**Figure 3.1: Tier 1 Capital Ratio %**

Figure 3.1 shows an example of the adjustment, which reveals the change of average Tier 1 capital ratios. The U.S. big banks, for instance, have shown a dramatic change in their Tier 1 capital ratios prior to the financial crisis. The underlying reason for the change lies in a single bank — Goldman Sachs. Its Tier 1 capital ratio dropped from over 500% in 2004 to about 24% in 2007. The extremely high Tier 1 capital ratios back

from 2004 to 2006 were closely related to Goldman Sachs' foresight in the CDO market. Goldman Sachs earned billions of dollars from 2004 to 2007 before the bubble burst, and it successfully anticipated the financial crisis, remaining relatively strong during period *I* (Summer, 2010).

Apart from the special case of Goldman Sachs, other U.S. large banks appear to have reasonable Tier 1 capital ratios. They more or less experienced capital shortage during the crisis and have been increasing capital reserves since 2010. The middle-sized banks seem to be well-managed with stable and consistent ratios well above 10%, having no problem to meet the capital requirement of the Dodd-Frank Act. The foreign banks are also unexpectedly well-capitalized. A possible explanation would be that under the financial reform, their U.S. counterparts have obtained special attention in the amount of reserves, which urged the banks to acquire additional capital.

## Chapter 4

### Results and Analysis

#### Sub-Chapter 1: Implications of Regression Results

The regression results of U.S. big banks are shown in Figure 4.1. Seen from the first regression of risk in period 0 (2004Q3-2007Q3), on a 5% significance level, only the p-value of percentage of derivatives (der0) is less than 0.05 and has a significant positive impact on the P/E ratio, which means that it drives up the risk of the banks. Consistent with the result, R-squared is low.

In the crisis period 1 (2007Q4-2009Q4), the p-values of MBS ratio (ser1), Tier 1 capital ratio (cap1) and debt to equity ratio (dte1) decrease while the p-values of percentage of derivatives (der1) and employee compensation rate (pay1) increase. Now only the debt to equity ratio rejects the null hypothesis and affects the P/E ratio negatively, implying that reasonable amount of leverage can increase the profitability of a bank. The coefficient of percentage of derivatives turns from positive to negative in this period. Recall the time trend impact that in a weak economy, the P/E ratio may drop regardless of an improvement in the business model of banks, though the integrated R-squared doesn't change much.

Finally in period 2 (2010Q1-2013Q4), all of the five key factors fail to reject the null hypothesis with p-values higher than 0.05. R-squared reduces substantially as no correlation is observed between the P/E ratio and five independent variables. The differences in three periods indicate that for the U.S. largest banks, Dodd-Frank has lessened the impacts of derivatives and

debt financing. That is, investment banks have largely reduced the amount of derivatives and debts after the crisis, probably turning towards a safer path to run the business. Certainly, the time trend impact should be considered as a reason for weak correlations too.

Source	SS	df	MS	Number of obs =	78
Model	105.078123	5	21.0156246	F( 5, 72) =	1.90
Residual	794.713073	72	11.0376816	Prob > F =	0.1042
				R-squared =	0.1168
				Adj R-squared =	0.0554
Total	899.791195	77	11.6855999	Root MSE =	3.3223

risk0	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ser0	.0095995	.0137954	0.70	0.489	-.0179012 .0371002
cap0	-.001739	.007699	-0.23	0.822	-.0170866 .0136086
dte0	-.1437484	.292642	-0.49	0.625	-.7271196 .4396227
der0	.0498645	.0228342	2.18	0.032	.0043454 .0953835
pay0	-.0000464	.0000493	-0.94	0.350	-.0001448 .0000519
_cons	13.78066	3.549275	3.88	0.000	6.705305 20.85601

Source	SS	df	MS	Number of obs =	54
Model	82943.3598	5	16588.672	F( 5, 48) =	1.38
Residual	577197.117	48	12024.9399	Prob > F =	0.2487
				R-squared =	0.1256
				Adj R-squared =	0.0346
Total	660140.476	53	12455.4807	Root MSE =	109.66

risk1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ser1	-1.629108	1.405968	-1.16	0.252	-4.455997 1.19778
cap1	-14.98279	12.47208	-1.20	0.236	-40.05958 10.094
dte1	-37.69129	16.03645	-2.35	0.023	-69.93473 -5.447844
der1	-.4988651	.3046875	-1.64	0.108	-1.11148 .1137502
pay1	.0010236	.0027813	0.37	0.714	-.0045685 .0066157
_cons	643.5787	341.0184	1.89	0.065	-42.0847 1329.242

Source	SS	df	MS			
Model	46522.6637	5	9304.53273	Number of obs =	96	
Residual	1842600.58	90	20473.3397	F( 5, 90) =	0.45	
Total	1889123.24	95	19885.5078	Prob > F =	0.8090	
				R-squared =	0.0246	
				Adj R-squared =	-0.0296	
				Root MSE =	143.09	

risk2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ser2	1.335424	.9510017	1.40	0.164	-.5539067	3.224755
cap2	14.57847	14.53418	1.00	0.319	-14.29621	43.45315
dte2	6.73565	14.04086	0.48	0.633	-21.15897	34.63027
der2	-.0004402	.1475581	-0.00	0.998	-.2935901	.2927097
pay2	.0000907	.0007233	0.13	0.901	-.0013462	.0015275
_cons	-278.7192	314.1292	-0.89	0.377	-902.7917	345.3532

Figure 4.1: Regression Results of U.S. Big Banks

Table 4.1 summarizes the average P/E (TTM) ratios of all the banks in three periods. The P/E ratios of U.S. large banks are found to be very high after the crisis. Looking at the annual trend of the data presented by a graph in Appendix C, we can see that in 2011, the average P/E ratio of U.S. large banks peaks above 200. Actually, it is not a common phenomenon shared by all big banks, but an abnormal rate completely caused by the collapse of Bank of America's stock. In December 2011, the stock price of Bank of America even fell below \$5 per share (Maureen Farrell, 2011). It was due to the fact that no one in the market believed in the announced asset value or capital reserve of the bank. Similarly, the other small rise in the P/E ratio appeared in 2009 was caused by Citibank, whose market expectation and consumer confidence hit the bottom in 2009 following its government bailout.

Table 4.1: Average P/E (TTM) Ratios

P/E (TTM)		0	1	2
		Mean	Mean	Mean
<b>US BIG BANKS</b>				
1	Goldman Sachs	12.38	11.31	13.43
2	Citibank	13.02	114.40	12.15
3	Bank of America Merrill Lynch	11.80	11.75	363.26
4	JPMorgan Chase & Co.	16.50	16.48	9.99
5	PNC Bank	12.78	15.66	10.57
6	Wells Fargo	14.96	21.95	11.41
	AVERAGE	13.57	31.92	70.13
<b>US MID-SIZED BANKS</b>				
1	Huntington Bancshares	13.57	10.56	16.88
2	Northern Trust	21.68	13.89	18.39
3	Comerica	12.69	8.45	23.42
4	Stifel Bank & Trust	20.34	25.53	49.16
5	M&T Bank	0.00	12.07	5.82
6	KeyBank	13.86	3.36	12.92
	AVERAGE	13.69	13.06	21.10
<b>FOREIGN-BASED BANKS</b>				
1	Deutsche Bank	15.92	4.54	57.72
2	UBS Bank	12.68	0.00	9.76
3	Toronto-Dominion Bank	14.41	14.25	13.00
4	BNP Paribas	7.46	9.82	9.22
5	Bank of Montreal	10.28	14.37	11.39
6	HSBC Holdings	14.93	20.95	11.24
	AVERAGE	12.61	10.65	18.72

Middle-sized banks have performed better than big banks in a sense of P/E ratio. Among the six sample banks, only Stifel Bank & Trust experienced a high P/E ratio over 100 in 2010, with a fall in its stock price. Foreign banks have been even stronger, except for a small rise in the P/E average in 2012 as a result of Deutsche Bank's short-term capital shortage during the summer (GuruFocus, 2014). Before the crisis, foreign banks generally had smaller P/E ratios than the U.S. banks; while after the crisis, both of the largest and middle-sized banks are doing

better in stocks. It's possible that under the Dodd-Frank Act, the accountability and trustworthiness of the U.S. banks are expected to increase in the market.

Source	SS	df	MS	Number of obs =	78
Model	1786.95118	5	357.390235	F( 5, 72) =	8.80
Residual	2923.57539	72	40.6052138	Prob > F =	0.0000
				R-squared =	0.3794
				Adj R-squared =	0.3363
Total	4710.52657	77	61.1756697	Root MSE =	6.3722

risk0	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ser0	-.0694206	.0281673	-2.46	0.016	-.1255712 -.0132701
cap0	.3656262	.3231097	1.13	0.262	-.2784812 1.009734
dte0	-.8144604	.3337043	-2.44	0.017	-1.479688 -.149233
der0	3.130199	1.989404	1.57	0.120	-.8356058 7.096004
pay0	-.0004279	.0002345	-1.82	0.072	-.0008953 .0000396
_cons	32.99786	9.387743	3.51	0.001	14.28373 51.71198

Source	SS	df	MS	Number of obs =	54
Model	1860.40856	5	372.081712	F( 5, 48) =	1.83
Residual	9746.19177	48	203.045662	Prob > F =	0.1243
				R-squared =	0.1603
				Adj R-squared =	0.0728
Total	11606.6003	53	218.992459	Root MSE =	14.249

risk1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ser1	-.2221894	.0925657	-2.40	0.020	-.4083052 -.0360737
cap1	-1.104651	.94065	-1.17	0.246	-2.995955 .7866523
dte1	-2.304882	1.299599	-1.77	0.082	-4.917902 .3081376
der1	-1.003163	4.68251	-0.21	0.831	-10.41798 8.411655
pay1	-.0000324	.0004525	-0.07	0.943	-.0009422 .0008774
_cons	65.37491	23.02516	2.84	0.007	19.07972 111.6701

Source	SS	df	MS			
Model	50829.8591	5	10165.9718	Number of obs =	96	
Residual	492660.231	90	5474.00256	F( 5, 90) =	1.86	
Total	543490.09	95	5720.94831	Prob > F =	0.1098	
				R-squared =	0.0935	
				Adj R-squared =	0.0432	
				Root MSE =	73.987	

risk2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ser2	.675294	.5788674	1.17	0.246	-.4747272	1.825315
cap2	6.767482	5.257082	1.29	0.201	-3.676629	17.21159
dte2	9.987304	6.899923	1.45	0.151	-3.720597	23.6952
der2	3.789427	11.81125	0.32	0.749	-19.67568	27.25453
pay2	-.0020068	.0017179	-1.17	0.246	-.0054197	.0014061
_cons	-149.8457	123.0729	-1.22	0.227	-394.3516	94.66011

Figure 4.2: Regression Results of U.S. Mid-Sized Banks

Figure 4.2 demonstrates the risk models of middle-sized U.S. banks. Back in period 0, securities and debt to equity ratio affect the P/E ratio negatively, meaning that effective securitization and debt financing benefit the banks. Recall that in the case of big banks, neither of the MBS ratio (ser0) nor the debt to equity ratio (dte0) is significant to move the P/E ratio around. It's sensible to think of the difference as a market opinion that the largest banks, like JP Morgan and Citibank, are indeed too big to fail. It seems acceptable for these banks to trade more securities or borrow more money, while the middle-sized banks shouldn't risk doing the same. The fact helps explain the regression result of the U.S. big banks, which shows that the debt to equity ratio becomes significant to influence the P/E ratio during the crisis. After the government let Lehman Brothers fail, the market froze and realized in a panic that government bailout was not guaranteed to these largest banks.

For middle-sized banks, the reasonable MBS ratios remain significant in reducing the banks' exposure to risk during the crisis. I will explain further later that there has been a rise in

the MBS ratio of smaller banks since the crisis, quite different from the big investment banks. R-squared drops nearly 60% from the pre-crisis period, and then hit the lowest in period 2, showing that no independent variable is significant in explaining the risk strategies. The time trend impact, again, plays an important role here. In general, the results are in line with the implication of Table 4.1 that the middle-sized U.S. banks have been more risk-averse since 2004. Among them, Northern Trust and Stifel Bank & Trust seem to be relatively more interested in risky investments, as inferred by high P/E ratios.

Figure 4.3 presents the regression results of foreign-based banks. Although not fully managed under the U.S. federal government, these banks are subject to some provisions of Dodd-Frank as long as they operate in the U.S. market. In all periods, the five key factors fail to interpret the P/E ratios of these global banks. The only exception is that, in period 1, derivatives account for considerable amount of risk exposure of the foreign banks, notably BNP Paribas and HSBC Holdings. HSBC Holdings, in particular, had a very large percentage of derivatives compared to other foreign investment banks, reaching approximately 27% in 2007.

Source	SS	df	MS	Number of obs = 78		
Model	91.7887297	5	18.3577459	F( 5, 72) =	1.14	
Residual	1161.63653	72	16.1338407	Prob > F =	0.3484	
Total	1253.42526	77	16.2782501	R-squared =	0.0732	
				Adj R-squared =	0.0089	
				Root MSE =	4.0167	

risk0	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ser0	.0125817	.0154933	0.81	0.419	-.0183037	.0434671
cap0	.0126484	.0608622	0.21	0.836	-.1086783	.133975
dte0	-.0905893	.1532475	-0.59	0.556	-.3960826	.214904
der0	.115331	.0666127	1.73	0.088	-.017459	.2481211
pay0	.0000153	.000048	0.32	0.750	-.0000803	.000111
_cons	9.654272	1.672839	5.77	0.000	6.319527	12.98902

Source	SS	df	MS			
Model	21775.2556	5	4355.05112	Number of obs =	54	
Residual	52652.1098	48	1096.91895	F( 5, 48) =	3.97	
				Prob > F =	0.0043	
				R-squared =	0.2926	
				Adj R-squared =	0.2189	
Total	74427.3654	53	1404.28991	Root MSE =	33.12	

risk1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ser1	-.1163458	.2031328	-0.57	0.569	-.5247716	.2920801
cap1	-1.943773	1.235022	-1.57	0.122	-4.426953	.5394056
dte1	-2.503524	1.793913	-1.40	0.169	-6.110428	1.103381
der1	2.323482	.7549823	3.08	0.003	.8054885	3.841476
pay1	.0006235	.0006376	0.98	0.333	-.0006585	.0019056
_cons	45.01119	18.99074	2.37	0.022	6.827754	83.19462

Source	SS	df	MS			
Model	19814.2513	5	3962.85026	Number of obs =	96	
Residual	177834.74	90	1975.94155	F( 5, 90) =	2.01	
				Prob > F =	0.0854	
				R-squared =	0.1002	
				Adj R-squared =	0.0503	
Total	197648.991	95	2080.5157	Root MSE =	44.452	

risk2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ser2	.0741667	.2411287	0.31	0.759	-.4048775	.5532108
cap2	-.7880402	1.616682	-0.49	0.627	-3.999862	2.423781
dte2	-1.645256	3.061055	-0.54	0.592	-7.726577	4.436064
der2	-.1558931	.8714312	-0.18	0.858	-1.887143	1.575357
pay2	.0008945	.0004717	1.90	0.061	-.0000426	.0018316
_cons	9.832026	37.61885	0.26	0.794	-64.90439	84.56844

Figure 4.3: Regression Results of Foreign-Based Banks

Soon after the crisis, the Dodd-Frank and other financial regulatory reforms shut down the derivatives market and the global banks have been recovering from the economic downturn. Opposite from the pattern that U.S. banks have shown, the foreign banks' R-squared increases in

the second period, possibly because they were not engaged in derivatives trading as intensely as the U.S. big banks.

As observed in different banking groups, the statistics of R-squared of the U.S. big banks are generally greater than those of the other two groups. It proves that first of all, the five key factors of the Dodd-Frank specifically deal with prominent risk-taking features of the U.S. largest banks, especially derivatives trading activities. Second, the regulation of the Dodd-Frank Act would have a more significant impact on the “too-big-to-fail”, like predicted in the second hypothesis. As they were considered to be too big to fail, the market was not alarmed by the rise of their MBS ratios or debt to equity ratios, which demonstrate the increasing amount of mortgage-backed securities and borrowing. Since the debt to equity ratio becomes significant during the crisis, we can assume that the market no longer believes in the “too-big-to-fail”. A brief summary of the regression results and conclusions is included in the appendix.

## **Sub-Chapter 2: Comparisons across Industry**

As mentioned in Chapter 3, I convert the data of the five key factors of Dodd-Frank into annual analyses of each bank and calculate the mean values of different banking groups. The trend analyses try to compare the impacts of the Dodd-Frank Act across the industry. Figure 3.1 of the Tier 1 capital ratios, as the first example, has depicted the idea, so that the further discussion in this chapter can be seen as an integrated analysis of all the sample banks.

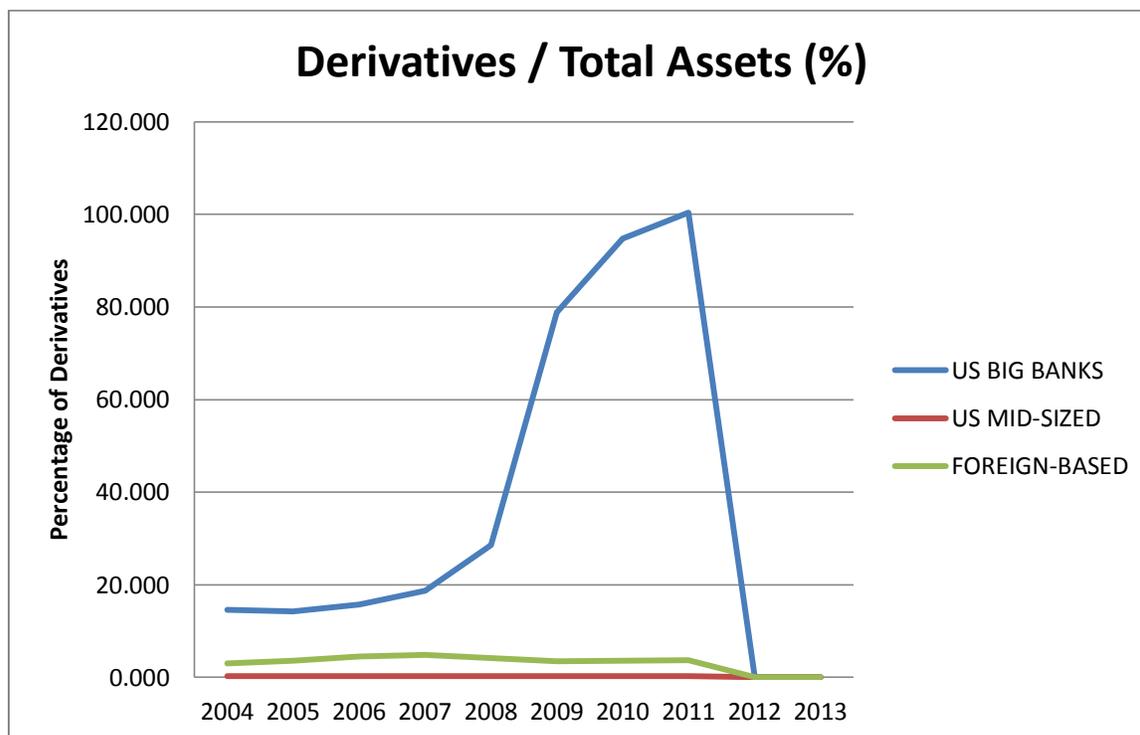


Figure 4.4: The Percentage of Derivatives in Total Assets

Figure 4.4 is a powerful figure that illustrates the effectiveness of Dodd-Frank, along with other regulatory reforms and the rise in public awareness of derivatives. Across the investment banking industry, banks erased derivatives entirely from their books. Imagine that \$1.4 quadrillion worth of business, carrying the highest level of risk, was successfully cleared after the financial crisis, the market obviously learnt the lesson. It's fair to say that the sharp decline of derivatives of the largest U.S. investment banks is correlated with the stringent ruling on derivatives of the Dodd-Frank Act.

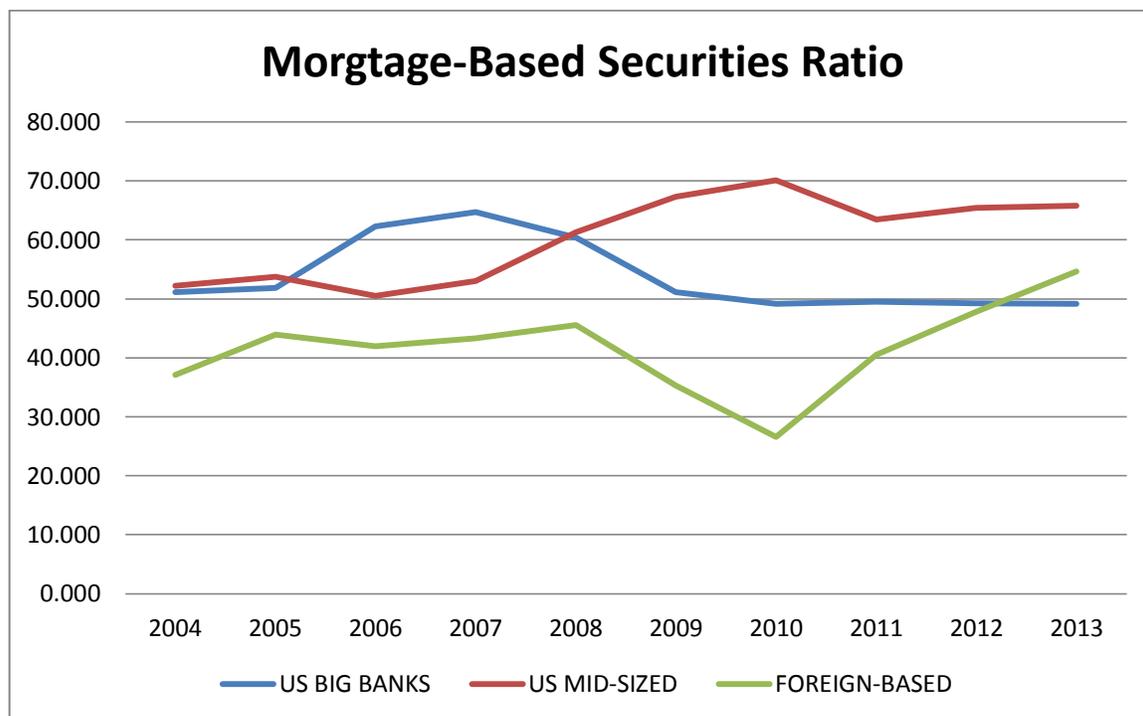


Figure 4.5: The MBS Ratio

Figure 4.5 shows that the middle-sized U.S. banks, on average, began to trade mortgage-backed securities more intensively than larger banks after the crisis. On the other hand, the foreign-based investment banks have been actively involved in security backing since 2011 and now own more mortgage-based securities than the big U.S. banks. In reverse, the U.S. big investment banks have cut their mortgage-based securities to approximately 50% of total securities and stand a lower MBS ratio than their competitors. Recall that the MBS ratios significantly influence the U.S. big banks' risk management in period  $0$  and  $1$ , the regulation of Dodd-Frank has been helpful in reshaping the business model of the largest U.S. investment banks, which again conforms the objective of the Dodd-Frank to influence the “too-big-to-fail” banks.

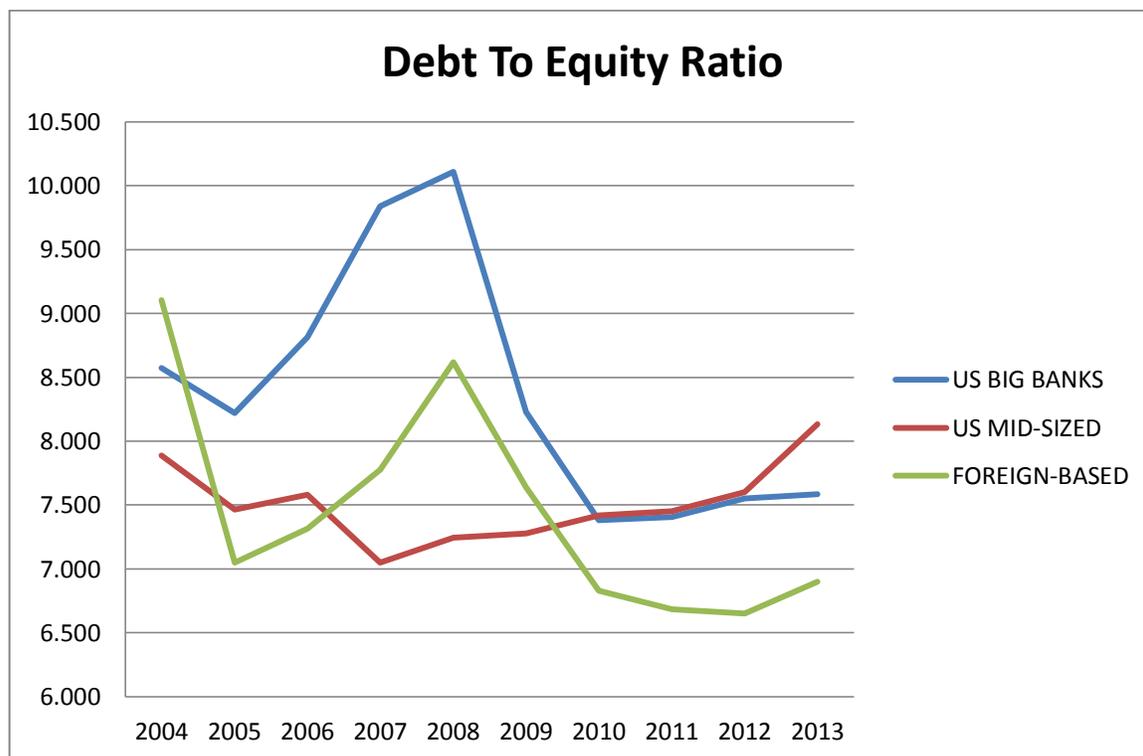
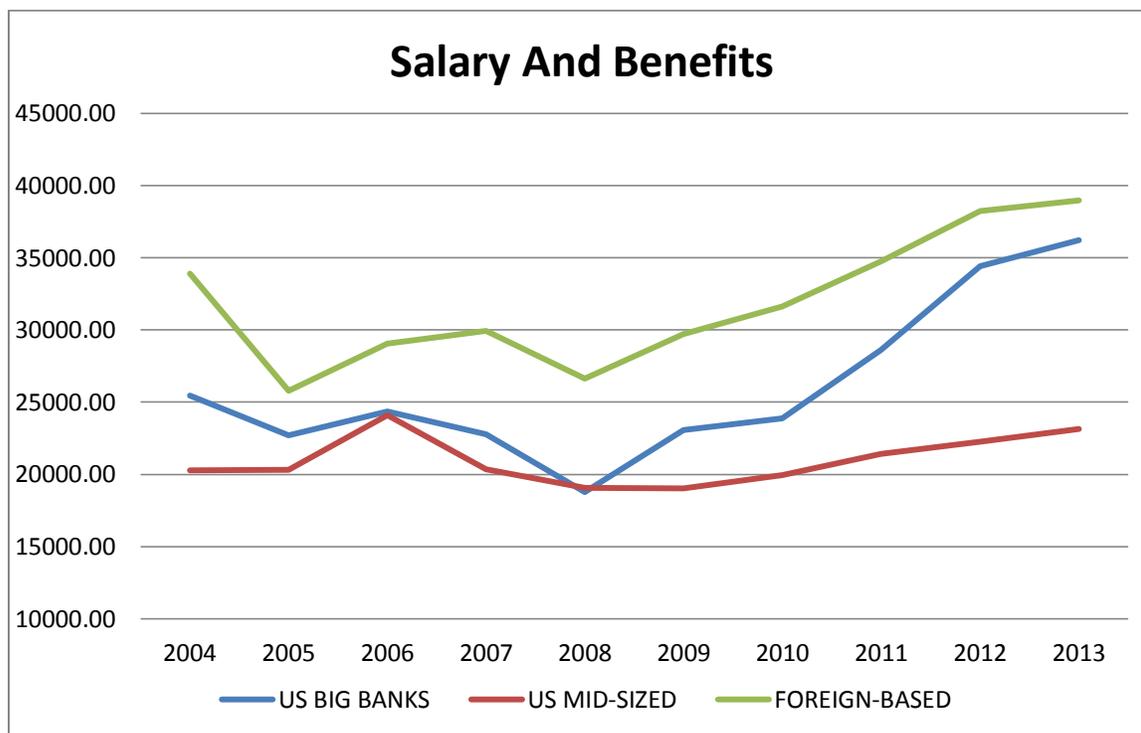


Figure 4.6: Debt-to-Equity Ratio

Figure 4.6 of debt-to-equity ratio is similar to that of the MBS ratio, as the industry trend shows the rising trend of middle-sized U.S. banks and reluctance of big U.S. banks to borrow. Foreign-based banks are generally less leveraged, partially because they have access to major funding resources from outside of the United States. One thing to point out in Figure 4.6 is that middle-sized U.S. banks follow a totally different trend from big banks. During the financial crisis when most big banks were very much in debt, middle-sized banks expressed little interest or need to borrow money, while in post-crisis period, they started to increase the debt-to-equity ratio and currently have an average of 8.13. The number still meets the capital requirement of the Dodd-Frank Act, since it requires financial institutions with total consolidated assets equal to or greater than \$50 billion maintain a maximum debt-to-equity ratio of 15-to-1 (Morrison & Foerster, 2010).



**Figure 4.7: Employee Compensation Policies**

Lingering concerns with executive compensation and proxy fees at giant companies in the U.S. are often heard in the economy. A famous example would be the employee bonus out of “Troubled Asset Relief Program” (TARP) funds of major investment banks in 2008. TARP was created by the government to enhance the financial strength of major banks for them to pass the financial crisis, whereas later it was found to be a bonus payment to banks’ employees. Andrew Cuomo, New York’s Attorney General, released a report in 2009, showing that more than 200 employees at Goldman Sachs and J.P. Morgan & Chase each received bonuses of \$3 million or more (Stephen Grocer, 2009). In 2011, a protest movement called “Occupy Wall Street” offered an insight of the inequality and dissatisfaction of the public towards the financial industry, and in the core of it, the richest investment bankers.

It's well acknowledged around the world that the U.S. investment banks give their employees great opportunities to gain wealth, while many would blame the investment banking industry for deepening the wealth gap in the U.S. society. As a result of the public attention, the Dodd-Frank Act specially addressed the compensation rates to ask banking companies and other financial institutions to change their compensation policies accordingly through its provisions. Yet, Figure 4.7 implies that the industry hasn't met the expectation to reduce the employee compensations, since all of the banks in the sample have been paying better salary and benefits to their full-time employees. From the numeric values, however, the salary and benefits seem to have been really low. The scale issue may be caused by some scale factors that cannot be identified by the regression. Another fact to consider would be that the number of full-time employees declined in many of the sample banks, such as Goldman Sachs. With a smaller total amount of compensation, the average salary and benefits have still risen for an individual worker. Interestingly, the middle-sized U.S. banks, despite of smaller business scales, could well compete with the biggest investment banks in the world in terms of compensation rates. In 2006, the average of their salary and benefits made an equal match to the U.S. giant banks.

## **Chapter 5**

### **Conclusion**

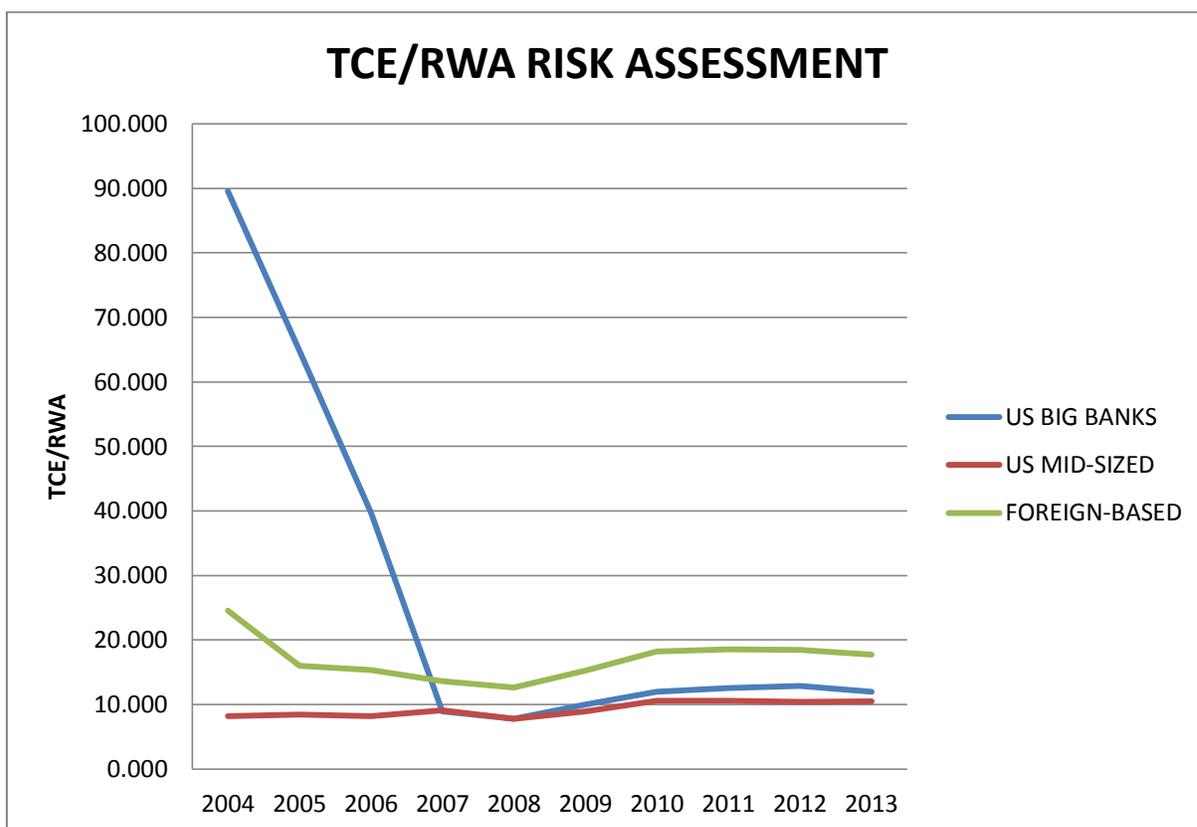
Nearly half of the regression results successfully reject the hypothesis that Dodd-Frank hasn't made any significant change in the risk management of investment banking. By changing trading activities, capital requirement, leverage and compensation policies, the regulatory structure of Dodd-Frank can productively reduce the financial distress of banks and the probability of bankruptcy, potentially preventing another financial crisis from happening. In addition, the Dodd-Frank Act has evidently had a greater impact on the largest U.S. banks, compared to middle-sized banks and foreign-based banks. In doing so, Dodd-Frank might be able to facilitate the balance and build win-win relationships between banks and consumers in the financial industry.

I also confirm results from previous studies that TCE/RWA ratio is an insightful measurement of banking risk, though there is a need for further studies on how to accurately define tangible common equity and how it should be calculated in such evaluations of risk. Last but not least, more research can be done to look into the specific investment banking management of each bank to examine the industry more thoroughly, by distinguishing the commercial banking sector from the investment banking sector.

## Appendix A

### Table of Annual TCE/RWA of Banks

TCE/RWA	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Goldman Sachs	500.709	355.251	206.301	23.275	15.850	13.094	17.895	18.637	18.564	15.320
Citibank	8.014	8.470	8.041	6.952	7.598	13.514	15.039	16.249	16.474	14.609
Bank of America	7.856	7.584	7.994	7.678	7.056	8.425	9.795	11.215	12.664	12.007
Merrill Lynch										
JPMorgan Chase & Co.	6.920	7.065	7.156	7.068	7.390	8.302	9.146	8.988	9.347	10.199
PNC Bank	6.861	5.192	4.500	4.841	4.019	8.406	10.820	11.324	11.189	10.255
Wells Fargo	6.792	5.529	4.238	3.997	4.576	8.137	8.929	9.105	9.174	9.614
<b>AVERAGE</b>	<b>89.525</b>	<b>64.848</b>	<b>39.705</b>	<b>8.969</b>	<b>7.748</b>	<b>9.980</b>	<b>11.937</b>	<b>12.586</b>	<b>12.902</b>	<b>12.001</b>
Huntington Bancshares	4.436	4.696	4.571	4.471	4.367	6.055	7.456	8.481	9.288	10.323
Northern Trust	9.604	8.616	8.990	8.705	8.834	10.629	11.891	11.740	11.366	11.174
Comerica	8.345	7.914	7.375	7.084	6.928	7.996	9.519	10.041	9.858	9.797
Stifel Bank & Trust	13.822	16.701	16.050	22.298	14.081	13.143	14.999	11.229	11.412	11.467
M&T Bank	6.870	6.795	6.681	6.327	6.073	6.720	8.121	8.783	8.940	9.873
KeyBank	6.027	5.732	5.673	5.731	6.364	9.192	11.627	13.266	11.492	10.462
<b>AVERAGE</b>	<b>8.184</b>	<b>8.409</b>	<b>8.224</b>	<b>9.103</b>	<b>7.775</b>	<b>8.956</b>	<b>10.602</b>	<b>10.590</b>	<b>10.393</b>	<b>10.516</b>
Deutsche Bank	33.728	34.818	35.640	29.106	27.239	33.862	36.339	34.005	30.051	32.498
UBS Bank	26.240	23.682	20.259	16.047	13.568	15.535	16.084	15.419	15.575	14.453
Toronto-Dominion Bank	58.099	9.766	9.271	9.471	8.393	12.161	15.673	15.577	14.560	12.387
BNP Paribas	11.118	10.665	10.321	10.460	9.693	10.203	14.193	15.189	15.365	14.855
Bank of Montreal	8.864	8.665	8.665	9.277	9.556	10.767	14.510	16.574	17.744	17.719
HSBC Holdings	9.414	8.584	8.083	7.526	7.263	9.200	12.463	14.503	17.718	14.591
<b>AVERAGE</b>	<b>24.577</b>	<b>16.030</b>	<b>15.373</b>	<b>13.648</b>	<b>12.619</b>	<b>15.288</b>	<b>18.210</b>	<b>18.545</b>	<b>18.502</b>	<b>17.750</b>

**Appendix B****Graph of TCE/RWA Comparison**

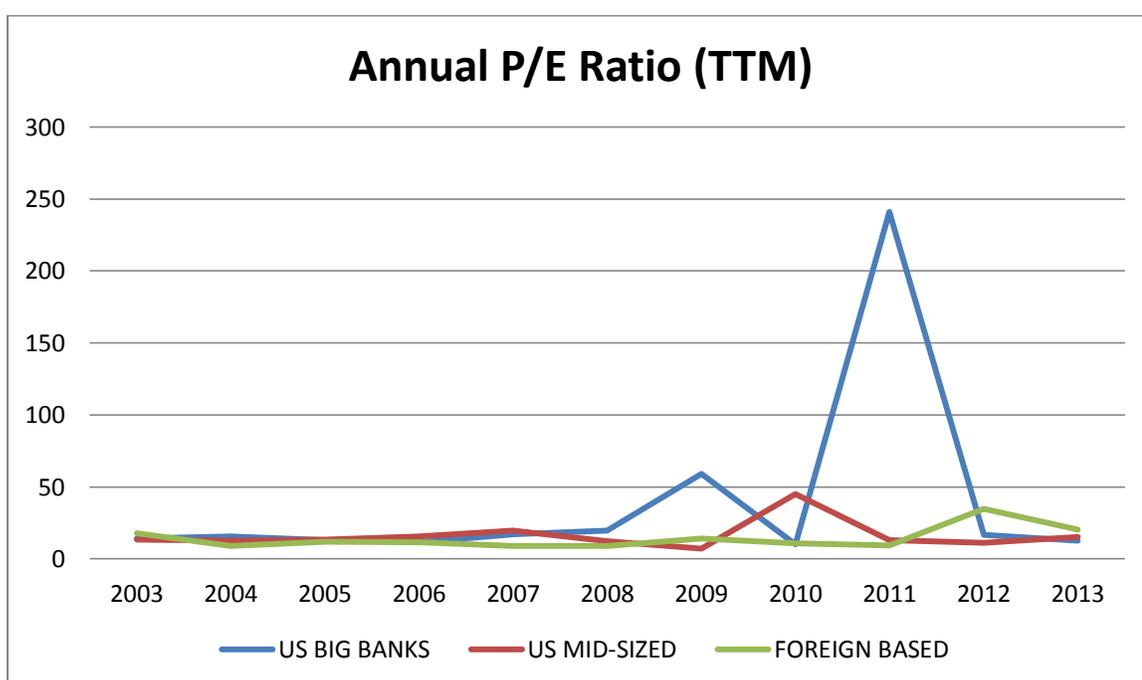
## Appendix C

### Change of Average TCE/RWA

TCE/RWA	0 (2004Q3 - 2007Q3)		t (2007Q4 - 2009Q4)		2 (2010Q1 - 2013Q4)	
	Mean	SD	Mean	SD	Mean	SD
<b>US BIG BANKS</b>						
1 Goldman Sachs	256.125	149.666	14.098	3.748	17.604	1.539
2 Citibank	7.872	0.721	10.212	3.233	15.593	0.943
3 Bank of America Merrill Lynch	7.763	0.272	7.747	0.860	11.420	1.201
4 JPMorgan Chase & Co.	7.059	0.154	7.798	0.581	9.420	0.744
5 PNC Bank	5.138	0.770	6.009	2.436	10.897	0.625
6 Wells Fargo	4.936	1.099	6.135	2.051	9.205	0.354
AVERAGE	48.149	25.447	8.667	2.152	12.357	0.901
<b>US MID-SIZED BANKS</b>						
1 Huntington Bancshares	4.552	0.241	5.125	0.932	8.887	1.139
2 Northern Trust	8.943	0.447	9.582	1.141	11.543	0.511
3 Comerica	7.635	0.466	7.406	0.682	9.804	0.269
4 Stifel Bank & Trust	17.618	4.071	14.325	3.249	12.277	1.918
5 M&T Bank	6.671	0.165	6.341	0.477	8.929	0.702
6 KeyBank	5.739	0.112	7.552	1.698	11.712	1.195
AVERAGE	8.526	0.917	8.389	1.363	10.525	0.956
<b>FOREIGN-BASED BANKS</b>						
1 Deutsche Bank	33.875	2.656	30.192	3.987	33.223	3.244
2 UBS Bank	21.015	3.290	14.693	1.239	15.383	0.694
3 Toronto-Dominion Bank	16.298	16.912	10.256	2.224	14.549	1.465
4 BNP Paribas	10.586	0.433	9.983	0.411	14.901	0.555
5 Bank of Montreal	8.809	0.256	10.114	0.704	16.637	1.578
6 HSBC Holdings	8.321	0.599	8.073	1.342	14.819	2.205
AVERAGE	16.484	4.024	13.885	1.651	18.252	1.624

## Appendix D

### Annual P/E Ratios Comparison



**Appendix E**  
**Variables Summary**

Name	Calculation
P/E (TTM)	<p>Stock market price / EPS over the past 12 months</p> <p>(Market expectation and consumer confidence Discounting earnings &amp; Risk)</p>
SER	<p>Mortgage-based securities / Total securities</p> <p>(Limits the proportion of CDOs and MBSs)</p>
DTE	<p>Total liabilities / Total shareholders' equity</p> <p>(Total consolidated assets <math>\geq</math> \$50B, DTE <math>\leq</math> 15)</p>
DER	<p>OTC Derivatives / Total assets</p> <p>(Market shut-down, \$1.4 quadrillion)</p>
CAP	<p>Tier 1 capital / Total assets</p> <p>(Volcker Rule: Investment funds <math>\leq</math> 3% Tier 1 capital)</p>
PAY	<p>Salary and benefits / # of full-time employees</p> <p>(TARP bonus)</p>

**Appendix F**  
**Regression Results Summary**

	<b>US BIG</b>	<b>US Mid-Sized</b>	<b>Foreign-Based</b>
0 (2004Q3- 2007Q3)	P (der0) = 0.032  $\beta = 0.05$	P (ser0) = 0.016  P (dte0) = 0.017  Both negative	Fail to reject H0
1 (2007Q4- 2009Q4)	P (dte1) = 0.023  $\beta = -37.7$	P (ser1) = 0.02  $\beta = -0.222$  $R^2 \downarrow$	P (der1) = 0.003  $\beta = 2.32$  $R^2 \uparrow$
	Time trend impact	Time trend impact	Time trend impact
2 (2010Q1- 2013Q4)	Fail to reject H0  $R^2 \downarrow$	Fail to reject H0  $R^2 \downarrow$	Fail to reject H0  $R^2 \downarrow$
Conclusion	Lessened impacts of derivatives and debt financing	Cross-Group comparison of acceptable risk finds less too-big-to-fail	Foreign banks were not engaged in derivatives trading as intensely

## BIBLIOGRAPHY

Bank Reg Data. Web. March 1, 2014. <<http://www.bankregdata.com/>>

Basel II Capital Accord. “Notice of Proposed Rulemaking (NPR)”. *The Federal Reserve Board*. September 5, 2006. Web. January 27, 2014.

<[http://www.federalreserve.gov/GeneralInfo/Basel2/NPR\\_20060905/NPR/section\\_5.htm](http://www.federalreserve.gov/GeneralInfo/Basel2/NPR_20060905/NPR/section_5.htm)>

*Company Filings*. U.S. Securities and Exchange Commission. Web.

<<http://www.sec.gov/edgar/searchedgar/companysearch.html>>

Dan Ryan, Alison Gilmore. “A Closer Look: The Dodd-Frank Wall Street Reform and Consumer Protection Act”. *PwC*. September 2013. Web. December 2, 2013.

<<http://www.pwc.com/us/en/financial-services/regulatory-services/publications/dodd-frank-closer-look.jhtml>>

GuruFocus. Web. March 27, 2014. <<http://www.gurufocus.com>>

INVESTOPEDIA Dictionary: Internal Growth Rate. *Investopedia.com*. Web. January 25.

<<http://www.investopedia.com/terms/i/internalgrowthrate.asp>>

INVESTOPEDIA Dictionary: Tier 1 Leverage Ratio. *Investopedia.com*. Web. January

23. <<http://www.investopedia.com/terms/t/tier-1-leverage-ratio.asp>>

John Lester, John Bovenzi. “The Dodd-Frank Act: What it Does, What it Means, and What Happens Next”. *Oliver Wyman*. 2010. Web. December 14, 2013.

<<http://www.oliverwyman.com/content/dam/oliver->

wyman/global/en/files/archive/2010/OW\_EN\_FS\_Publ\_2010\_The\_Dodd\_Frank\_Act.pdf>

Kathrina Maramba. “The Dodd-Frank Act, Farming Financial Reform”. American University Washington, DC. April 2012. Web. December 2, 2013.

<<http://www.american.edu/soc/communication/upload/Capstone-Maramba.pdf>>

Kevin S. Buehler, Christopher J. Mazingo, and Hamid H. Samandari. “A Better Way to Measure Bank Risk”. *Mckinsey.com*. April 2010. Web. October 31, 2013.

<[http://www.mckinsey.com/insights/financial\\_services/a\\_better\\_way\\_to\\_measure\\_bank\\_risk](http://www.mckinsey.com/insights/financial_services/a_better_way_to_measure_bank_risk)>

Kevin McCoy. “Dodd-Frank Act: After 3 Years, a Long To-Do List”. *USA Today*. September 12, 2013. Web. October 18, 2013.

<<http://www.usatoday.com/story/money/business/2013/06/03/dodd-frank-financial-reform-progress/2377603>>

Markus K. Brunnermeier. “Deciphering the Liquidity and Credit Crunch 2007–2008”. *Journal of Economic Perspectives*. Winter 2009. Print.

Maureen Farrell. “Bank of America stock closes below \$5”. *CNN Money*. December 19, 2011. Web. March 30, 2014.

<[http://money.cnn.com/2011/12/19/markets/banks\\_stocks\\_hit/](http://money.cnn.com/2011/12/19/markets/banks_stocks_hit/)>

Megan Murphy, Justin Baer, Francesco Guerrera, Patrick Jenkins, Jeremy Grant, Martin Arnold and Sam Jones. “How Investment Banks Shape Up after Crisis”.

*HappyWednesday.org*. December 21, 2010. Web. October 8, 2013.

<<http://happywednesday.org/portal/content/how-investment-banks-shape-after-crisis>>

- Morrison & Foerster. "The Dodd-Frank Act: A Cheat Sheet". 2010. Web. February 26, 2014. <<http://www.mofo.com/files/uploads/images/summarydoddfrankact.pdf>>
- Peter Eavis. "Exporting U.S. Rules for Foreign Banks". *The New York Times*. January 22, 2014. Print.
- Sonali Das and Amadou N.R. Sy. "How Risky Are Banks' Risk Weighted Assets? Evidence from the Financial Crisis". *International Monetary Fund*. January 2012. Web. January 30, 2014. <<http://www.imf.org/external/pubs/ft/wp/2012/wp1236.pdf>>
- Stefan Walter. "Financial Regulatory Reform – What it means for bank business models". *Ernst & Young*. November, 2012. Web. October 8, 2013. <[http://www.ey.com/Publication/vwLUAssets/Financial-Regulatory-Reform/\\$FILE/Financial-Regulatory-Reform\\_EK0113.pdf](http://www.ey.com/Publication/vwLUAssets/Financial-Regulatory-Reform/$FILE/Financial-Regulatory-Reform_EK0113.pdf)>
- Stephen Grocer. "Wall Street Compensation – No Clear Rhyme or Reason". *The Wall Street Journal*. July 30, 2009. Print.
- Viral V. Acharya, Sascha Steffen. "The 'Greatest' Carry Trade Ever? Understanding EuroZone Baviannk Risks". May 2013. Print.
- Wharton Data Services. "Bank Regulatory". *The Wharton School, University of Pennsylvania*. 1993-2013. Web. January 29, 2014. <<http://wrds-web.wharton.upenn.edu/wrds/ds/bank/index.cfm>>
- Yener Altunbas, Simone Manganelli and David Marques-Ibanez. "Bank Risk during the Financial Crisis – Do Business Models Matter?". *European Central Bank*. November 2011. Web. October 8, 2013. <<http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1394.pdf>>

## ACADEMIC VITA

Wei Luo  
1400 Martin Street APT 3073  
State College, PA 16803  
wol5109@psu.edu

---

### Education:

**The Pennsylvania State University, Schreyer Honors College**  
Bachelor of Science in Economics  
Class of May 2014  
Minor: Business / Liberal Arts, International Business

### Honors and Awards:

Schreyer Honors College  
Departmental Honors Program in Economics  
Deans' List: Fall 2011 – Fall 2013  
Phi Kappa Phi

### Activity / Experience:

Bates White Research Experience for Undergraduates  
Supervisor: Stephen Yeaple  
Fall 2013

Teaching Assistant  
Professor: Stephen Yeaple, Adrienne Kearney, Daniel Goldstein

2014 ARGUS University Challenge  
Professor: Richard Button

Schreyer Consulting Group, Nittany Consulting Group