Judging the contribution of the financial sector

Issues with FISIM, ROE and Tail-end risk of U.S. Commercial Banks

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Table of Contents

Certification

I certify that the contents of this thesis were conceived of and written by myself, and that the ideas contained herein are my own unless otherwise stated, in which case full credit is given to the authors and or source.

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Tables and Figures

Tables

Figures

List of Abbreviations

BEA	Bureau of Economic Analysis
ECB	European Central Bank
FDIC	Federal Deposit Insurance Corporation
FISIM	Financial Intermediation Services Indirectly Measured
FRB	Federal Reserve Board
GDP	Gross Domestic Product
GVA	Gross Value Added
ROA	Return on Assets
ROE	Return on Equity
RoRWA	Return on Risk Weighted Assets
RWA	Risk-weighted Assets
SEC	Securities and Exchange Commission
SNA	System of National Accounts
UK	United Kingdom
UN	United Nations
U.S.	United States

Executive summary

In this thesis I argue that while the financial sector has undergone major growth in the last 50 years, that at least recently this growth has been built on an increasing assumption of risk. In order to prove my argument I examined the problems associated with FISIM, ROE and the increase of tail-end risk assumption in the U.S. commercial banking sector. I first examined the problems associated with measuring implicitly charged services through FISIM. I found that adjusting loan-side FISIM to reflect risk led to a reduction, and that the choice of reference rate largely affects the outcome of the calculation of FISIM. Correspondingly, the lack of definition by regulators as to a proper reference rate, FISIM thus does not reflect a clear picture of finance in the economy. I next show that by breaking down the ROE of the U.S. commercial banking sector it can be seen that financial leverage may be responsible for the historically high RO; however further research is needed to confirm this assumption. I also examined the increase in both tail-end risk exposures as represented by derivatives, and the increase in competition among banks, two factors which have been shown to contribute to financial fragility, and thus may have contributed to the sub-prime crisis. Finally, I found that it might be possible to use a risk-reflected FISIM as a warning signal to show when banks are engaging in risky behavior, by not estimating the proper risk premium to cover risks. The implications of this last finding, while preliminary in nature still requiring much work to uncover its plausibility, but if verified could prove to be a tool for monitoring banks risk pricing abilities.

Chapter One
Introduction and Background

1.1 Introduction

The financial sector of the United States has been demonized in the last few years, in relation to the Sub-prime crisis and the global economic downturn. Many claim this crisis will rearrange the financial landscape of the world and we will see dramatic changes such as the revival of U.S. household savings and the end of risk modeling, as well some not so surprising side effects, such as an explosion of public debt and accelerating financial concentration (Kaufmann, 2009, p.221). While in general the underlying causes of financial crises may go back to the fundamentals of the capitalist system[1], many have laid the blame for the recent sub-prime crisis squarely on financial deregulation, financial innovations, excessive risk-taking and lending practices of financial intermediaries, as well as Greenspan and his lax monetary policy (Munchau 2010, pp. 7-44). By nature, the services provided by financial intermediation are based on assuming some degree of risk in order to make a profit, but there is a fine and not always identifiable line between appropriate risk and excessive risk. Of course ex-post, we can see that the financial intermediaries in the U.S may have engaged in excessive risk taking; we can be confident in saying this because after all there was a crisis. However, how can we judge the appropriate level of risk taking ex-ante or before the system is so taxed that is starts to unravel? In other words how can we distinguish positive growth in the financial sector and growth build on increasing levels of risk, in search of higher returns?

[1] Here I am referring to the financial fragility theories of Fisher, Minsky and Kindleberger.

This is an important and fundamental question to which there is no easy answer. However, this question needs to be answered if we are to reduce the frequency and damaging impacts of financial crises, and a better understanding of the measurements and performance ratios used to judge the state of the financial sector is a good place to start. Some questions which need to be examined are, first, what measurements are used to judge the output of the financial sector, and second, are these measurements giving us the whole story, or are they just obscure enough, intentionally or unintentionally, to give a false sense of security in the role of finance in the greater economy. It is in this direction that I have focused my research and I hope to give some light on these contemporary and important issues.

1.2 Background

The financial sector has rapidly grown in recent years, outpacing the larger economy as well as regulation. Although this is an international phenomenon, it is especially true for the U.S. and UK, both major financial centers, which saw rapid growth in the last few decades. In the U.S., the financial sector grew tremendously, from 2.32% of GDP (gross domestic product) in 1947, to 7.69% in 2005, and employee compensation in the financial sector grew concomitantly, from 2.76% to 7.65% for the same time period (Philippon 2007, p. 2). The story is the same in UK where GVA (gross value added) of the financial intermediation sector has grown faster than the economy as a whole by more than 2 percent per year, or more than double that of the economy as a whole (Haldane, Brennan and Madouros 2010, p. 4).

While there is much debate, there is no consensus as to the causes of this growth. Some have argued that the evolution and rise of corporate finance has spurred

the growth (Philippon 2007, pp. 3-4). Others argue that we have been witnesses to a financial revolution, claiming IT, financial innovations, and globalizations have spurred the growth (Gieve 2007, p.2). Still others have argued that the growth of the financial sector was merely an illusion or high returns built of greater assumption of risk (Haldane, Brennan and Madouros 2010). Despite the lack of consensus in the debate on the cause of growth, most agree that financial sector has undergone rapid growth and thus has become increasing important to the greater economy.

In the buildup to the sub-prime crisis, the perceived importance of the financial sector has seen a comparable growth. A Mckinsey report issued in 2007, just before the financial meltdown, signed by both U.S. Senator Charles Schumer and New York City Mayor Michael Bloomberg, sings the praises of the financial sector calling it vital to the heart of the economy. The report describes the financial sector as a large, fast growing industry, a major contributor to the tax base and a major source of quality jobs, accounting for 1 in every 19 jobs nationally. According to the report, financial services is the third largest sector of the U.S. economy, accounting for approximately 8% of GDP, and from 1995 to 2005 the industry grew at a compound annual growth rate of more than 5%. The report further emphasize the indirect input, or positive externalities of the financial sector, saying that well-regulated and efficient financial markets fuel growth by optimizing capital allocation, allow market participants to raise capital at lower costs, as well as enhance financial stability through better risk management and diversification, which lowers overall systemic risks (Mckinsey report 2007, pp.34-36). While some of the statements in this report, regarding enhanced financial stability and risk management of the financial sector, can be seen retrospectively as exaggerated or misguided, the report exemplifies the general pre-crisis view of the importance of the

financial sector to the economy.

However, as the sub-prime crisis took root, public opinion quickly turned a full 360 degrees and many started to question the role of financial sector growth in the crisis. This opinion can be seen in the popular media as well as in academia and professional circles. Michael Moore's movie *Capitalism*, captured, or may have formed, the public opinion about the evils of risk taking financial intermediaries, who were profiting tremendously at the expense of the working classes. While this movie has many flaws, grossly under researched and focuses rather one-sidedly on the bad side of finance, it had the effect of rallying Americans to demand some accountability in the financial sector.

Academia also has it views on financial sector growth. If financial fragility theorists are correct, then the booms and busts of the business cycle are just an inherent part of the capitalist system (Minsky 1977). By this argument, we can expect to see crisis after crisis due to the fragile nature of capitalist economies. However, even if we expect the next crisis, we may not be able to prevent it because no two crisis happen in exactly the same way; the nature, timing and fallout of each different. The sub-prime crisis is no exception to this rule. While the crisis itself was not so difficult to predict, because housing prices could not increase perpetually, the aftermath and its reach were harder to predict. The linkages between homeowner default and the destruction of the value of new exotic asset-backed instruments, as well as the inter-banking lending freeze, were not understood by many and thus hard to foresee (Ferguson 2008, p. 336).

With the collapse of the housing bubble the spread of the crisis across international markets, the implication of excessive growth in the financial sector and its real value started to be seriously questioned. Has this growth in the financial sector been

accompanied by a growth in the benefit to society, or has it only benefited those working in the top ranks of the sector? To put it another way, is the financial sector benefiting the economy and society, or is it benefiting from the economy and society? This is another important question to which there is no easy answer.

Any conversation relating to growth in the financial sector is not complete with discussing the role of regulation. Central to this is the question of how the financial sector was able to build upon so risky a base, despite heavy regulation including the implementation of the Basel II capital adequacy restrictions, without tipping off regulators or officials. While investment banks fall outside the framework of the Basel II, commercial banking is covered by it and followed it precisely. However despite following the strict 8% capital adequacy standard, many commercial banks were also increasing their off-sheet balance assets, some of which carry large tail-end risks, increasing their returns without exceeding the capital adequacy requirements.

1.2.1 Measuring output of the financial sector

Fundamental to understanding the growth in the finance sector is a solid understanding of how growth is measured. How can regulators be expected to manage the economy if the measurements are not giving them the whole picture, or even giving misleading information? If the measurements are not representing the full picture, than there are no preventative measures to reign in unhealthy growth in finance, and no forewarning of an impending crisis. This brings us to the discussion of how the contribution of finance is measured.

The standard method of measuring the output of a sector, and thus its contribution to the economy is GVA, which the UN (United Nations) SNA (System of

National Accounts) defines as, the value of output less the value of intermediate consumption (Value of output – value of intermediate consumption).[2] Through this basic measurement, the contribution of a sector of the economy to GDP can be seen. However, there are problems in applying this method to all sectors. In particular, for the financial sector, GVA does not represent its entire contribution to the economy. The argument has been developed that GVA is not the best way to estimate the contribution of the financial sector because it only measures the direct contribution to the economy and ignores indirect contributions, or implicit services, such as productivity growth through provisions of funds for start up businesses and new investment projects, which may be important contributors (Haldane, Brennan, Madouros 2010 p.3). To address the value added by the indirect contributions and implicit services provided by financial intermediaries, the SNA introduced FISIM (Financial Intermediation Services Indirectly Measured) in 1992, as a rough guideline, which when used in connection with GVA, in theory, better approximates the value of the output of the financial sector, and thus its contribution to GDP.

This new standard for measuring the output of the financial sector, using a combination of GVA and FISIM, in theory captures the value of both the explicit and implicit services provided by financial intermediation. GVA still measures explicit output, such as financial consulting, portfolio management, loan processing fees, etc, while FISIM measures implicit services, such as offering depositors a better rate than hording their cash at home, and providing funds to borrowers. Financial intermediaries provide a variety of services to depositors, borrowers and clients, and not all of these are explicitly charged for, but are embedded in the interest rate banks charge to borrowers

[2] UN System of National Accounts 1993

and paid to depositors.[3] For example, if a bank provides consulting services for an individual, they can charge a set fee for the services provided, and the banks profit is clear. But if that same individual also has deposits in the bank, or a loan from the bank, the bank is offering a different basket of services all together, implicit services, which are not directly charged. Finally by adding the output of both the implicit and explicit services rendered by the financial sector, as measured with the combination of GVA and FISIM, we can get the total value of the output of the financial sector to the economy.

1.2.2 Problems with the standard calculation of FISIM

While calculating GVA is straight forward, the calculation of FISIM is not as clear. As previously discussed, measuring the total value of the output of the financial sector is difficult because some of this output is not explicitly charged for, but imbedded in the interest spread charged to borrowers and paid to depositors. To see how FISIM captures this implicit value, I will briefly explain methods used to calculate it and some problems that arise in the calculations.

The simple definition of FISIM is provided by the SNA as, "The difference between the rate paid to banks by borrowers and a reference rate, plus the difference between the same reference rate and the rate actually paid to depositors".[4] Basically, FISIM measures the services provided by financial intermediaries in taking deposits and making loans.

The SNA defines four ways in which financial services are provided and charged for:[5]

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[3] These issues are discussed in detail in Haldane, Brennan and Madouros (2010).
[4] SNA Book section 6.163, page, 115.
[5] SNA Book section 6.160, page, 115.

1. Financial services provided in return for explicit charges

2. Financial services provided in association with interest charges on loans and deposits

3. Financial services associated with the acquisition and deposal of financial assets and liabilities in financial markets

4. Financial services associated with insurance and pension schemes

The first group, services provided in return for explicit charges, includes many of the services provided by financial institutions, including but not limited to, portfolio management, arranging mortgages, giving tax advice, and processing credit card payments for businesses. For these types of services, the service itself and the charges associated with the service are easily defined and computed. The second group, services provided in association with interest charges on loans and deposits, needs further explanation because these services are not so easy to identify. This group contains the services provided by traditional financial intermediation, which the SNA defines as the process by which a financial institution accepts deposits from a party wishing to receive interest on funds for which they have no immediate use for, and they then lend these funds to another party whose funds are insufficient to meet their immediate needs. In this function the financial institution supplies a link by which the first party can lend to the second and each of parties pay a fee to the financial institution for the service provided. The party, which lends the funds, accepts a rate of interest lower than the rate paid to the borrower, and the difference between these rates composes the combined fees implicitly charged by the financial institution to the depositor and borrower.[6]

Problems in calculating FISIM can arise in the selection of reference rate, as

[6] This paragraph is paraphrased from the SNA book section 6.163, page 115.

well as which loans and deposits to include in the calculation. In regard to the reference rate, the SNA specifies that the rate should be between the bank interest rates on Deposits and loans. Furthermore, because loans and deposits held in a bank are not necessarily equal, the reference rate cannot be a calculated as a simple average, but should be a rate which "contains no service charge and reflects the risks and maturity of the deposits and loans".[7] However, banks have many different categories of loans and deposits, all with different interest rates paid and received. Therefore the selection of a single reference rate to capture the total implicit output of a bank is bound to lead to misrepresentations (Eichmann 2010, Fixler and Zieschang 2010, Basu, Inklaar and Wang 2008, Colangelo and Mink 2010, Davies 2010). The SNA does not explicitly provide a reference rate in their guideline, but does suggest an inter-bank lending rate may be appropriate. On this point, regarding the choice of reference rate, there currently is much debate, which I will discuss at length in the literature review in chapter 2.

1.2.3 Adjusting FISIM to reflected risk

In addition to the selection of a reference rate, FISIM has other conceptual problems, including its inclusion of risk. Research in this area has grown in the last few years as the sub-prime crisis has brought to light some of the deficiencies of FISIM in measuring implicit output. Generally, these risk-adjusted FISIM theories center on the issue of how to extract the risks that are imbedded in the SNA method of calculating FISIM. These risks include mainly term premium and default risk on the loan-side of FISIM.

To explain how these risks affect FISIM, we have to look in more detail at its calculation. The SNA equation is as follows:

[7] SNA Book, section 6.166, page, 116.

Total implicit output = output of depositor's services + output of borrower's services

Output of depositor's services = (reference rate - average rate paid) x average liability balance

Output of borrower's services = (average rate received – reference rate) x average asset balance

Average rate paid = (interest expense / average liability balance)

Average rate received = (interest income / average asset balance)

Focusing on the loan side, both the term premium and default risks are supposed to be captured by subtracting the reference rate from the average rate received for the balance of loans held by a bank. However, by following the SNA guideline of using a reference rate which reflects a risk-free rate of borrowing, for example a U.S. Treasury bill as is used in the U.S., it's hard to see how this can properly reflect the risk premium. While the calculation of an average interest rate received will include to some degree the losses the bank has suffered in the past, it has no connection to present or future trends, thus further examination of the reference rate used in calculating the loan-side FISIM is warranted.

To summarize, the calculation of FISIM is fraught with problems, assumptions and ambiguities. The method for calculating FISIM as conceived of by the SNA, is more of a guideline, and not set in stone. The specific numbers used in the calculation are left to the individual country or institution. While its not my intention to criticize the SNA for their lack of definition in calculating FISIM; this is understandable given the problems associated with applying one method of measurement to many different countries, with their own unique economies. However, this same ambiguity surrounding the calculation of FISIM also in a way negates the very reasons for its creation. In other words, FISIM is supposed to enhance the measurement of the output of the financial sector by providing more information on the value of implicit services. However, with

the vagueness of calculation standards and the inherent conceptual problems in defining something as slippery as “the value of implicit services”, it is hard to see how FISIM can provide any useful and accurate information on the output of the financial sector.

This is the first main topic of my thesis, the problems associated with FISIM.

1.2.4 Balance sheet manipulation

The sub-prime crisis has brought out many questions surrounding the reportedly high returns in financial sector even while the system was breaking down. While measuring financial sector output through FISIM and GVA has its problems, so too does the way we judge its performance as represented by financial statements and performance ratios. These performance ratios such as ROE (Return on Equity), ROA (Return on Assets), and others give a picture of how the firm, or bank is profiting, however, these ratios are easily manipulated by increasing some kinds of risks and thus can cloud or misrepresent a firm or bank’s risk position and profitability.

Banks have many tools with which to manipulate their balance sheets. ROE can be artificially boosted simply by increasing leverage, or the amount of total assets to Tier 1 capital, which in effect makes the bank look more profitable, but the risks of insolvency can increase when riskier assets are included in the pool of total assets. This ties in with the kinds of assets banks have on and off their balance sheets. Increasing the percentage of assets which carry large tail-end risks is another method by which banks artificially boost performance. This technique involves stockpiling assets or financial products into the asset pool, which have above average returns, in exchange for assuming greater risks. This is fine if the risks do not materialize, but if the small chance

of risk comes to be reality then the banks will also loose above average losses. While these techniques increase ROE, some argue the increase is an illusion and can negatively affect systemic risk and the FISIM output (Haldane, Brennan and Madouros 2010, Ashcraft and Steindel 2008).

In the years leading up to the sub-prime crisis, the US commercial banking sector was reporting its highest ROE on record, hovering around 14% for the decade from 1994 to 2004, as shown in figure 1 below. As is now known, despite this record-high ROE, the financial system was is such a fragile state that when Lehman Brothers failed in 2008, the whole system started to unravel. Financial intermediaries, including commercial banks, manipulated their balance sheets chasing higher returns and an elevated ROE.

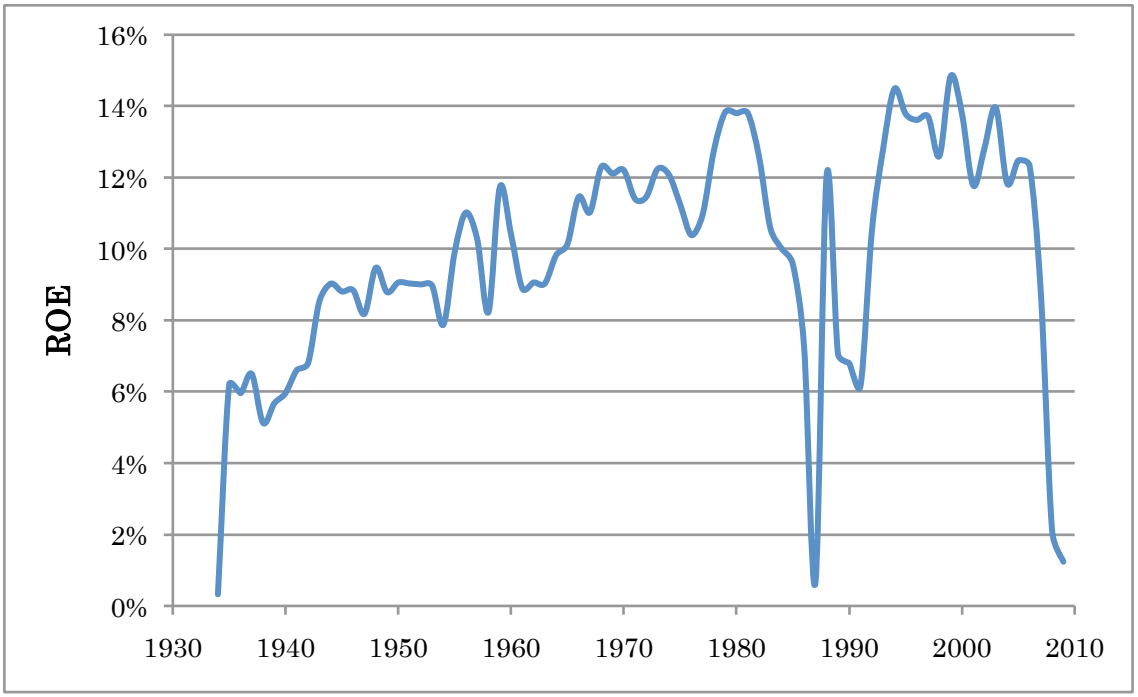

Figure 1 Return on Equity of U.S. commercial banks, 1934 to 2010
Source: FDIC and author's calculations

As shown in figure 1, the U.S. commercial banking sector repotted more or less

slow but steady increase in ROE from around 1935 until the early 1980's when the saving and loan crisis broke out, and many institutions failed. Then in the mid-1990's the ROE jumps to record heights, reaching around 15 percent in 1999.

Many researchers have tried to explain the source of these high ROE's in commercial banks. One argument is that the banking sector benefited from the Solow residual which refers to productivity gains achieved from increases in technology, in this case the IT revolution, which translated to an increase in output and ROE (Haldane, Brennan, and Madouros 2010, pp.10-12, Gieve 2010, pp.2-3). Another argument is that this increase in ROE was merely window-dressing, or balance sheet manipulation, in the form of increased financial leverage (Haldane, Brennan and Madouros 2010, pp.13-18, Ashcraft and Steindel 2008, pp.3). Still another argument is the claim that the increased ROE is a result of seeking higher returns through tail-end risky products and assets, included off-balance sheet financing techniques and increased bank involvement in the growing derivatives market (Haldane, Brennan, Madouros 2010). These issues will be further elaborated upon in the literature review.

This is the second main topic of my thesis, the factors affecting ROE for the U.S. commercial banking sector.

1.2.5 Tail-end risk, financial innovations and financial fragility

In the wake of the sub-prime crisis, questions have repeatedly been asked about the risks taken on by the financial sector, in particular investment banks. While the risks undertaken in relation to securitized sub-prime loans on the part of major investment banks such as Lehman Brothers, Goldman Sachs and others is well known, commercial

banks were also involved although to a lesser degree, in off-balance sheet financing, and some other structured financial products. In this sense, commercial banks started to resemble investment banks, or at least the lines separating the two kinds of institution were beginning to blur (Davis, 2009, p.36).

Despite the heavy regulation of U.S. markets and banks, including Basel accords, FDIC, FRB (Federal Reserve Board), and SEC (Securities and Exchange Commission) just to name a few of the regulatory agencies, commercial banks still found ways to increase their risk profile in search of returns. To this point Gorton argues that the sub-prime crisis has its roots in the transformation of the banking system centering around two changes, first the exponential growth in derivative securities, and the massive amounts of loans originated by banks into capital markets through securitization (Gorton 2010, p. 16). The U.S. commercial banking sector in particular has experienced a dramatic increase in the derivatives reported by the banks, as show in figure 2 below.

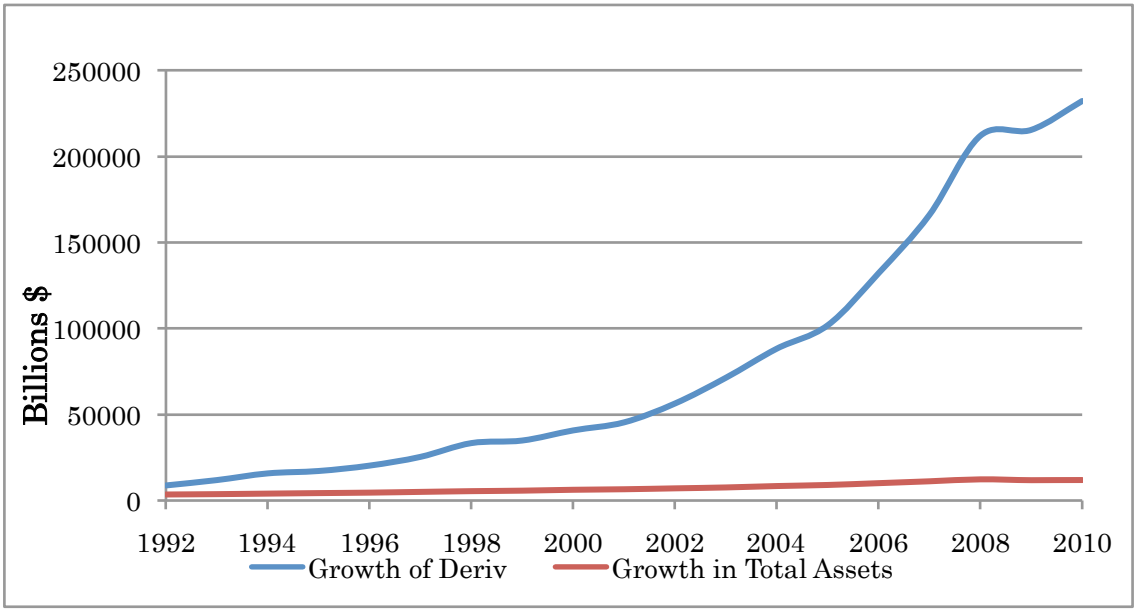

Figure 2 Derivatives and total assets reported by U.S. commercial banks, 1992 to 2010
Source: FDIC

This growth in derivatives reported by banking sector, has far outpaced the total assets reported on their balance sheets. In this sense, the difference between investment banks and commercial banks is reduced except for the fact that commercial banks are FDIC insured, meaning there depositors are guaranteed. The moral hazard implications are obvious, and this raises a question as to whether this gives commercial banks more freedom to chase tail-end risk, or does heavy regulations and capital adequacy keep these institutions is check? However, this last point is still controversial and beyond the scope of my research.

Increasing the amount of securitized loans and derivatives held by a bank has the effect of increasing the risk exposure, or at least moving the risk exposure to the tail-end of the risk spectrum. This makes a bank more susceptible to failure if something goes awry in the greater economy, and if enough banks are involved in this increase in risk exposure, the systemic fragility increases. According to the laws of normal distribution, the risks become greater the farther you stray from the mean. This implies that in general a risk-adverse individual will place a bet close to the middle of the spectrum, where returns are low-but-stable. Conversely the risk-seeking individual will place their bet away from the center, closer to the tail, where returns are higher, but the return is less certain.

The financial sector was placing their bets way at the tail-end of the risk spectrum en masse leading up to the sub-prime crisis. Banks were placing their bets on one of the many possible future states of the world being realized, that prices would keep going up. If this is realized, they earn above average returns in exchange for assuming greater risk. However, if one of the ugly states of the world is realized, say one in which a major institution like Lehman Brothers is allowed to fail by the

government, and homeowners default in mass, the banks may lose big. This is just what happened and presents the dangers of seeking phantom returns through balance sheet manipulation.

The implications of this increase in risk are that the system becomes more fragile and closer to crisis. When a bank deepens its risk exposure they become more vulnerable to insolvency if systemic shocks and adverse events in the greater economy occur. But an approximate level of risk, or borrower credit worthiness, can be difficult to judge in a state of "irrational exuberance"[8] where asset values are expected to keep rising, as was the case in the sub-prime crisis. As Lowenstein writes, before the crisis there was a general feeling that risk was outmoded, or no longer a threat (Lowenstein, 2010, p.296). Banks were taking larger risks, and the system was weakening.

As the sub-prime crisis unfolded, the number of bank failures saw a sharp increase. As shown in figure 3, the number of failed commercial banks first peaked in the late 1930's, and then remained relatively stable. In the 1980's the savings & loan crisis saw massive system-wide failure of banks, peaking at 534 in 1989. Then from 1997 to 2007 there was on average, 4 bank failures per year, but as the sub-prime crisis unfolded, again many banks begin to find themselves insolvent, and the number increases to 30 in 2008 and then skyrockets to 148 in 2009, and 154 in 2010.[9]

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[8] Alan Greenspan Speech given at the Annual Dinner and Francis Boyer Lecture of The American Enterprise Institute for Public Policy Research, Washington, D.C. December 5, 1996. Available at congresshttp://www.federalreserve.gov/boarddocs/speeches/1996/19961205.htm

[9] Source FDIC

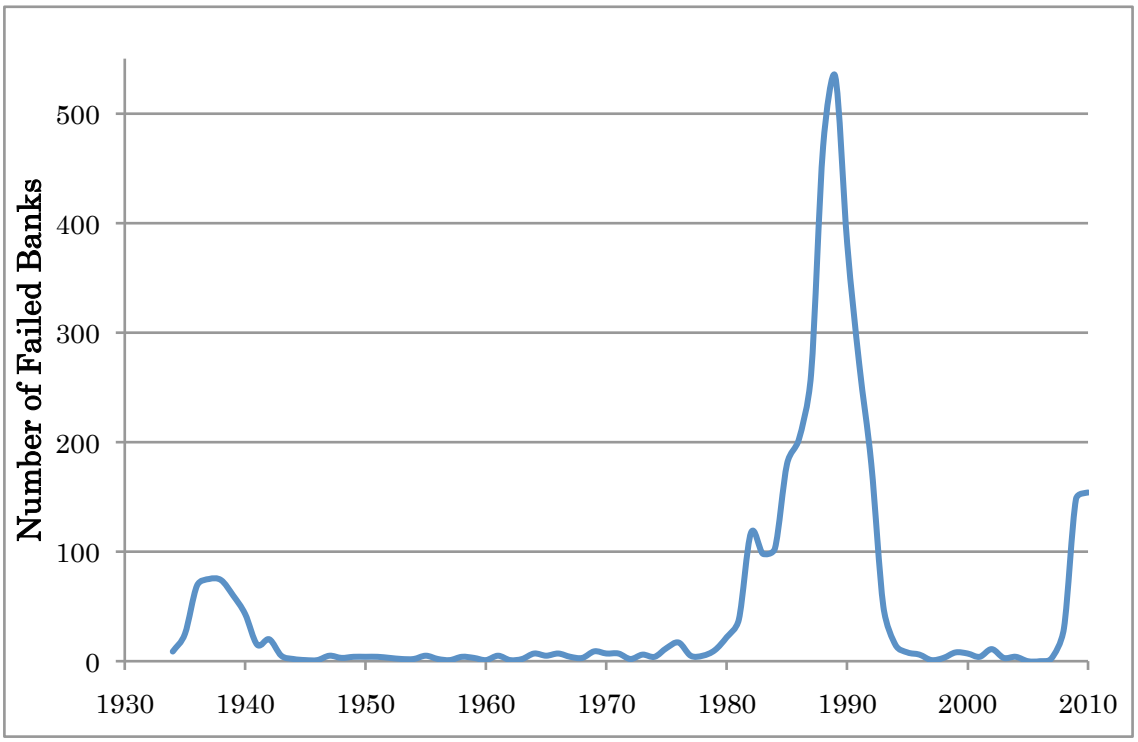

Figure 3 Number of failed U.S. commercial banks, 1930 to 2010
Source: FDIC

In the build-up to the sub-prime crisis there was an increase in the use of and involvement in new exotic products and derivatives among commercial banks. It has been argued that the nature of these financial innovations is extremely complicated and dangerous to investors and the economy as a whole, and yet, many professionals invested heavily in them without fully understanding them (Mauchau 2010, p. 43). What is the impact of poorly understood and widely used financial innovations, in increasing tail-end risk and financial fragility?

This is the third main topic of my thesis, the impact of the increase in tail-end risk of the U.S. commercial banking sector, as represented by derivatives.

In the literature review I will expand the discussion on some of the previously discussed issues and present many theories of how to adjust FISIM to address these deficiencies. I will also expand the issues surrounding performance measures and tail-end risk in the U.S. commercial banking sector. I will then apply four different methods by which the standard FISIM can be adjusted to reflect risk to approximate a risk-reflected measurement of the loan-side FISIM of the U.S. commercial banking sector. This, I hope will bring some of the problems associated with FISIM to light with a practical example, from which conclusions and recommendations can be made.

1.3 Research objectives and questions

The objectives of my research are:

1) To gain a deeper understanding of how FISIM functions to measure implicit services of the financial sector, and secondly to show how risk affects the calculation of FISIM with the case of the U.S. commercial banking sector. I hope to add to this body of research with my analysis of the loan-side FISIM of the U.S. commercial banking sector.
2) To examine the ROE of the U.S. commercial banking sector leading up to the sub-prime crisis, to discover what factors were responsible for the increasingly high ROE.
3) To look at the increase of tail-end risk in the U.S. commercial banking sector, and analyze its impact of financial fragility.

My research questions are as follows:

1) Are the implicit services provided by the commercial banking sector properly

reflected by the standard calculation of FISIM?

a) What is the impact of risk, in particular term premium and default risk, in the FISIM measurement?

2) What factors have the biggest influence in raising the ROE of the U.S. commercial banking sector?

3) What is the role of the growth in tail-end risk exposure, as represented by derivatives, in contributing to financial instability and the sub-prime crisis?

1.4 Outline of thesis

The remainder of the paper is organized as follows. Chapter two presents a literature review discussing the past research on FISIM, including benefits and drawbacks of FISIM, selected theories on adjusting FISIM to reflect risk, return-boosting balance sheet manipulation techniques and the growth in derivatives markets for the U.S. commercial banking sector. Following this I will present my hypothesis statement. Chapter three explains the models and methodology used in my analysis, which includes, 1) Calculating a standard FISIM of U.S. commercial banks following the SNA guidelines, 2) Calculating the FISIM of U.S. commercial banks using four different risk-reflected methods, 3) comparing the results of the standard and risk-reflected FISIM outcomes, 4) breaking down the ROE of U.S. commercial banks into separate components, 5) measuring the tail-end risk exposure of the U.S. commercial banking sector, as represented by derivatives. Chapter four presents the results and findings of the analysis. Chapter five discusses the results and findings and how they serve to support my hypotheses. Chapter six presents a summary, conclusions, the limitations of the research and recommendation for further research.

Chapter Two
Literature Review

Much research of late has been conducted on the nature of FISIM and the financial sector's contribution to the economy especially following the sub-prime crisis. For the purposes of my research, I surveyed literature surrounding three issues. First, issues with calculating the FISIM of the financial sector. Second, issues with manipulating ROE in the banking sector, including leverage and tail-end risk. Third, issues surrounding the effects of risk and financial innovations on financial stability.

The main argument of my research, that current conventions are misrepresenting the true nature of the financial sector, i.e. the problems associated with FISIM, ROE and tail-end risks, builds upon work done by Haldane, Brennan and Madouros in a 2010 paper titled, *The Contribution of the Financial Sector, Mirage or Miracle?* In this work, the authors present a series of facts to show that the real contribution of the financial sector to the UK economy is overstated. They argue that FISIM mismeasured banking output, and because it makes up a large percentage of the banking sector's value of gross output, this in turn overstates the contribution of Finance as a percentage of GDP. They conclude that better measurement practices of the financial sector need to be developed, including adjusting the risk aspect of FISM, in order to better understand the position of finance in the economy, and better distinguish real productive growth from growth based on risk seeking.

Another finding of Haldane, Brennan and Madouros (2010) has to do with the elevated ROE of the UK's banking sector before the crisis. They found that by breaking down the ROE of the banking sector it can be seen that financial leverage was largely responsible for the increase in ROE. They argue that because ROE was built on

leverage, it is merely the illusion of increases in performance.

My research will build upon these findings and apply them to U.S. commercial banks to examine how term premium and default risk effect the calculation of FISIM, examine the factors which fed ROE for the sector, and also examine the effects of increases in tail-end risk exposure

The arguments and findings of Haldane, Brennan and Madouros have drawn some criticism and counter-argument. Fixler and Zieschang (2010), claim that in examining whether FISIM overstates the contribution of financial services to the economy is not as simple as the authors make it out to be. They claim that, two parts are needed for this conclusion, the industry's share in GDP and growth in volume output. For the first part, they agree that there has been a substantial increase in the share of financial services in GDP. However, they question to what extend there has been a similar increases in the volume of output of financial services and related to this, whether there has been a large price inflation in indirectly measured financial services. They further argue that a distinction needs to be made between risk increasing sector-wide on one hand, and the price and volume decomposition of that risk. Basically, if risk is increasing, and the banks are increasing their rates to cover this risk, then the prices of financial services will increase, and thus overall output of financial services will concomitantly increase, but this increase is not an overestimation due to problems with FISIM, but merely banks adjusting their rates and process to cover the increase in risk. This point is a key counter argument to the findings of Haldane, Brennan and Madouros, and my analysis of the U.S. commercial banking sector's risk-reflected FISIM measurement, will serve to answer this debate, at least for the U.S commercial bank's case.

2.1 Pros and cons of FISIM

The introduction of FISIM was meant to address the need for measuring the value of financial services embedded in interest rate margins. While most agree that this as a step in the right direction the criticism of the standard practice of calculating FISIM is overwhelming.

A basic criticism of FISIM is that the calculations as well as the concept itself are overly difficult. Haldane, Brennan and Madouros (2010) argue that it is difficult to pin down the value of indirect services because of their vagueness; for example, do two loans for $50 each represent the same level of activity as one loan for $100? They further argue that because FISIM is measured using conventions, rather than actual data, the results can lose touch with reality. In line with this argument is the argument that FISIM does not measure the actual value of services because it relies on aggregate data. Berger (2010) claims that the calculation of FISIM would ideally require determination of a separate reference rate for each transaction, and the identification of borrowers and lenders, but because this is not achievable in practice, the compromises in measurement give rise to a set of problems.

Another major criticism of FISIM is the choice of reference rate used in the calculation. The SNA guidelines suggest the use of a single reference rate in calculating both loan-side and deposit-side FISIM, however, the use of a single reference rate is too simple to reflect the variety of loan and deposit services provided by banks, each carrying their own different maturities and risks (Basu, Inklaar and Wang 2008, Colangelo and Mink 2009, Hagino and Sonoda 2009).

Michael Davies (2009) criticizes the SNA methodology due to its tendency to sometimes give implausible results, which he claims stem in part from the choice of

reference rate. He provides some results of experiments done in Australia regarding reference rate selection in which he concluded:

1) A midpoint reference rate, between interest rate received and paid, gives less volatile results than an exogenous one, such as a U.S. treasury bill.
2) When using a midpoint reference rate, a close match between assets and liabilities used in calculating FISIM gives a better result.
3) The closer assets and liabilities are to equality, the better the result.

The finding of Davies, go against the SNA methodology as well as many of the risk-adjusted theories discussed later in this chapter, which all use exogenous reference rates as opposed to a midpoint rate as Davies proposed.

Still another criticism of FISIM is that the current practice does not exclude risk from the measurement. This is a problem because if the risks in the financial sector are unusually high, this will tend to exaggerate the outcome (Haldane, Brenan and Madouros 2010, Davies 2009, Colangelo and Mink 2009, Eichmann 2009, Basu, Inklaar and Wang 2008). The general suggestion is to eliminate the risk element from the measurement of FISIM, but there is no consensus on an appropriate method for doing this. I will discuss the various methods proposed in the next section.

2.2 Methods of adjusting FISIM to reflect risk

The many theories on how to adjust FISIM to reflect risk are varied, however they generally center on the issue of extracting the risk component from the measurement. The risk component is mainly concerned with the term premium and credit default risks. These risks are concentrated on the loan side, thus this is where most of the criticism focuses. The following example illustrates how these problems arise,

"Suppose two similar firms need to borrow money. The first issues a debt security and pays the market rate, which includes the term premium and default risk premium. The second borrows from a bank and pays interest rate charged by the bank. Current FISIM assumes the second corporation will only pay the risk-free rate, federal funds rate in the U.S. approach, and the remainder of the payment is considered as bank output. While both firms face similar costs of funds, only the payment above risk-free rate paid by the second firm is considered in the implicit financial services output" (Colangelo and Mink 2010, p.340).

Davies (2009) also illustrated this point with a breakdown of the interest component FISIM as conceived by the SNA and ECB (European Central Bank), as shown in figure 4 bellow.

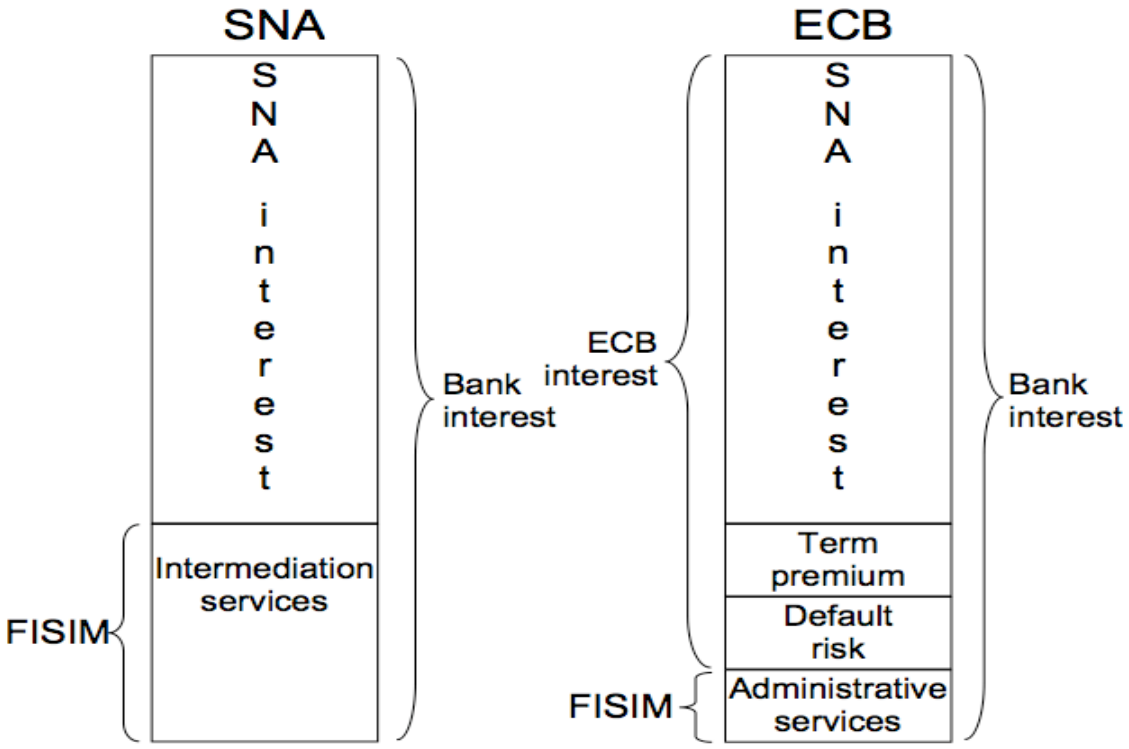

Figure 4 Bank interest on loans
Source: Davies (2009)

He shows that in the ECB conception, term premium and default risk are included in the interest component rather that the services component. The justification he gives is that the term premium and default risk are components of interest faced by lenders and borrowers other than those who lend and borrow from the financial intermediaries, and thus should be excluded from FISIM measurement (Davies 2009, p.354).

However there is not universal agreement that these risks should be excluded from FISIM. Fixler and Zieschang (2010) claim that while FISIM is not accurate in estimating the implicit output, evidence for removing the risk premium from FISIM is weak at best.

Wolfgang Eichmann (2009) also questions both the 1993 SNA definitions of the components of interest rate, and the way FISIM is defined and measured in practice by the ECB. He argues that the European practice of calculating FISIM, being the difference between the actual interest rate and the reference rate, does not measure the intermediation services provided by banks, but the intermediation services plus a risk premium. He recommends the risk premium be eliminated from the calculation, suggesting this new formula:

Intermediation services[10] = (Actual interest rate – risk premium) – reference rate

Basically Eichmann redefines the calculation of FISIM as the difference between the risk-adjusted actual rate and the reference rate.

Eichmann further develops his ideas on the bearer of the risk component for both loans and deposits[11] and offers some theoretical approaches to measuring these and the implications on calculating FISIM.

[10] Eichmann used the term intermediation services to mean implicit services provided by financial intermediaries.

[11] Eichmann separated deposits into money and financial capital. In his explanation, deposits represent financial capital, and not cash deposits.

For loans: Actual rate – reference rate = service +risk assumption by the bank

For deposits: Reference rate – actual rate = risk assumption by the depositor[12]– service

In order to measure the risk component, he suggests two methods, first is the ECB practice of adjusting interest rate to exclude address risk, currency risk, and maturity risk, by the use of different reference rates, as opposed to a single one suggested by the SNA. A second proposed method is to find a standard service component for both loans and deposits. In order to achieve this, for loans he suggests using the difference between a short-term Euribor and the risk-free actual rate of a short-term euro-denominated bank loan to a government. For deposits, he proposes the difference between a short-term Euribor and the lowest short-term actual deposit rate for financial capital. Finally, once the standard service component is identified, it should be subtracted form the actual interest rate in the loan side, and added to the actual interest rate on the deposit side.

Colangelo and Mink (2009) also argue that term premium and credit default risk should be excluded from FISIM, and go on to show that theses risks had the affect of overstating banking sector output in Europe by an average of 37% from 2003 to 2008. The authors provide a framework for adjusting the term and credit default risks in measuring FISIM. To adjust for term premium they suggest identifying an appropriate "risk-free" yield curve and use this curve to extract reference rates for different maturities of deposits and loans. In building a "risk-free" yield curve, the suggest using the long-term debt securities issued by German central government for long-term maturities, and the secured interbank lending rate, or unsecured interbank lending rate and swap yield curve for short-term maturities.

To adjust for credit term risk on loans they suggest two methods. One method

[12] Eichmann argues that in the case of deposits, the risk is born by the depositor, not the bank. However, in the case of deposit insurance, this risk is minimized.

is to use the secured interbank lending rates and the swap yield curve because they reflect the risks of the lender rather than the borrower. Another method is to use the ratio of loss provisions and the outstanding amounts of the underlying loans to derive a risk premium on loans.

Basu, Inklaar and Wang (2008) argue that compensation for bearing systemic risk should not be included in bank output. They apply some models to extract the risk component from FISIM and conclude that from 1997 to 2007 U.S. commercial bank output is overstated by 21 percent and thus leading to an overstatement of GDP by 0.3 percent. Their models are based on the idea that a bank's main service in making loans is to reduce the asymmetric information between borrowers and lenders, which the banks accomplish through screening and monitoring. With this in mind they argue that in calculating FISIM, the implicit revenue from screening and monitoring should equal the spread of the gross loan rate over the yield on an equally risky fixed-income security, and not a risk-free rate, such as U.S. Treasury security which is the current practice in the U.S. Figure 5 below illustrates the breakdown of interest component of bank output.

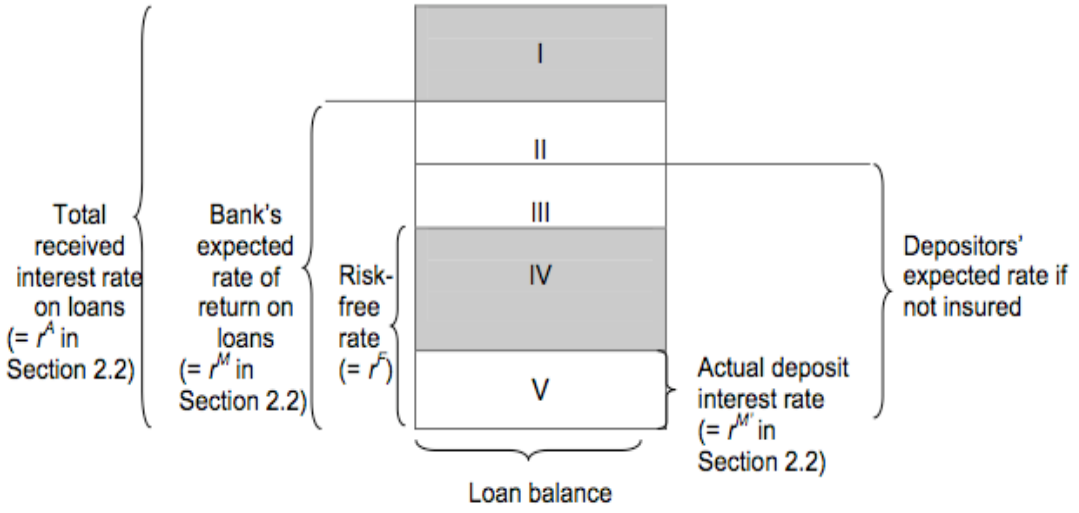

Figure 5 Decomposition of bank's total interest receipt
Source: Basu, Inklaar and Wang 2008.

With this diagram Basu, Inklaar and Wang breakdown the interest receipt of a bank. "Area I represents the implicit fees for intermediation services in lending, such as origination and monitoring. Area II represents the loan risk premium. Area III represents the deposit insurance premium. Area IV represents the implicit fees for transaction and payment services, mostly to depositors. Area V represents the deposit interest payment. With this explained the authors further extrapolates that the sum of areas I though V equal the banks total receipt of loan interest income. The sum of areas II through V equal the banks expected return on the funds given the loan's systematic risk. The sum of area III through V equals the depositor's expected return on deposits given the bank's loan portfolio, if the banks have no deposit insurance. Finally, the sum of area IV and V equals the risk-free return x deposit balance" (Basu, Inklaar and Wang 2008, p. 329).

Fixler and Zieschang criticize the approach of Basu, Inklaar, and Wang because it relies on information symmetry between banks and credit providers, which they argue is not a practical assumption. Basu, Inklaar, and Wang's approach for eliminating risk premium from FISIM is accomplished by separating bank loans by maturity and matching them with a corresponding market-based reference rate. Fixler and Zieschang claim this approach denies the costs banks incur in obtaining private information of potential borrowers. Their argument claims that by using a reference rate for bank loans based on credit market risk premiums will be lead to an exaggerated underestimation of the implicit output when calculating FISIM.

This critique of Basu, Inklaar and Wang is extended on by Ashcroft and Steindel (2008), who also claim their model assumes a special case where there are no information problems, and thus a bank does not produce any real services to borrowers.

However this is not the case in most situations, as Ashcraft and Steindel argue, the use of market reference rate, as proposed by Basu, Inklaar and Wang, is hard to accept because of the difference between a bank loan, where a bank provides some services, and a security, which involves no service element.

Fixler and Zieschang (2010) clash with much of the literature regarding the elimination of risk from FISIM, and suggest an alternative method of accounting for risk. They provide a detailed breakdown of FISM and argue that while the SNA's method of calculating FISIM does lead to some inappropriate estimates of bank output, the evidence for removing risk premium from FISIM is not strong. As an alternative to removing risk from FISIM, they propose to calculate FISIM using current prices, incorporating the market value or fair value of loans as opposed to the SNA guideline of using book value. They do this by converting the loans to a market value equivalent, achieved by multiplying the stock of loans by a comparable market rate, and then calculating FISIM as usual.

Hagino and Sonoda examine FISIM as measured in Japan and reach similar conclusion as some of the previous authors that multiple reference rates need to be applied to reflect the different maturities of different categories of loans and deposits. However they argue that credit cost, not credit risk premium should be deducted form FISIM. This is because these costs reflect a failure to perform risk management activities and monitoring of borrowers. The authors conclude that by adjusting Japan's FISIM to reflect term premium and credit costs, leads to an approximately 20 percent reduction.

Kil-hyo Ahn (2008) explains the FISIM practice in Korea where FISIM is calculated not only for depository corporations and financial intermediaries, but also

financial auxiliaries. He argues that financial auxiliaries play a similar role to financial intermediaries in Korea because they take deposits form customers and lend money to investors to buy securities.

What can be seen in the literature regarding how to adjust FISIM to reflect risk, there is multitude of theories regarding reference rate, term premium and default risks, as well a differences in various regions and countries on how FISIM is implemented and calculated in practice. I will build my analysis on some of the models discussed and I hope to make a contribution to this body of research with my analysis of the risk-reflected FISIM calculation of the U.S. commercial banking sector.

2.3 Return-boosting balance sheet strategies and tail-end risk

In the aftermath of the sub-prime crisis, many have claimed the dangers or evils of new financial innovations and balance sheet strategies that artificially boost returns. Haldane, Brennan and Madouros (2010) argue that balance sheet strategies may have contributed to high, but temporary, excessive returns in the financial sector, which in turn feed the growing contribution of the financial sector to GDP. They discuss three types of balance sheet strategies, which prop up returns at the expense of assuming greater risks, including[13]:

1) Increased leverage, on and off-balance sheet

2) Increased share of assets held at book value

3) Writing deep out-of-the-money options

They authors argue that through these techniques banks were able to hide their increased exposure to risk, usually in the tail of the return spectrum, due to the nature of

[13] These appear in Haldane, Brennan and Madouros 2010, p.13

complex financial products as well as opaque accounting disclosures. They further conclude that these balance sheet strategies which led to excessive returns stem from the inability to measure and price risk, and thus the growth in the financial sector was largely a risk illusion.

The effects of securitization on bank output through the calculation of FISIM, is examined in greater detail by Ashcroft and Steindel (2008). They argue that not only does the practice of moving loans off balance sheet increase bank returns, it also lowers bank output. This is because, once a bank loan is securitized, the bank stops providing services associated with this loan to the borrowers, which in turn increases the output of borrowers relative to the bank. Additionally, the bank no longer needs to pay depositors to finance the loan, resulting in a decrease in implicit services provided by the bank to depositors and a lower bank output and overall GDP of the country.

Derivatives have also come to light as a tool by which banks can boost returns while silently increasing their tail-end risks. Caouette, Altman, Narayanan and Nimmo (2008), describe derivatives as a tool to help banks deal with their paradoxical desire to enjoy the benefits of asset concentration with out having to face the attendant risks. They argue that while credit derivatives have offered many benefits to banks and capital markets, they also have a dark side. Derivatives increase the distance between the borrower and the ultimate lender, which decreases incentives to monitor, and increases moral hazard. Another issue they argue is that derivates can in some cases give incentive to destroy corporate values, because a trading position that benefits from a decline in credit worthiness may be desirable in some cases. Furthermore because much of the derivatives market is unregulated, it is difficult to know all the players involved in a transaction and their incentives. Finally, derivatives can create systemic problems

when used excessive to build up leverage.

Davis (1995) gives a counter argument for derivatives, claiming that they should act to increase overall financial stability. This is because they perform the function of spreading risk and the management of risk across many parties, as opposed to having them concentrated on one balance sheet. Thus they may help to diffuse the impact of shocks. However he also argues that derivatives have a down side in that the market is relativity new, they carry counterparty, market and liquidity risks, and they lack of transparency.

All of the literature surveyed regarding return boosting balance sheet strategies and tail-end risk conclude that these practices falsify the true position of the firm or bank by increasing returns at the expense of increasing risks. I also build upon this body of research by examining the case of the U.S commercial banking sector and its involvement in some of these techniques and financial products.

2.4 Relationship between risk and financial fragility

The relationship between risk and financial crisis is rooted in fundamental economic theory. Keynes in his seminal work, the General Theory of Employment, Interest and Money (1935) argued that investment is based on the marginal efficiency of capital, which states that prospective yield should be larger that the replacement costs in making an investment. Furthermore, this investment is affected by risks, both borrowers and lenders, which tend to be underestimated in booming times, in part due to short-period changes in the state of long-term expectations based on animal spirits, as well as interest rate changes. Keynes theories have spawned a horde of ideas build upon his work, some of which I will now briefly discuss.

Building on the theories of Keynes and Fisher, Minsky (1975, 1977) argues that the economy is in a fragile financial structure, and that crisis is to be expected. He argues, that since the end of World War II the structure has shifted from a robust to fragile state due to changes in the way investments and capital assets are financed in the economy. He further argues that our economy is in a state of systemic fragility, or that the economy is functioning as it is designed to, and thus our economy is prone to experiencing repeated financial crises. He develops a model by which a financial crisis happens:

> "A financial crisis starts when some unit cannot refinance its position through normal channels and is forced to raise cash by unconventional instruments or by trying to sell out its position. Inasmuch as the assets in position have thin markets, excess supply leads to a sharp price break. Once this occurs the initial disequilibrium is made worse. Other units experience a decrease in asset values and thus have difficulty in making position." (Minsky 1977, p. 140)

This model developed by Minsky fits very will with the sub-prime crisis, and therefore can help explain the impact of the growth of derivatives in the U.S. banking sector.

Kindleberger (2000) builds on the models of Fisher and Minsky providing much to this body of knowledge. In his book, *Manias, Panics and Crashes*, he develops the concept of displacements, which act as an object of speculation. He defines a displacement as some outside event that changes horizons, expectations, profit opportunities, or behavior, and he includes the growth in financial innovations and derivatives in this category (p. 41). He comments that toward the end of the cycle, speculation tends to detach from reality and people seek to become rich with no understanding of the process involved. Kindleberger's contribution can also aid in

explaining of the impact of the growth of depravities among U.S. commercial banks.

Davis (1995) contributes much to the discussion of financial fragility, adding the aspect of competition. In his book *Debt, Financial Fragility and Systemic Risk*, he argues that many factors combined can create a situation of financial fragility and lead to a crisis, including: reductions in the barriers to entry in the form of deregulation, innovation, opening of new markets, technology increases, developments in existing markets. Additionally, the new entry of firms, including entry into new markets by existing firms, lower process in credit markets (declining risk premiums), low or declining capitalization, higher quantities in credit markets, exploitation of safety-net protection and low value of banking franchises also have effects of increasing instability. He analyses several financial crises in which these factors can explain the process by which financial crisis unfolds. In my analysis I will apply the framework provided by Davis to analyze the role of financial innovations, mainly derivatives in the sub-prime crisis.

As Keynes, Minsky, Kindleberger and Davis have argued or implied, financial crisis and are part of our economic system, and that excessive risk taking plays a key role in the boom and bust of the business cycle. These theories generally argue that financial crises are due to some exogenous shock in the system, that shock is different depending on the crisis. While all these theories were written well before the advent, or popularization of many of the structured financial products, which where are at the heart of the recent financial crisis, they are still very relevant, and can be used to explain the impact of financial innovations in the recent sub-prime crisis. In my analysis, I apply some of these theories, especially that of Davis, to explain the role of derivatives, in the recent crisis. The increased use of these innovations combined with the increased

competition in the banking sector, as seen in the steady increase of banking charters issued, is one possible cause of the recent financial crisis.

2.5 Hypothesis statement

My hypotheses are as follows:

Hypothesis 1: Adjusting the calculation of the loan-side FISIM of the U.S. commercial banking sector to reflect term premium and default risk will lead to a reduction in loan-side FISIM

Hypothesis 2: The high ROE of the U.S commercial banking sector reported in the years 1994 to 2003, was mainly due to an increase in the assumption of risk in the form of financial leverage.

Hypothesis 3: The increase in tail-end risk exposure, as represented by financial innovations of derivatives, in combination with increased competition in the banking sector, contributed to increased to financial instability and the recent sub-prime crisis.

Chapter Three
Framework and Methodology

In proving my main argument, that the U.S. banking sector is misrepresented by standard measures of FISIM, ROE and the growth of tail-end risk, I will conduct a Five-part analysis:

1) Calculate standard FISIM of the U.S. commercial banking sector, following the SNA and BEA guidelines. The findings of this analysis will contribute to answering hypothesis 1.
2) Calculate a risk-reflected FISIM of the U.S. commercial banking sector, following four previously developed approaches. The findings of this analysis will contribute to answering hypothesis 1.
3) Compare the outcomes of the standard and risk-reflected FISIM approaches, and interpret the results. The findings of this analysis will contribute to answering hypothesis 1.
4) Separate the ROE of U.S. commercial banks into four components and examine which component or mix of components is responsible for the temporary high ROE in the late 1990's and early 2000's. The findings of this analysis will contribute to answering hypothesis 2.
5) Examine the increase in derivatives and competition in the U.S. commercial banking sector. The findings of this analysis will contribute to answering hypothesis 3.

The main source of data for this research is aggregate data of the U.S. commercial banking sector, including balance sheet and income statements obtained

form the FDIC (Federal Deposit Insurance Corporation) online database,[14] and compiled using Excel. All other sources of other data are referenced with a footnote, and explanation if necessary. The following is a detailed explanation of the models and methods used in each of the five analyses.

3.1 Standard calculation of FISIM of the U.S commercial banking sector

In calculating the standard FISIM for U.S commercial banking sector, I followed the SNA guideline, and BEA recommendations, which is consistent with current practice in the U.S., as discussed earlier. I will provide explanation and justification in place where my methods differed. The standard FISIM calculation is as follows:

Calculating FISIM

Total implicit output = output of depositor's services + output of borrower's services

Output of depositor's services = (reference rate - average rate paid) x average liability balance[15]

Output of borrower's services = (average rate received – reference rate) x average asset balance[16]

Calculation of average rates (these are all based on Book Values)

Average rate paid = (interest expense / average liability balance)

Average rate received = (interest income / average asset balance)

Choice of reference rate

As discussed earlier, the SNA requires a reference rate reflecting the pure cost of borrowing, but does not recommend a specific rate. Therefore, for the purposes of this

[14] The data was downloaded from the FDIC Statistics on Depository Institutions division, (http://www2.fdic.gov/sdi/index.asp)
[15] For average liability balance I used the total deposits in domestic & foreign.
[16] For average asset balance, I used the gross loans and leases

analysis, I used three reference rates, the Federal funds rate, or inter-bank lending rate, the 3-month U.S. Government Treasury bill, and the 7-year U.S. Government Treasury bill, to show the difference in possible alternatives that can be used in the U.S. while still meeting the SNA guidelines. The three rates used reflect different risk-free rates for different maturities. Table 1 below provides the data used in this analysis and the following risk-adjusted calculations of FISIM. The results are shown in section 4.1.

Table 1 Loans, deposits and interest data for U.S. commercial banks, 1992 to 2010

Year	*Gross Loans and Leases*	*Total Deposits Domestic & Foreign*	*Total Interest Income*	*Total Interest Expense*	*Average Rate Paid*	*Average Rate Received*
1992	2041	2,699	185	122	4.52%	9.06%
1993	2157	2,754	179	106	3.85%	8.30%
1994	2366	2,874	190	111	3.86%	8.03%
1995	2611	3,028	227	148	4.89%	8.69%
1996	2820	3,197	240	150	4.69%	8.51%
1997	2979	3,422	257	165	4.82%	8.63%
1998	3241	3,681	274	179	4.86%	8.45%
1999	3493	3,831	280	175	4.57%	8.02%
2000	3818	4,180	330	225	5.38%	8.64%
2001	3887	4,378	309	188	4.29%	7.95%
2002	4160	4,690	276	121	2.58%	6.63%
2003	4432	5,035	263	95	1.89%	5.93%
2004	4910	5,593	269	97	1.73%	5.48%
2005	5385	6,073	333	165	2.72%	6.18%
2006	5984	6,731	419	263	3.91%	7.00%
2007	6629	7,310	461	308	4.21%	6.95%
2008	6841	8,082	398	211	2.61%	5.82%
2009	6499	8,333	369	122	1.46%	5.68%
2010	6597	8,514	381	89	1.05%	5.78%

All numbers rounded to nearest billion

Source: FDIC, and author's calculations

3.2 Risk-reflected calculation of FISIM of the U.S. commercial banking sector

After getting the standard FISIM of the U.S. commercial banking sector, I employed a similar method used by Davies (2010),[17] applying a variety of methods for calculating FISIM, to a common data set, and interpreting the results. For the following four risk-reflected methods of calculating FISIM I used the same balance sheet and income statement data used in the standard calculation, as shown in table 1. This includes loan and deposit balances as well as interest income and interest expense. The following is a detailed description of each method. For the purposes of this analysis, I focused on the loan-side FISIM calculation because this is where the majority of risks are embedded, as discussed in the literature review.

3.2.1 Eichmann's approach

This approach involves identifying a standard service component for both loans and deposits, and subtracting this form the actual interest rate in the loan side, and adding it to the actual interest rate on the deposit side. For the standard service component of loans, Eichmann suggests using the difference between a short-term Euribor, and the risk-free actual rate of a short-term euro-denominated bank loan to a government. For the service component of deposits, he proposes the difference between a short-term Euribor and the lowest short-term actual deposit rate for financial capital. His equations are as follows:

(Actual interest rate – **risk premium**) – reference rate = intermediation services

For loans: Actual rate – reference rate = **service** + risk assumption by the bank

For deposits: Reference rate – actual rate = risk assumption by the depositor – **service**

[17] Davies calculated the FISM of Australian banks using different references rates on the same data set,as discussed earlier in the literature review.

In order to find the service component for U.S. commercial banks, I used the U.S. equivalents of the variables in Eichmann's equations. Table 2 below provides the Eichmann variables and my substituted U.S. equivalents.

Table 2 Eichmann's variables and their U.S. equivalents

Eichmann Variable	*U.S. Equivalent*
Short-term Euribor	6-month Treasury Bill
Short-term Euro dominated loan to a government	Bank Prime rate
Lowest short-term actual deposit for financial capital	1-month Certificate of Deposit

In order to find the service component of FISIM for U.S commercial banks, I adjusting Eichmann's equation to incorporate the U.S equivalents as follows;

Service component of Loans = bank prime rate – 6-month Treasury bill

Service component of Deposits= 1-month Certificate of deposit - 6-month Treasury bill

After converting Eichmann's equation to a U.S. equivalent, I plugged U.S. commercial bank data into the equation and calculated the result, which is shown in section 4.2.

3.2.2 Fixler and Zieschang's approach

Fixler and Zieschang propose to eliminate the risk component of FISIM by calculating FISIM using current prices; this effectively incorporates the market or fair value of loans as opposed to the SNA guideline of using book value. The authors provide the following equation to show their risk-adjusted FISIM;

Loan interest receivables – (reference rate x the market value of loans)

In following the methods developed by Fixler and Zieschang to convert the loans to market value, I first separated the loans reported on balance sheets by the banks,

into four categories, and calculated the market rate for each category by multiplying the balance of each category of loans by a market interest rate roughly matching the average maturity of each loan category. This information is summarized in table 3 below.

Table 3 Breakdown of loans and corresponding market reference rates

Loan Category	*Market rate*
Secured by Real Estate (SRC)	Freddie Mac 30-year mortgage rate (FM 30)
Commercial and Industrial (C&I)	3-month non-financial commercial paper (3-moCP)
To individuals (I)	Credit card loan rates (CC)
All Other Loans (OL)	Average interest received on all loans (Ave Int)

After calculating a market rate for each loan category, I used a weighted-average of each loan category and plugged the data into the equation provided by Fixler and Zieschang as follows;

Loan interest receivable – (reference rate x ((SRC x FM30) + (C&I x 3-moCP) + (I x CC) + (OL x Ave Int))

The result of the previous equation was calculated giving the market value of the U.S. commercial banking sector's loans, or the Fixler & Zieschang risk-reflected loan-side FISIM output. The results for this analysis are presented in section 4.2.

3.2.3 Colangelo and Mink's approach

To adjust FISIM output for term premium, Colangelo and Mink suggest identifying an appropriate "risk-free" yield curve and use this curve to extract reference rates for

different maturities, of deposits, and fixation periods for loans. In building a "risk-free" yield curve, the suggest using the long-term debt securities issued by German central government for long-term maturities, and the secured interbank lending rate, or unsecured interbank lending rate and swap yield curve for short-term maturities.

To adjust for credit default risk on loans the authors suggest two methods. One method is to use the secured interbank lending rates and the swap yield curve because they reflect the risks of the lender rather than the borrower. Another method is to use the ratio of loss provisions and the outstanding amounts of the underlying loans to derive a risk premium on loans, I choose to use the later due to data availability.

Applying this to U.S. commercial banks requires again converting the author's variables to U.S. equivalents, which I provide as follows:

German central government long –term debt securities→ 7-year U.S. Treasury bill

Secured interbank lending rate→ federal funds rate

Swap yield curve→ 7-year U.S. Treasury Bill yield curve

Ratio of loss provision to outstanding amount of underlying loan→ percentage of loss provision reported to gross loans

After getting these variables, I then separated the loans into the same four categories previously used, and calculated the term premium and default risk premium as shown in table 4 below.

Table 4 Colangelo and Mink's term premium and default risk adjustments

Loan Category	*Term premium adjustment*	*Default risk and term premium adjustment*
Secured by Real Estate (SRC)	10-year U.S. Treasury bill	Federal reserve average mortgages rates (FEDM) less 5-year U.S. Treasury bill Plus 10-year U.S. Treasury bill
Commercial and Industrial (C&I)	3-month Commercial Paper	3-month non-financial commercial paper (3-moCP) less 5-year U.S. Treasury bill Plus 1-year U.S. Treasury bill
To individuals (I)	3-year U.S. treasury bill	aaa rated bonds (aaa) less 5-year U.S. Treasury bill Plus 3-year U.S. Treasury bill
All Other Loans (OL)	Average of above three	Average interest received on all loans (Ave Int) less 5-year U.S. Treasury bill Plus 3-year U.S. Treasury bill

Once these variables were converted to U.S. equivalents, I then calculated the Colangelo and Mink risk-reflected loan-side FISIM by adding the total of each loan category for both term premium and default risk and subtracting these from the Risk free, or standard FISIM (which uses the federal fund rate as a reference rate). The result is presented in section 4.2.

3.2.4 Basu, Inklaar and Wang's approach

To extract the risk component, the authors suggest separating bank loans by maturity and matching them with a corresponding reference rates. To approximate term premium, the authors match the average maturity of the loan category with a U.S. treasury bill of approximate equal maturity as a reference rate. For the default risk premium, the authors match the approximate risks of each category with an equally risky market rate. In applying this approach to my data set of U.S. commercial banks entails, I chose to use similar market reference rates as with Colangelo and Mink's method, with slight

changes. Table 5 below summarizes this information.

Table 5 Basu, Inklaar and Wang's term premium and default risk adjustments

Loan Category	*Term Premium Reference rate*	*Default risk Reference Rate*
Secured by Real Estate (SRC)	10 year U.S. treasury bill	Freddie Mac 30-year mortgage rate
Commercial and Industrial (C&I)	1-year U.S. treasury bill	aaa corporate bonds
To individuals (I)	3-year U.S. treasury bill	bbb corporate bonds
All Other Loans (OL)	Average of above three rates	Average of above there rates

After getting these variables, I calculated the loan-side FISIM by adding the total of each loan category for both term premium and default risk and subtracting these from the risk-free, or standard FISIM (which uses the federal fund rate as a reference rate). The result is presented in section 4.2.

3.3 Breakdown of ROE for the U.S. commercial banking sector

To examine the source of the record high ROE of the U.S. commercial banking sector in the years leading up to the sub-prime crisis, I will apply data of the U.S. Commercial banking sector, to an equation proposed by Haldane, Brennan and Madouros (2010). I chose the timeframe 1992 to 2010, to analyze bank ROE because this period is sandwiched between two crisis, the savings and loan crisis of the 80's and 90' and the sub-prime crisis from 2008, and in this period the commercial banking sector reported record-high ROE at or above 14% in the years 1994, 1999, and 2003. The source of the data is the FDIC online database, and includes some details taken from aggregate balance sheet and income statements from 1992 to 2010. In particular, total assets, tier 1

capital, common equity, net income and risk-weighted assets. All values were taken as stated on the balance sheets or income statements except common equity, which was calculated as:

Total equity - preferred stock

All data was compiled using excel and inserted into the Haldane equation discussed below.

Before separating the ROE I provide a simplified calculation of the ROE of the U.S commercial banking sector for the same timeframe, 1992 to 2010. This ROE follows the standard approach of:

$$ROE = \frac{\text{Pre-tax net operating profit - applicable income taxes}}{\text{Total equity capital}}$$

Then I match this with the Haldane equation for ROE in order to show the parity.

Following this, I employ the Haldane equation and separate the ROE of the U.S. commercial banking sector into its four components, financial leverage, common equity margin, return on risk-weighted assets, and unit risk. The equation is shown below, and the results are presented in section 4.3.

$$ROE = \frac{\text{Total assets}}{\text{Tier 1 capital}} \times \frac{\text{Tier 1 capital}}{\text{Common equity}} \times \frac{\text{Net income}}{\text{RWA}} \times \frac{\text{RWAs}}{\text{Total assets}}$$

ROE = Financial leverage x Common equity margin x RoRWAs x Unit-risk

The equation relies on some assumptions, for instance the definition of risk-weighted assets, and how these risks are accounted for. I will discuss this and other limitations as well as explain the meaning and significance of each of the four parts of the equation in the discussion of results in the following chapters.

3.4 Measuring tail-end risk and competition in U.S. commercial banks

To examine the banking sector's increasing exposure to tail-end risk, I once again used the balance sheet and income statement data collected from the FDIC online database and analyzed the growth in the levels of derivatives reported. I used derivatives to represent tail-end risk in this analysis because these data are readily available from the FDIC database, and this category of 'asset' includes, many tail-end risk heavy products, such as:

-Interest rate contracts

-Futures and forward contracts

-Written option contracts

-Purchased option contracts

-Foreign exchange rate contracts

-Commitments to purchase foreign currencies and U.S. dollar exchange

-Spot foreign exchange rate contracts

-Contracts on other commodities and equities

I compared the total amount of derivatives reported to the total assets, as well as the percentage of derivatives to total assets.

In order to measure the competition in the U.S. commercial banking sector, I collected data from the FDIC online database on new charters issued per year. The data for both derivatives and new charters were compiled using Excel and then applied to the framework provided by Davis (1995) to see the wellness of fit in Davis's theory, which examines the relationship between financial innovations, competition and other factors to financial fragility. The results are presented in section 4.4.

Chapter Four
Results and Findings

This Chapter explains the results and findings of each of the analyses, using figures and tables where necessary to aid in understanding.

4.1 Standard FISIM of U.S. commercial banking sector

The result of a simple risk-free calculation of the total FISIM of U.S. commercial banks, following the SNA and BEA methods, is represented in figure 6 below. This figure compiles the results of three different reference rates, which could be used in practice in the U.S. These include the interbank lending rate, or federal funds rate, as well as the 3-month and 7-year treasury bills; all three represent a near risk-free rate of different maturities.

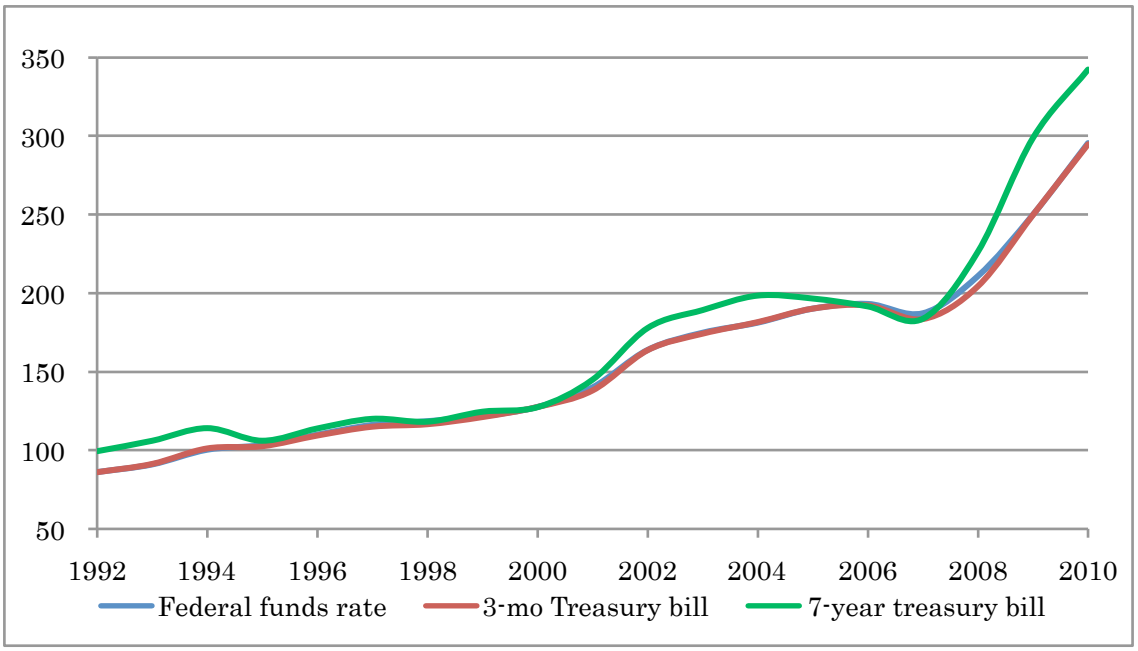

Figure 6 Total FISIM using three risk-free reference rates
Source: FDIC and author's calculations

The basic finding of this analysis conveys conventional wisdom that when calculating FISIM, using a reference rate with a longer maturity, generally offering a higher yield, translates to higher FISIM output. Furthermore, the difference in the outcomes of the three reference rates in this simple calculation of FISM depend entirely on the reference rate used, as this was the only variable which was changed. The first two reference rates used, the Federal funds rate and 3-month Treasury bond, resulted in nearly identical FISIM outputs every year, due to the closeness of the two rates. However, the gap widens, however slightly, between these first two FISIM outcomes and the third, which uses the 7-year Treasury bond as a reference rate. For the 7-year bond, the total FISIM output is matched in some places and exceeds the other two rates in other years. The relationship between reference rate and output is simply a function of the FISIM equation; a higher reference rate leads to a higher output. Table 6 below provides a breakdown of the output of deposits and loans for each reference rate.

Table 6 Standard FISIM outcomes using three risk-free reference rates

Year	***Federal funds rate***			***3-month U.S. treasury bill***			***7-year U.S. treasury bill***		
	Deposits	*Loans*	*Total*	*Deposits*	*Loans*	*Total*	*Deposits*	*Loans*	*Total*
1992	-27.00	113.16	86.16	-27.27	113.36	86.10	27.52	71.93	87.03
1993	-22.83	113.86	91.03	-21.45	112.78	91.33	46.57	59.50	73.08
1994	10.00	90.39	100.39	14.59	86.61	101.20	87.59	26.51	144.88
1995	28.53	74.78	103.31	23.38	79.22	102.60	48.82	57.29	110.03
1996	19.44	90.54	109.98	14.65	94.77	109.42	52.69	61.21	121.12
1997	21.84	94.35	116.19	12.94	102.09	115.04	51.61	68.43	154.49
1998	17.93	100.61	118.54	1.74	114.87	116.60	15.36	102.88	93.11
1999	15.40	106.40	121.80	8.12	113.03	121.16	46.81	77.76	140.10
2000	35.83	91.76	127.59	35.83	91.76	127.59	34.16	93.28	153.47
2001	-18.13	158.18	140.05	-35.65	173.73	138.09	25.65	119.31	122.77
2002	-42.68	206.53	163.85	-44.08	207.78	163.69	80.67	97.12	187.66
2003	-38.10	212.92	174.81	-43.14	217.35	174.21	82.23	106.99	161.22
2004	-21.49	202.72	181.22	-18.70	200.26	181.56	119.45	78.98	228.97
2005	30.55	159.60	190.15	30.55	159.60	190.15	87.03	109.52	221.19
2006	71.53	121.60	193.13	63.45	128.78	192.23	57.40	134.16	219.43
2007	58.96	128.22	187.19	19.49	164.02	183.51	21.68	162.03	202.82
2008	-55.83	266.65	210.83	-97.85	302.23	204.37	45.20	181.14	230.93
2009	-108.67	358.60	249.93	-109.50	359.25	249.75	112.99	185.73	321.15
2010	-73.67	369.13	295.45	-77.08	371.76	294.68	134.07	208.16	134.07

Source: FDIC and author's calculations

By looking at the FISIM output of deposits and loans seperately, we can see some more interesting results. Figures 7 and 8 below give the FISIM of deposits and loans respectively. For deposits, the higher reference rate in general resulted in a higher output. However on the loan side, the higher reference rate leads to a much lower output. The reasons for this is again embeded in the FISIM equation. Deposit-side is (reference rate - average rate paid) x balance of deposits, while loan-side is (average rate received - reference rate) x balance of loans. The average rate paid should be lower than the average rate received, or the bank is not making profit. Therefore, applying the

same reference rate to both deposit and loans will give this result. This highlights some of the issues previously mentiond about the problems in using of a single reference rate.

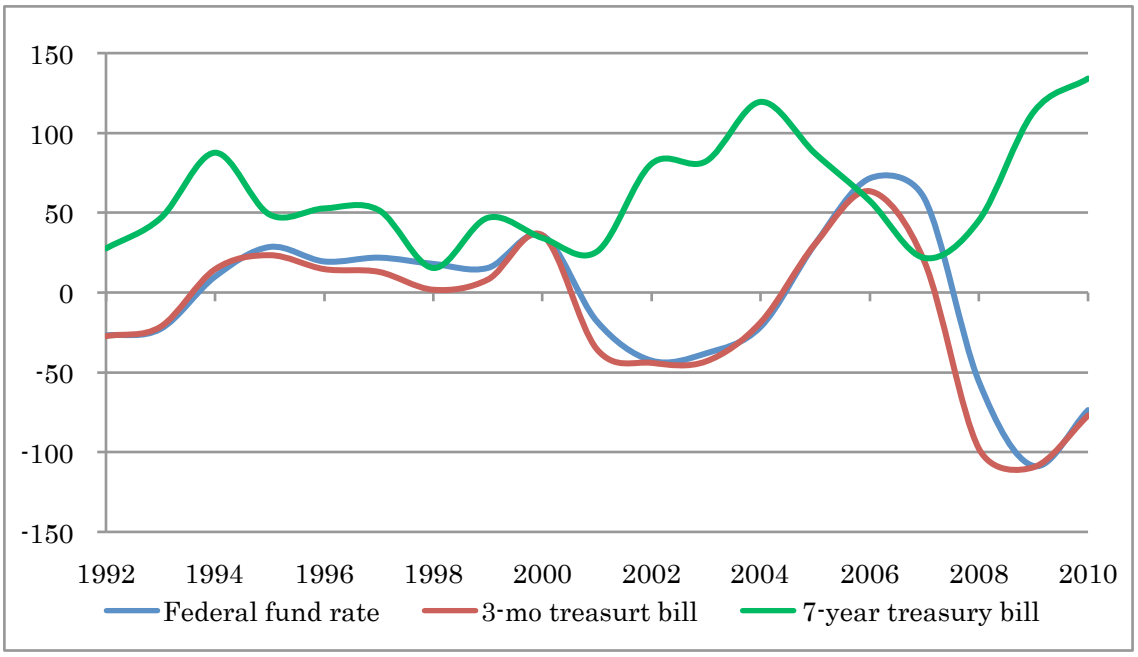

Figure 7 Deposit-side FISIM using three risk-free reference rates

Source: FDIC and author's calculations

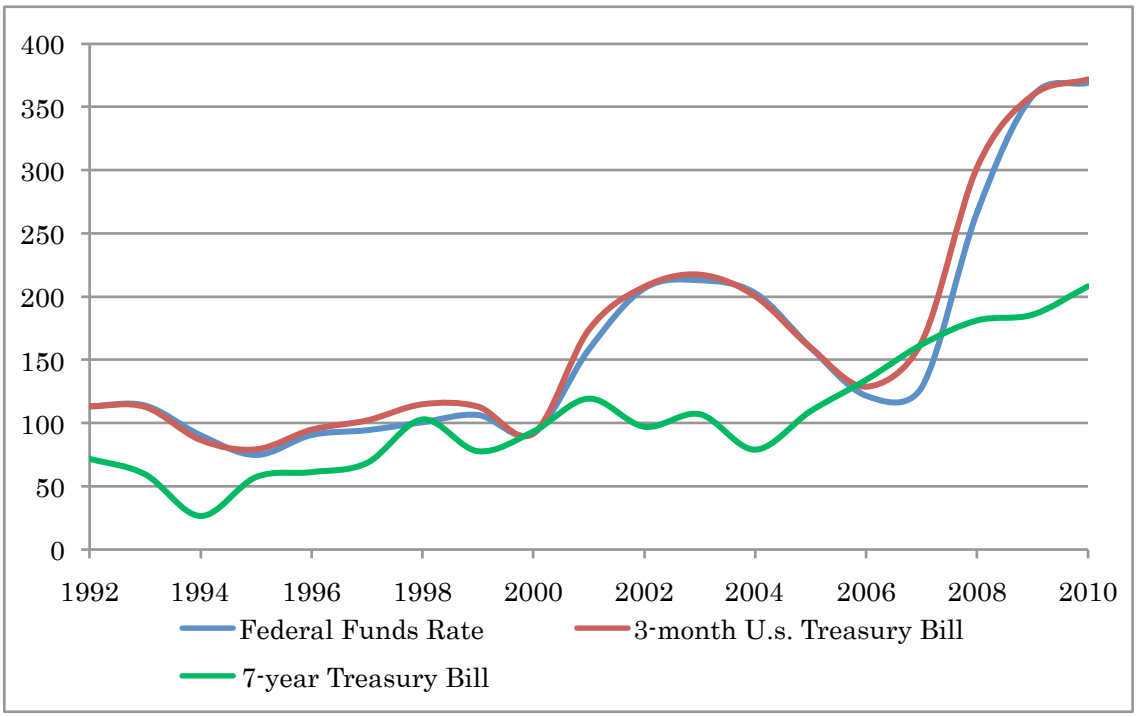

Figure 8 Loan-side FISIM using three risk-free reference rates

Source: FDIC and author's calculations

4.2 Risk-reflected loan-side FISIM of U.S. commercial banking sector

The four different risk-reflected calculations of loan-side FISIM of the U.S. commercial banking sector, is represented in figure 9 below. This figure compiles the results of the four methods developed by Eichmann, Fixler and Zieschang, Colangelo and mink and finally Basu, Inklaar and Wang. The four methods result in a wide range of FISIM outcomes, all generally below the risk-free FISIM outcome, except for the years of 2000, and 2005-2007. Figure 9 below summarizes the results, compared to the standard loan-side FISIM result (which uses the federal funds rate as a reference rate). Table 7 below provides the same information

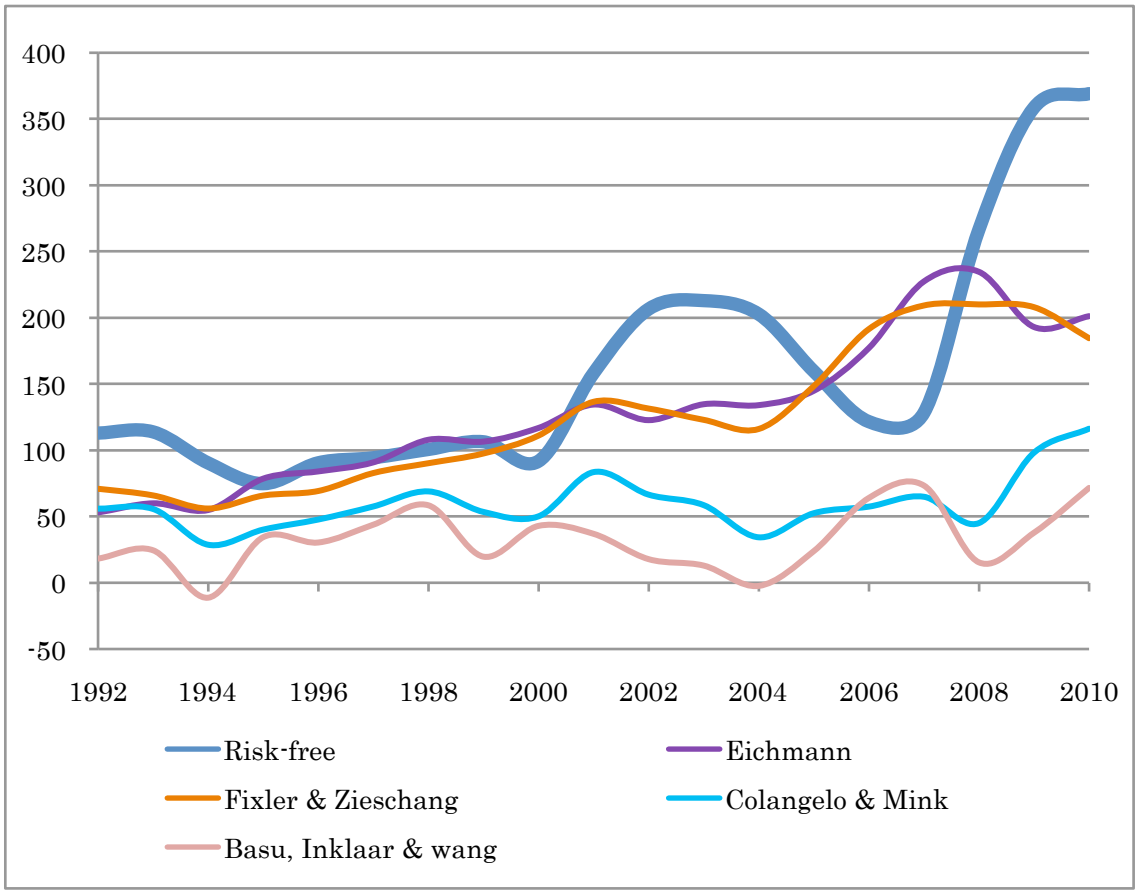

Figure 9 Standard (using risk-free reference rate) and risk-reflected FISIM outcomes
Source: FDIC and author's calculations

Table 7 Summary of standard and risk-reflected FISIM outcomes

Year	*Standard FISIM (using Fed fund rate)*	*Eichmann*	*Fixler & Zieschang*	*Colangelo & Mink*	*Wang, Basu & Inklaar*
1992	113.16	52.86	71.15	55.77	18.23
1993	113.86	59.96	65.92	55.69	24.51
1994	90.39	54.89	56.03	28.69	-11.27
1995	74.78	78.59	65.81	40.13	34.41
1996	90.54	84.04	69.26	47.72	30.38
1997	94.35	90.86	82.81	57.57	43.84
1998	100.61	107.93	90.22	68.95	58.47
1999	106.40	106.54	97.56	53.47	19.70
2000	91.76	116.83	111.05	50.13	42.93
2001	158.18	134.49	136.59	83.51	36.95
2002	206.53	122.72	131.47	66.50	17.83
2003	212.92	134.73	122.96	58.60	12.98
2004	202.72	134.04	116.06	34.31	-2.37
2005	159.60	144.86	148.36	52.50	23.89
2006	121.60	177.13	191.42	57.46	64.00
2007	128.22	227.37	209.25	64.90	73.38
2008	266.65	234.65	210.04	45.06	15.40
2009	358.60	193.02	207.98	98.19	37.78
2010	369.13	201.21	184.54	116.27	71.61

Source: FDIC and author's calculations

4.2.1 Eichmann's approach

Eichmann's risk-adjusted approach in general yielded a lower loan-side FISIM compared to the risk-free calculation, except for 1995, 1998-2000, and 2006-2007, as shown in figure 10 below. This result can be explained by looking at the Eichmann equation ((average rate received – service component) – risk-free rate) x loans. He further defines the (Actual rate – reference rate) = (service + risk assumption by bank).

This means that if the service or risk assumption of the bank is increasing, then the output will decrease. This is because increasing the rate from which the reference rate is subtracted will lower output.

Relating the result from Eichmann's method to the timeline of the sub-prime crisis is more difficult. Eichmann's outcome follows a steady increase, possibly due to the increasing amount of loans in the banking sector, with a drop after 2008.

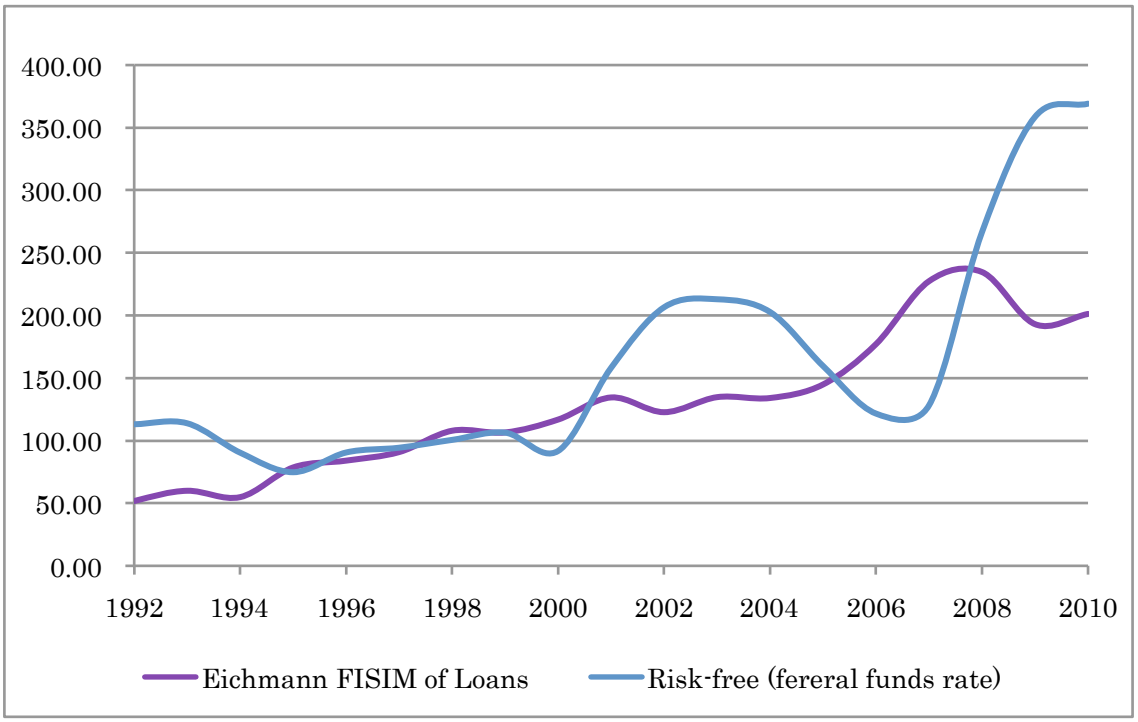

Figure 10 Eichmann's risk-reflected loan-side FISIM
Source: FDIC and author's calculations

4.2.2 Fixler and Zieschang's approach

Fixler and Zieschang's approach follows a similar trend to that of Eichmann's. It is also in general lower than the risk-free outcome except for the years, 2000, and 2006-2007, as shown in figure 11 below. While the trend is similar, the reasons are different. Fixler and Zieschang's method calculate the market value of loans as opposed to the book value. This in effect ties the bank loans to movements in the greater economy.

The higher than risk-free outcomes of 2000 and 2006-2007 can be explained due to the unusually high federal funds rate in those years, which as previously discussed will act to lower the FISIM output. The market value rate used in calculating the loans remains stable; therefore the fluctuations in the federal funds rate can explain the result. A possible implication of this is that during these periods, banks were for some reason unable to increase the risk premium to cover the risks, and thus not able to follow the risk-free rate. Possible reasons for this include increased competition among banks and interest rate policies of FRB, which will be discussed in the next chapter

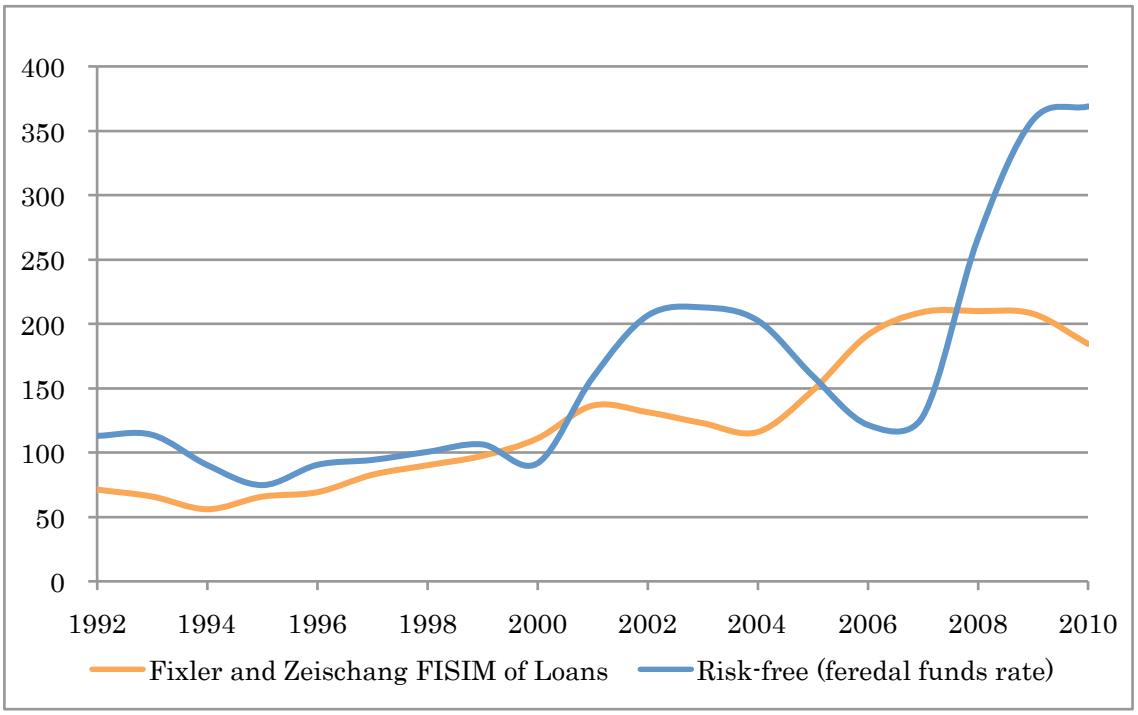

Figure 11 Fixler and Zieschang's risk-reflected loan-side FISIM
Source: FDIC and author's calculations

4.2.3 Colangelo and Mink's approach

This approach gave a much more reduced FISIM outcome, as compared to the Eichmann and Fixler and Zieschang approaches. This approach eliminates the term premium and default risk from the loan-side FISIM measurement, by separating loans

my maturity and applying a corresponding reference rate, as opposed to a single reference rate. However, this result dramatically reduces the loan-side FISIM output, as shown in figure 12. The results can be explained by looking at the way the authors conceive of and measure both term premium and default risk. For term premium they substitute the single reference rate for one matching the average maturity of the loan category, switching the federal funds rate for a variety of U.S. treasury bills corresponding to the matching maturity. However, to account for the default premium, the authors substitute the reference rate for a market equivalent that matches the risks of the loan category. A rate from the market will in general be higher than the federal funds rate, although carry more risk, so this will automatically lead to a reduced FISIM output, but the decrease in FISIM is very dramatic and may require further research to confirm the author's model.

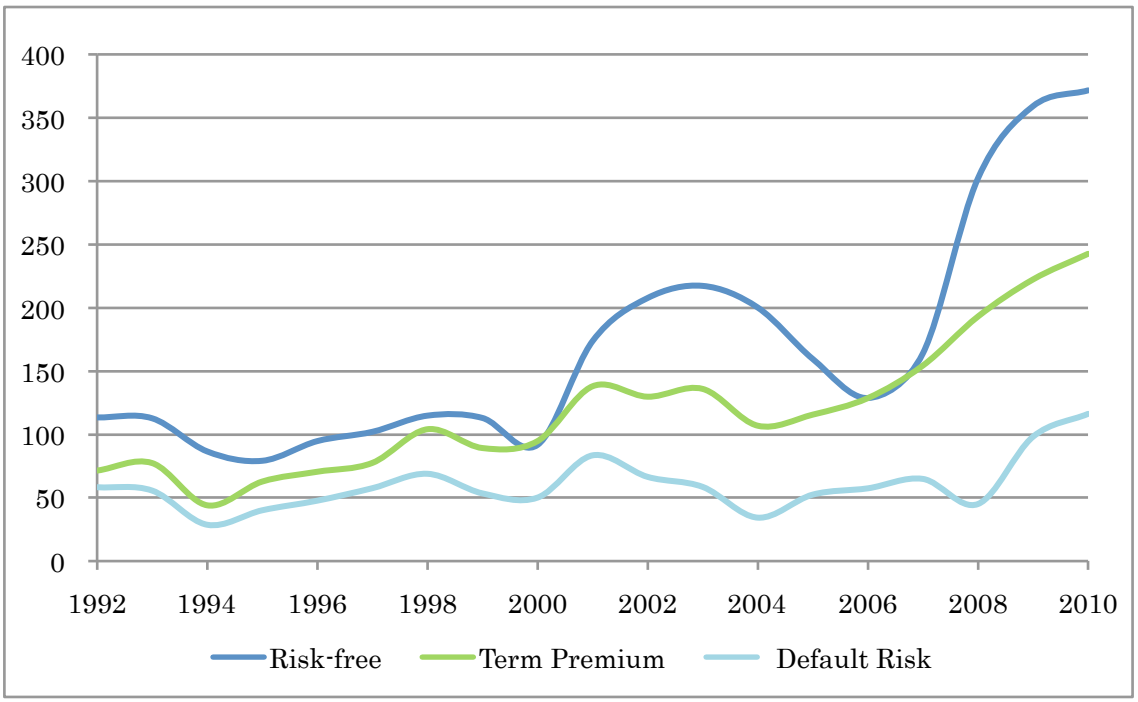

Figure 12 Colangelo and Mink's risk-reflected loan-side FISIM
Source: FDIC and author's calculations

4.2.4 Basu, Inklaar and Wang's risk-adjusted approach

This approach gives by far the most striking reduction in the FISIM of U.S. commercial banks. The authors propose to reflect the term premium and default risk in the standard FISIM calculation, however, their method gives a much lower, and sometimes negative loan-side FISIM outcome, as shown in figure 13 below.

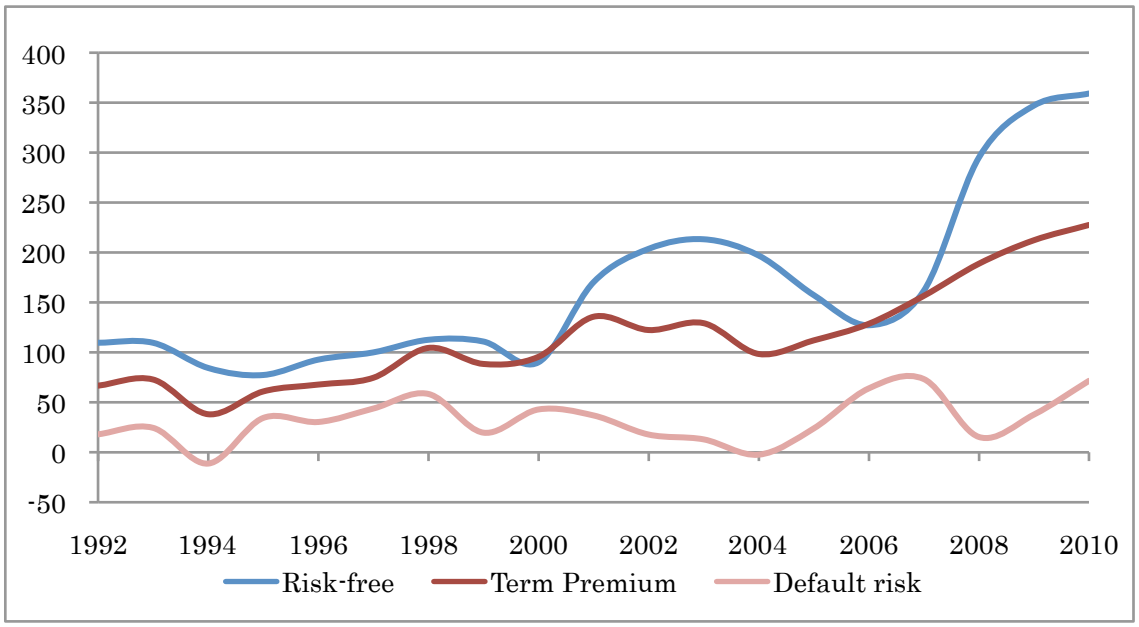

Figure 13 Basu, Inklaar and Wang's risk-reflected loan-side FISIM
Source: FDIC and author's calculations

The result can be explained by the methods used to represent the term premium and default risks. For the term premium the method used a U.S. treasury bill matching the loan category's maturity; just as in Colangelo and Mink's method, this results in a lower but not too significant reduction in FISIM. However, the method for eliminating the default risk gives a large reduction in output, due to the large rates used in the calculation.

Additionally there is the presence of a negative FISIM of the years 1994 and 2004. Some have argued that a negative FSIIM should not happen in most circumstances, and that observation of a negative FISIM is due to flaws in the measurement instrument, the choice of an inappropriate reference rate, or through the application of an aggregate measure to a detailed component (Berger 2010). However, if FISIM is adjusted to reflect term premium and default risk, it is possible to have a negative loan-side FISIM.

4.3 Breakdown of ROE of U.S. commercial banking sector

The results of the ROE breakdown for the U.S. commercial banking sector compared to the simple ROE, is presented in figure 14 below. The results show that the combined components of the Haldane ROE equation correspond closely with the Simple ROE previously calculated, with only slight differences. The parity of these two ROE calculations is necessary to confirm the results of the breakdown of ROE

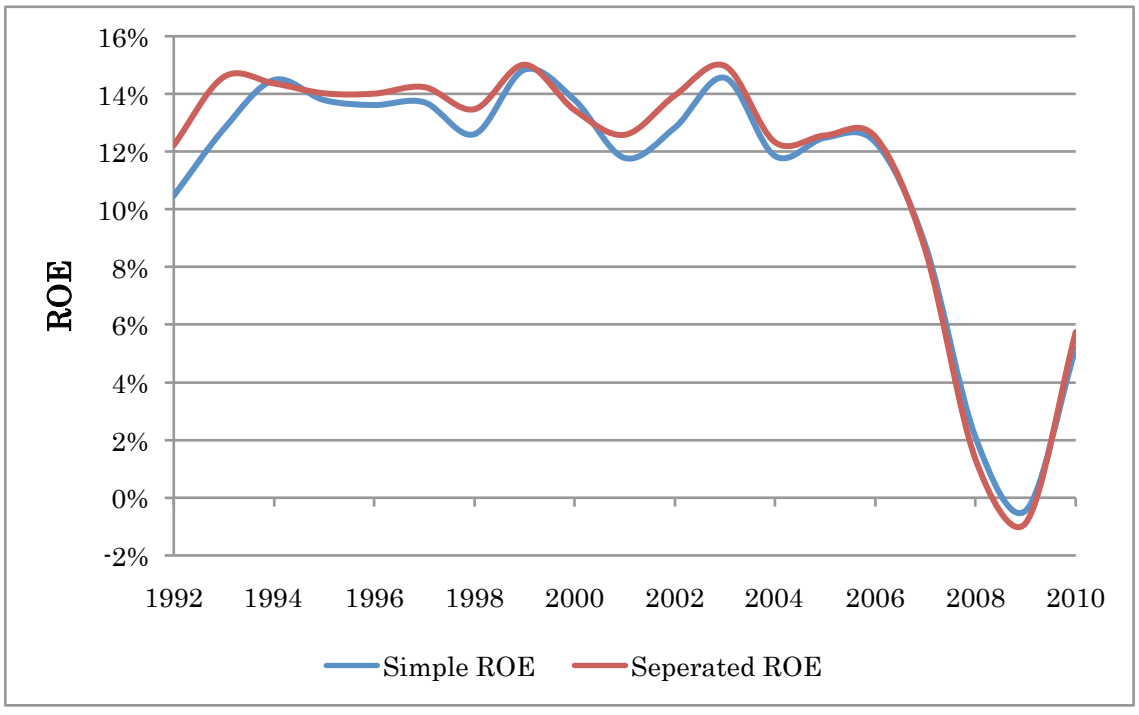

Figure 14 Simple and Haldane ROE of U.S. commercial banking sector, 1992 to 2010
Source: FDIC and author's calculations

The breakdown of ROE into the four components is shown in figure 15 below. The results show a peak in financial leverage in 2008, followed by the steep drop 2009 and 2010. However there is no correspondingly significant movement in any of the other factors.

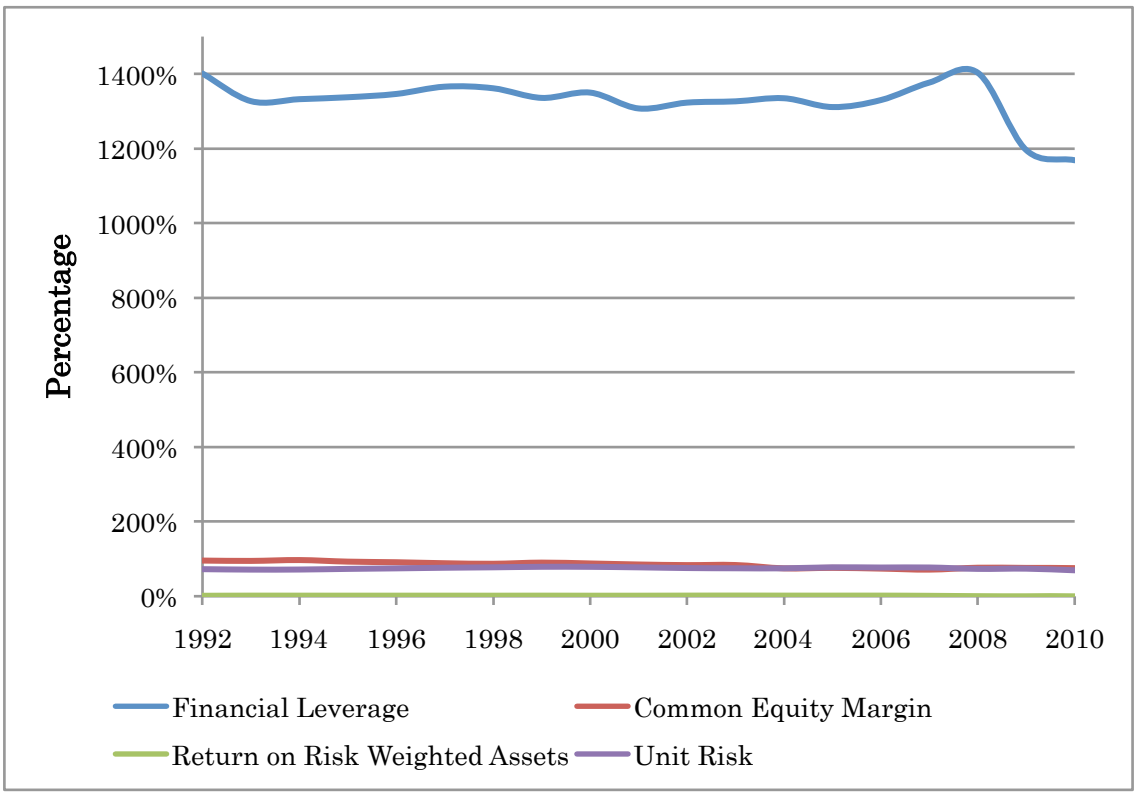

Figure 15 Breakdown of ROE of U.S. commercial banking sector, 1992 to 2010.
Source: FDIC, and author's calculations

According to these results we cannot see a direct relation between increase in financial leverage and high ROE for the period of 1992 to 2010. In fact, when financial leverage is at its peak of 14.03 in 2008, total ROE is near its lowest point 1.33%. To explain this we further examination of the components of the Haldane ROE equation is warranted. The data for this figure are also provided in table 8 below, which presents a detailed year-by-year comparison of the four components of the Haldane ROE equation.

Table 8 Breakdown of ROE of U.S. commercial banking sector, 1992 to 2010

Year	Total ROE	Financial Leverage (times)	Common Equity Margin	RoRWAs	Unit Risk
2010	5.74%	11.68	76.04%	0.93%	69.50%
2009	-0.88%	11.96	75.92%	-0.13%	73.91%
2008	1.33%	14.03	76.43%	0.17%	73.29%
2007	8.58%	13.77	71.34%	1.13%	77.01%
2006	12.51%	13.30	74.05%	1.65%	76.94%
2005	12.56%	13.11	76.02%	1.63%	77.45%
2004	12.32%	13.35	74.71%	1.65%	74.78%
2003	14.97%	13.26	83.61%	1.80%	74.92%
2002	13.94%	13.23	83.40%	1.67%	75.56%
2001	12.58%	13.07	85.06%	1.46%	77.43%
2000	13.43%	13.50	87.80%	1.44%	78.78%
1999	15.01%	13.36	90.10%	1.58%	78.92%
1998	13.47%	13.61	87.00%	1.47%	77.49%
1997	14.23%	13.66	88.41%	1.54%	76.35%
1996	14.01%	13.46	91.11%	1.53%	74.70%
1995	14.02%	13.37	92.73%	1.54%	73.28%
1994	14.36%	13.32	96.92%	1.55%	71.54%
1993	14.59%	13.27	94.68%	1.63%	71.35%
1992	12.22%	14.01	95.57%	1.26%	72.51%

Source: FDIC and author's calculations

4.4 Increased tail-end risk exposure and competition among U.S. commercial banks

The results of this analysis show the derivatives[18] reported among U.S. commercial

[18] As previously discusses, this includes: interest rate contracts, futures and forward contracts, written option contracts, purchased option contracts, foreign exchange rate contracts, commitments to purchase foreign currencies and U.S. dollar exchange, spot foreign exchange rate contracts and contracts on other commodities and equities

banks, have grown nearly exponentially from 1992 to 2010, taking only a short pause in 2008 for the sub-prime crisis, as previously show in figure 2.

In 1992 the total assets reported by the U.S. commercial banking sector was around $3,506 billion dollars, and this grew to around $12,066 billion in 2010. However, the growth in derivatives far outpaced this growth. In 1992 derivatives reported by the sector were around $8,765 billion, or roughly 2.5 times the amount of total assets reported by the sector, see figure 16. This is in stark contrast to 2010, when total assets reported were around $12,066 billion and derivatives topped $232,190 billion, or roughly 19 times the total assets. This is a large increase in a group of assets that carry large tail-end risks.

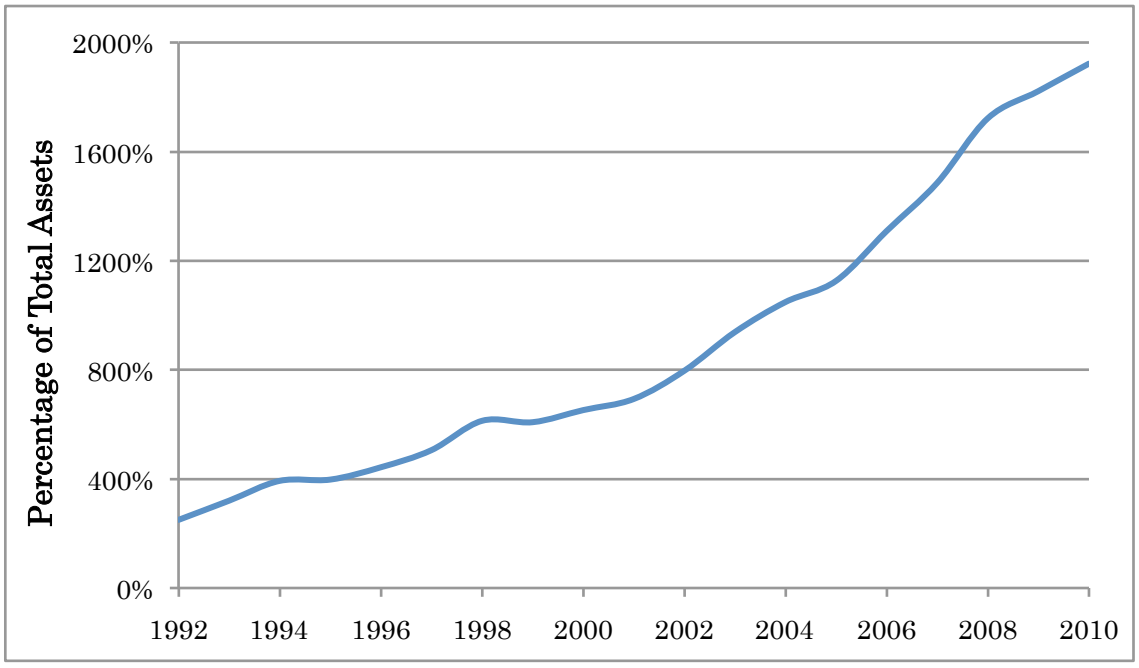

Figure 16 Derivatives as a percentage of total assets for U.S. commercial banking sector, 1992 to 2010
Source: FDIC

Competition in the U.S. commercial banking sector as evidenced by the issue of new charters has also experienced some increases. Following the savings and loan

scandal of the 80's and 90's new charters were held under 50 per year. However this starts to increase around 1994, peaking around 230 in 1999. A drop in new charters and a subsequent increase peaking again in 2008 at around 175 follow this increase. When the sub-prime crisis started unfolding, and banks began failing, as previously shown in figure 3, new charters came to a abrupt halt approaching zero in 2010, see figure 17 below.

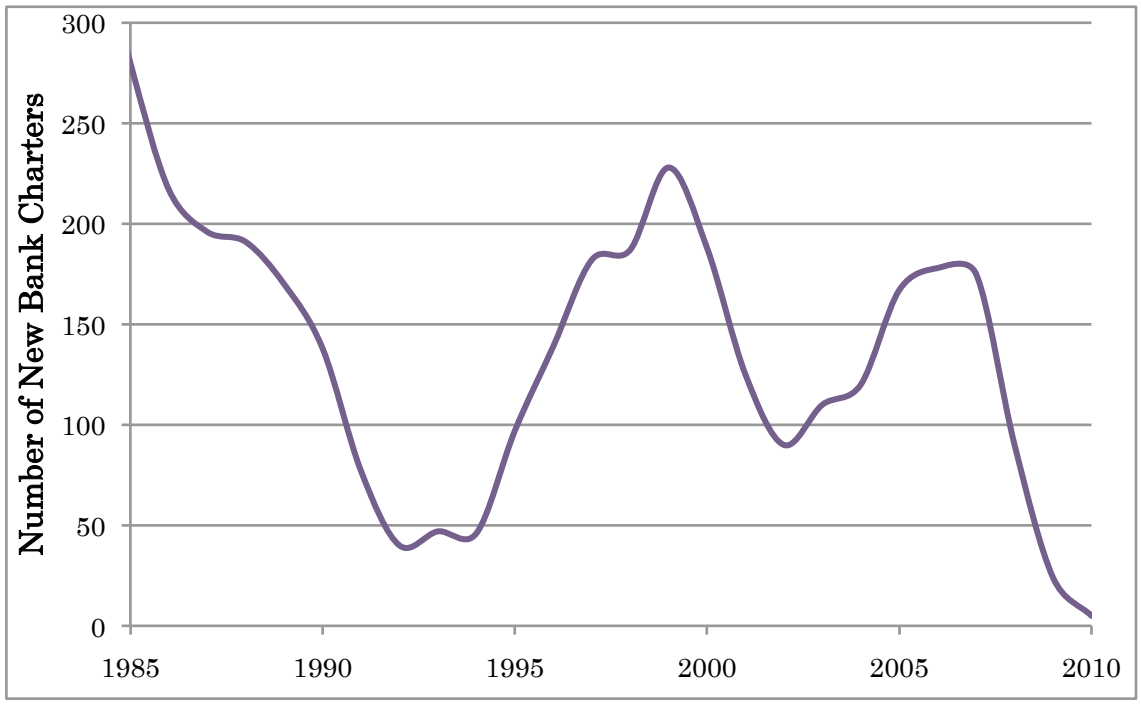

Figure 17 New charters issued in U.S. commercial banking sector, 1992 to 2010
Source: FDIC

Using Davis's (1995) framework of financial crisis, derivatives represent a financial innovation, which was heavily used but poorly understood, due to its complicated nature novelty. However financial innovation alone is not enough to cause instability but combined with increased competition the seeds of crisis are laid. The implications of the impact of tail-end risk and competition, on financial stability will be discussed in the next chapter

Chapter Five
Discussion of Results

Most of the results presented thus far confirm my main argument of my research, that current conventions are misrepresenting the true nature of the financial sector, i.e. the problems associated with FISIM, ROE and tail-end risks. I will now discuss the results in relation to how they serve to prove or disprove my hypotheses.

5.1 Answering Hypothesis 1

Hypothesis 1: ***Adjusting the calculation of the loan-side FISIM of the U.S. commercial banking sector to reflect term premium and default risk will lead to a reduction in loan-side FISIM***

This hypothesis was largely confirmed by the results presented comparing the standard to risk-reflected FISIM outcomes, as shown in figure 9 and table 7. However, this hypothesis was not completely confirmed due to the few in which the risk-reflected FISIM outcomes of Eichmann and Fixler and Zieschang was higher than the standard FISIM, see figures 10 and 11 respectively. As discussed earlier, the presence of a risk-reflected FISIM outcome which is higher then the standard risk-free FISIM is possibly indicating a period when banks are not to increase their risk premium to cover the risks in the sector. This could be due to excessive competition, which forces banks to aggressively compete for deposit and loan customers (Davis 1995, p. 219), or due to excessively low interest rate policy of the FRB.

As discussed many times over in this paper, the discussion in regard to the FISIM output of U.S. commercial banks centers around two issues, the choice of and

use of reference rate and the issue of including or excluding risk from the measurement. The results from the standard and risk-adjusted FISIM analysis highlight these issues very clearly. First, the wide difference in FISIM output between the risk-free and risk-reflected calculations shows the relationship between FISIM output and the reference rate used. The problem is that there is no universal agreement on a reference rate to use. The SNA guideline merely states that the reference rate should equal a "risk-free rate" of borrowing. However, due to the variety and complexity of markets in which commercial banks deal, the argument for using a risk-free rate is losing ground.

A second issue brought out is the problem of using a single reference rate as opposed to several reflecting the maturity of the loans and or deposits. Commercial banks have many categories of loans, each with different maturities and risk profiles. Applying one reference rate to the whole basket of loans is less than accurate and sure to give false outcomes, as previously discussed.

The difference among the four risk-adjusted methods also requires further examination. The Eichmann and Fixler/Zieschang approaches gave similar results; generally lower than risk-free FISIM except for a few years where it was higher. The Collangelo/Mink and Basu/Inklaar/Wang approaches also resembled each other; both resulting in a much lower FISIM output, than the risk-free FISIM.

One possible explanation of the low FISIM result of the Colangelo/Mink and Basu/Inklaar/Wang approaches can be explained by their use of a market reference, as opposed to a banking one. The argument is that banks have a lower risk compared to capital markets; therefore if you apply a market reference rate to a bank loan, the risks will be drastically overestimated, (Fixler and Zieschang 2010, Ashcraft and Steindel 2008).

5.2 Answering hypothesis 2

Hypothesis 2: ***The high ROE of the U.S commercial banking sector reported in the years 1994 to 2003 was mainly due to an increase in the assumption of risk in the form of financial leverage.***

This hypothesis was not verified because the link between increasing financial leverage and increasing ROE was not shown in the results. The presence of high financial leverage of 14.03 corresponds to the one of the lowest total ROE reported of 1.33. This result could be due to the fact that after the crisis, the top of the equation (pre-tax net operating profit - applicable income taxes) decreased sharply, while the bottom of the equation (equity capital) remained stable, thus pushing the ROE to near negative territory in 2008 and negative in 2009. At the same time financial leverage was stable and even increasing slightly, because the top of the equation (total assets) decreased slightly following the crisis, while the bottom of the equation (tier 1 capital) increased slightly. The results showed while the financial leverage was high, there was no direct link between fluctuations in financial leverage and ROE however, it is possible that analyzing data for a longer time period could give a better result.

5.3 Answering hypothesis 3

Hypothesis 3: ***The increase in tail-end risk exposure, as represented by financial innovations of derivatives, in combination with increased competition in the banking sector, contributed to increased to financial instability and the recent sub-prime financial crisis.***

This hypothesis was largely proved, but full confirmation remains to be achieved. While the growth in derivatives correspond increase in competition, there may be other

factor involved. What is more important is applying the two factors to the framework of Davis. Davis argued that a new innovation paired with increase in the competition has repeatedly preceded financial crisis. In this light, we can see derivatives as the financial innovation and combined with the increase in bank charters and thus competition among banks, the use of derivatives became a growing tool to increase returns while expanding tail-end risk. The two factors fit perfectly within the framework of Davis in explaining the role of derivatives and competition in increasing financial instability preceding the sub-prime crisis.

5.4 Other findings

A potentially important incidental finding, one I had not anticipated, is the link between the findings of hypothesis 1 and 3. For the years of 1999 and 2004 there was an interesting result of all four risk-reflected FISIM techniques showed a reduction, while the next year, 2000 and 2005 respectively, the risk-reflected FISIM all increased, while the risk-free FISIM dropped dramatically. Initially I assumed this was just a time lag, or that the risk-free rate was somehow following the risk-adjusted. However, another explanation is the link between increased competition and the use of financial innovation as show in hypothesis 3.

When competition increases, banks have to compete more aggressively for deposits, which reduces the spread between deposit and loan rates (Davis 1995, p. 219). Even if risk is increasing in the economy, as can be witnessed by the increase in derivatives and securitization, banks are not increasing the risk premiums, they in fact were reducing them, as shown in a drop in the risk-reflected FISIM. A possible reason for this is the increase in competition as argued by Davis. The implication of this for

the FISIM output is that competition in the banking sector may lead to an underestimation of the risk premium needed to cover risk, as seen when risk-reflected FISIM drops and risk-free FISIM does not. While this was argued by Davis, and thus is not a new idea, what is new is that *FISIM may be able to serve as a warning or notification when banks are under pricing risk*. While this is not the intention of the SNA in creating FISIM, it could be develop further into a kind of early warning measurement for the banking sector, to show when they are engaging in risk behavior which contributes to financial instability and possible financial crisis.

Chapter Six
Summary and Conclusions

This chapter will provide a brief summary, highlighting the main points and findings, as well as explain how the findings address the research objectives and questions. Following this I will provide the limitations of this research and the areas of further where further study is needed.

6.1 Summary

In this thesis I argued that while the financial sector has undergone major growth in the last 50 years, that at least recently this growth has been built on an increasing assumption of risk. In order to proved my argument I looked at the problems associated with FISIM, ROE and the increase of tail-end risk assumption in the U.S. commercial banking sector.

I first examine the problems associated with measuring the implicitly charged services through FISIM. I found that adjusting loan-side FISIM to reflect risk led to a reduction, and that the choice of reference rate largely affects the outcome of the calculation of FISIM. Correspondingly, due to the lack of definition by regulators as to a proper reference rate, FISIM thus does not reflect a clear situation of finance in the economy.

I next show that by breaking down the ROE of the U.S. commercial banking sector it can be seen that financial leverage may be responsible for the historically high ROE. However this result cannot be completely verified due to the short nature of the study I conducted, so further research is needed to confirm this assumption.

Following this I examined the increase in both tail-end risk exposures as represented by derivatives, and the increase in competition among banks. I measured the derivatives reported on bank balance sheets and the new charters issued in the commercial banking sector, two factors which Davis (1995) shows to be contributors to financial fragility. Thus the combination of these two factors may have contributed to the sub-prime crisis.

Finally, I found that it might be possible to use a risk-reflected FISIM as a signal to warn when banks are engaging in risky behavior, by not estimating the proper risk premium to cover risks should they materialize. The implications of this last finding, while still preliminary in nature and requiring much work to uncover its plausibility, could prove to be a tool for monitoring banks risk pricing abilities.

6.2 Conclusion

To provide a conclusion I will review my research objectives and question and show how my research addressed each of this areas.

The objectives of my research were:

1) To gain a deeper understanding of how FISIM functions to measure implicit services of the financial sector, and secondly to show how risk affects the calculation of FISIM with the case of the U.S. commercial banking sector. I hope to add to this body of research with my analysis of the loan-side FISIM of the U.S. commercial banking sector.
2) To examine the ROE of the U.S. commercial banking sector leading up to the sub-prime crisis, to discover what factors were responsible for the increasingly high ROE

3) To look at the increase of Tail-end risk in the U.S. commercial banking sector, and analyze its impact of financial fragility.

These objectives were all met thought the research provided in the literature review and the analyses conducted.

I showed with my analysis of the standard and risk-reflected FISIM the relationship between reference rate and FISIM output. I also showed how then banking sector sometimes underestimates the required risk premium, as evidenced by the times when risk-reflected FISIM is higher than risk-free FISIM. I also showed by breaking down the ROE of the U.S. commercial banking sector that while having a high amount of financial leverage, it cannot be confirmed that the ROE is solely built upon this factor alone. Further research is needed here to confirm this hypothesis. Finally by applying the framework of Davis I made an argument for the combined roles of derivatives and competition in increasing financial instability and contributing to the sub-prime crisis. The excessive use of financial innovations by new entrants or low skilled banks is a possible factor in increasing the financial fragility.

My research questions are as follows:

1) Are the implicit services provided by the commercial banking sector properly reflected by the standard calculation of FISIM?
    a) What is the impact of risk, in particular term premium and default risk, in the FISIM measurement?
2) What factors have the biggest influence in raising the ROE of the U.S. commercial banking sector?
3) What is the role of the growth in tail-end risk exposure, as represented by derivatives,

in contributing to financial instability and the sub-prime crisis?

In answering question 1, I showed how the various risk-reflected FISIM methods all serve to adjust FISIM to reflect the element of risk. I concluded than term premium and default risk generally act to increase FISIM. However this is not necessarily an overstatement of FISIM as Haldane, Brennan and Madouros claim because if banks increase the risk premium to cover increasing risks in the sector, this will mechanically boost FISIM.

To answer question 2, I broke down the ROE of the U.S. commercial banking sector into separate components, showing that financial leverage while high is not in isolation responsible for the high ROE.

To answer question 3, I analyzed both the growth in derivatives and competition among U.S. commercial banks, and then applied the framework of Davis (1995) to show how these factors can contribute to financial fragility, and thus could have contributed to the sub-prime crisis.

6.3 Limitations

The limitations of this research are include; first, each analysis used aggregate data for the entire U.S. commercial banking sector, as opposed to analyzing the data for individual banks. Aggregate data has the advantage of being easily available, but the disadvantage of being a simplified picture, or merely an average of the banking sector. A different approach could have been to take a sample of banks and looking at their individual balance sheet and income statement data.

A second limitation is that I used many previously designed models, which each have some assumption and limitations of their own, however, I attempted to limit

these as much as possible in adapting the models to fit my analysis. Included in this are two of the risk-reflected FISIM methods I used, which were developed to measure European FISIM and thus required converting the variables to fit the U.S. case.

A fourth limitation is the equation used to breakdown the ROE of commercial banks. This equation assumes that the risks of the risk-weighted assets are correctly accounted for, but it has been argued that risk-weighted assets may not perfectly capture relative credit risks (Davis, 1995 p. 105).

A fifth limitation is in showing the link between derivatives and competition on financial fragility. While these two factors fit with in Davis's framework, there are many other factors coexisting simultaneously, which also may create financial instability. Therefore it is difficult to isolate specific factors that are solely responsible of financial crisis.

6.4 Areas of further research

There is still much research, which needs to be done in relation to the calculation of FISIM. While this paper has focused on the practical measurement techniques and applied them to the U.S. commercial banking sector, thus progressing the discussion a bit further, more research is needed on the conceptual framework of FISIM. I have just scratched the surface of some of these issues.

Another area of potential importance is the possibility of using risk-reflected FISIM as a warning when banks are not pricing risk correctly. As evidenced by the years when risk-reflected FISIM dropped in relation to risk-free FISIM, banks may not be increasing the risk premiums to a level able to cover the risks should they materialize. However, much more research is needed if this incidental result is to be confirmed.

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