

# The New Face of Commercial Banking

Alex Fayman, Su-Jane Chen and Paul Camp

Metropolitan State University of Denver, USA

---

This research examines the performance of U.S. commercial banks leading up to the Great Recession and in the years post October 2008 government bailout of the banking system. Of particular interest was to investigate whether the government rescue augmented the level of moral hazard on the part of bank executives or, on the contrary, resulted in reduction of risk in the financial services industry. By looking at key bank performance metrics, this research also analyzes whether bank behavior was affected by the Fed monetary policy stance (restrictive or expansive) during 2000-2017 examination period. Furthermore, this study looks into the impact of Dodd-Frank Wall Street Reform and Consumer Protection Act on bank performance. The results indicate that post 2008 bailout and 2010 passage of Dodd-Frank, U.S. commercial banks became more conservative in management of liquidity, risk, and capital. This research does not find evidence of increased moral hazard post financial crisis. Furthermore, in the same period, banks have become more efficient and boosted their dependence on core deposits as opposed to purchased funding.

*JEL classification:* G0, G1, G2, G4

*Keywords:* Commercial Banking

---

## 1. Introduction

The financial crisis of 2007-2009 that has become known as the Great Recession had its origins in a number of complex and not always integrated factors that all came together to create a perfect storm that became the first financial crisis of the 21<sup>st</sup> century. The years leading up to 2008 could be described as time of economic confidence infused with an unhealthy dose of hubris. There were deafening voices proclaiming a new era of economic prosperity to which the old rules did not apply. Yet the tightening banking regulations of the 1990s were the ones that strengthened the industry post the 1980's Savings and Loans debacle. Indeed, it was widely believed that the passage of regulations such as the Federal Deposit Insurance Corporation Improvement Act of 1991 that strengthened the banking system by requiring banks to compute their capital holdings based on the risk of their asset portfolios.

FDICIA of 1991 resulted in higher levels of capital and lower levels of risk at depository institutions, while at the same time the introduction of PCA (Prompt Corrective Action) posed a threat of immediate shutdown in case a bank dabbled in risky lending or investments and was flirting with insolvency (Aggarwal et al., 2001; Jacques et al., 1997). This sense of confidence in regulatory dialectics lulled regulators into a false sense of security, even as banks financially engineered new ways to

securitize assets without actually removing the risk off their balance sheet. These newly engineered processes exposed financial institutions to recourse even as they simultaneously reduced the level of regulatorily required capital. This was one of the precursors that led to the financial meltdown of 2007-2009 (Acharya et al., 2013). What happened is somewhat reminiscent of Enron Corporation, which created special vehicles to hide liabilities from the market even as the firm simultaneously generated higher profits as a result of the practice.

A search for the cause of the financial meltdown and the ensuing Great Recession could begin with a look at the expansionary monetary policy pursued by the Federal Reserve following the burst of the dot-com bubble and the September 11<sup>th</sup>, 2001 terrorist attacks. The Fed, in an effort to keep the looming recession shallow and short, flooded the markets with liquidity that planted the seeds and paved the way for an unmatched liquidity shock experienced by the U.S. financial system (Gorton et al., 2012). As the financial markets were doused with cash, U.S. banks glided under the aging regulatory radar with insufficient capital to deal with the unmitigated storm headed their way. At that time, banks actually increased their dependence on short-term purchased funding even as the restraints of corporate governance were loosened by executive compensation packages that incentivized greater forbearance of risk and rewarded short-term performance and encouraged increased investment in subprime obligations (Beltratti et. al., 2011, Ellul et al., 2013).

At the same time in the housing market, fresh legislative changes made it profitable for banks to look beyond their traditional market of credit-worthy, AAA-rated borrowers (Allen et al., and Leonello, 2015). Additionally, laws such as the Financial Services Modernization Act of 1999 and the Community Reinvestment Act (CRA), originally passed in 1977 and amended several times through the years leading up to the Crisis, slowly expanded the scope of banks' business operations and services that they could provide. These new laws allowed for new risky business avenues. In case of CRA, one can argue, increased risk was further encouraged and even legislated. As a result, banks morphed into financial services centers from pure lending outlets, one of the reasons why they began to pursue riskier borrowers in the subprime real estate market. As an illustration, in 2001, 15% of the mortgages came from the subprime mortgage market. That percentage jumped to almost 50% during 2006 (Acharya et al., 2012). In addition, the character of these loans was putting the borrowers at risk as many featured low-to-no down payments, negative amortization options, introductory teaser rates, and ARMs (adjustable rate mortgages), whereby the borrower's payment would jump after an initial low payment period and continue to change in response to rates.

In addition, the legislative environment allowed banks to bundle and package tranches of subprime loans as collateralized mortgage obligations and sell them on the open market. Often, the originating institution got the loans off its books, and sometimes some degree of recourse remained with the originating institution (Acharya et al., 2013). The purchasers of the securitized debt obligations relied on the

investment grade rating to justify the transactions and the credit rating agencies, in search for repeat business, did not disappoint their customers (originations institutions) and awarded them with investment grade credit ratings.

As the Federal Reserve began moving away from its easy monetary policy in late 2004, interest rates began to rise in 2005 and 2006. Consequently, required payments on ARMs began to go up and default rates in the subprime market started to increase and continued to gain momentum into 2007. The ever-increasing loan defaults led to the failure of U.S. mortgage lenders and eventually 417 banks and thrifts (Gilbert et al., 2017). Financial institutions that had purchased complex mortgage-backed securities, unsure of their risk exposure, began hoarding liquidity, causing further tightening in the credit markets and a general perception that the worst was yet to come (Fратиanni et al., 2010).

During the 19 months, beginning July 2007, the largest 120 banks in the United States, Western Europe and the Pacific Region lost \$3.23 trillion in market capitalization (Fратиanni et al., 2010). Computer models projected that in the absence of fiscal and monetary policy interventions by Federal Reserve and Congress on the scale that was in evidence during 2008-2010, America would likely have experienced a second Great Depression. It is speculated that the 2010 GDP would have been 11% lower than what it actually registered, 8.5 million additional jobs would have been lost, and the American economy would be mired in a deflationary spiral (Blinder et al., 2010).

Though it may not be a comforting conjecture, the crisis of 2007-2009 was not unique and followed a pattern documented by researchers. The pattern begins with a central bank in pursuit of increased liquidity or easy money that increases prices of assets such as real estate. That stage is eventually followed by tightening of credit, which leads to increasing rates, falling prices, and defaults by firms or agents that made investments at inflated prices (Allen et al., 2000). The 10-year since the first major financial crisis of the 21<sup>st</sup> century marks a special opportunity for a retrospective. Given the depth and severity of the crisis, it is of importance to examine whether the American banks learned their lesson and changed their behavior. Since there is support for the hypothesis that government guarantees pave the way for moral hazard at banking institutions, this research examines how banks responded post crisis, especially in light of new tightening regulations.

Given the preceding discussion, the goal of this research is to analyze the impact of the Emergency Economic Stabilization Act, including the Troubled Asset Relief Program (TARP), Basel III and its stricter capital and liquidity requirements, as well as Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) and its increased regulatory burden on U.S. banks in the aftermath of the Great Recession. Did the government bailout augment systemic levels of moral hazard or did Basel III, Dodd-Frank, and the depth of the credit crisis curtail bank risk? Duchin et al., (2014) show that banks that received TARP funding tended to invest in riskier loans and securities. The findings suggested that Too Big to Fail firms were the likeliest to

follow down that path because they received the greatest amount of relief from the government. Since Dodd-Frank was enacted, in part, to reduce, if not to fully eliminate, such government relieving initiatives to prevent risk-seeking behavior, time will show if these government initiated rescues were effectively eliminated because the perceived value of TBTF cannot be understated when it comes to small banks and their depositors that do not qualify for such protections (Gilbert et al., 2013). In this research, we test the tightening effects of Dodd-Frank against moral hazard-inducing TARP bailout and examine their effects on bank performance and risk in the decade since that ominous October in 2008.

This research also aims to assess the impact of Federal Reserve policies (expansive versus restrictive) on key bank performance metrics and examine the changes in bank behavior post Great Recession that went beyond compliance with stricter capital and liquidity regulations. The timing of this study should be noted because October 2018 marks a 10-year anniversary of the Emergency Economic Stabilization Act of 2008 that resuscitated the banking system. Therefore, an examination of bank performance over the past decade is warranted. The analysis of the paper sheds light on whether or not the Great Recession, the bailout and heightened regulatory requirements resulted in risk-reducing adjustments to the way in which banks conducted business in the 10 years post government rescue.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes data and relevant variables. Section 4 covers methodology. Section 5 presents empirical test results. Section 6 includes concluding remarks.

## 2. Literature Review

Fahlenbrach et al., (2011) examined bank performance during the 1998 Russian currency crisis to determine the extent to which it predicted outcomes during the 2008 banking crisis. They considered two competing theories as the foundation of their study. Their "Learning Hypothesis" postulated that organizations can learn lessons from negative outcomes they encounter and change strategies so that if similar conditions arise again at some point in the future, those negative outcomes can be avoided. The authors also posited a competing "Business Model" hypothesis, which held that organizational structures were relatively static and fixed over time and thus firms had little or no ability to "learn" from the past. An organization with a strong Business Model culture would have as its model "We've always done it this way," and would likely do it again with similar outcomes.

The finding of Fahlenbrach, et al., (2011) supports the "Business Model" hypothesis and demonstrated that bank management showed very little demonstrated ability (or willingness) to learn from past experience. In fact, past experience was found to be strongly predictive of results and behavior in future crises. In particular, research showed that greater reliance on short-term debt funding and higher rates of profit growth in the three years prior to the crisis predicted negative outcomes in future crises. Some argue that stronger regulations are capable of

curbing such behavior but research shows that regulations are only capable of mitigating such risk-seeking behavior when banks have strong and significantly large owners who can exert control over the management (Laeven et al., 2009).

Strong corporate governance is especially important in banking institutions because the inherently high leverage creates small margins for error that can dissipate quickly and leave depositors, investors, correspondent banks and FDIC (i.e. taxpayers) exposed. Indeed, bank executives have significant power influencing the value of a firm's assets and therefore its equity. Huizinga et al., (2012) report that bank balance sheets often inaccurately portray the true value of bank assets. Their findings show that in 2001, 8% of banks reported a market-to-book ratio below 1. That percentage rose to 60% by the end of 2008. This should not come as a surprise since the value of bank assets collapsed during that period (Gorton 2009; Diamond et al., 2011). According to James (1991), when banks fail, in many instances, there are unaccounted losses that are positively related to the size of the failing banks. Huizinga et al., (2012) also find that during the last financial crisis, banks overstated the value of their real estate loan portfolios and mortgage-backed securities by an average of 17% and 10%, respectively. The authors further stipulate that regulators were aware of these inconsistencies and chose to exercise increased forbearance in light of the ensuing financial meltdown.

Bank managers also exercise their discretionary power in recognizing potential losses on their loan portfolios. In particular, when it becomes apparent that an entire loan or a portion of a loan is going into default, bank managers have some latitude in deciding how quickly to recognize the loss and how large that loss should be. The size of the loss impacts the firm's balance sheet and income statement and could render it both unprofitable and insolvent. Beatty et al., (2011) determine that the speed with which banks recognize expected losses is positively related to lending ability during recessionary periods. Further, according to Beatty et al., (2011) banks that recognize expected losses more quickly tend to reduce their lending less during recessionary periods and are subject to fewer capital crunches. Thus, executive leadership affects firm performance leading up to a financial crisis and its ability to navigate troubled waters of a financial meltdown.

One of the most important factors in corporate governance that harnesses managerial behavior is executive compensation, which many believe was the root cause of the financial crisis (Tung et al., 2011). Blinder (2009) argued that poor incentive structure at U.S. banks was "one of the most fundamental causes" of the financial meltdown. In fact, when government instituted Troubled Asset Relief Program (TARP) through the passage of the Emergency Economic Stabilization Act of 2008 and tried to implement its Capital Purchase Program (CPP), strong banks opted out of the program, which sought to purchase equity in financial firms. As published, TARP contained bounds on executives earning above \$500,000 a year, causing many firms to not qualify for the program and/or to repay the government money faster post crisis (Bayazitov et al., 2012). Because executive compensation and

its equity and short-term focused structure have played an important role in bank risk appetite leading up to the financial crisis, research has focused on inside debt as a form of compensation. Research shows that when banks owe money to the CEO through deferred compensation or pension, they exhibit lower stock volatility, R&D spending, and leverage, and higher diversification and liquidity (Cassell et al., 2012; Edmans et al., 2011). Also, firms with greater levels of inside debt exhibited better performance and lower risk during the crisis (Tung et al., 2011) as well as lower dividend yield and dividend payout ratios (Eisdorfer et al., 2015). This research has the potential to help regulators curb moral hazard and risk-seeking behavior at banks by stipulating guidelines over executive compensation.

As valuable as inside debt may be in reducing bank risk, Murphy (1999) argued that "Stock ownership provides the most direct link between shareholder and CEO wealth." An analysis of incentive compensation at U.S. banks before and during the crisis revealed conflicting findings. According to Guo et al., (2015) incentive-based compensation was positively related to firm performance and value during the Great Recession. The research shows that the higher the proportion of incentive pay as a component of the total compensation package, the lower the probability of financial distress. The study also finds that Too Big To Fail banks tend to take more risk and have a greater chance of finding themselves in financial distress. Yet TBTF banks with greater levels of incentive pay post lower risk of insolvency. In researching similar questions, Fahlenbrach et al., (2011) find that firms whose CEO's interests are better aligned with the shareholders do not produce higher stock returns during the crisis.

The debate on what caused a banking crisis continues and certainly it is possible that executive compensation was significant in ushering the crisis. Arguably, financial meltdowns are historically preceded by some forms of deregulatory actions that ultimately derail the banking industry. One such example is the Savings and Loans crisis of the 1980s, which was preceded by a decade of deregulations and followed by retightening of the regulatory playbook. Several works have shown a relationship between a relaxation of financial regulation in the marketplace, incidences of a credit crisis (Allen et al., 2000) and shocks to the banking system (Caprio et al., 1996; Kaminsky et al., 1999).

The topic of moral hazard in banking operations was also explored by Acharya et al., (2012) with respect to optimal capital structure at depository institutions. The authors argued that if a bank's management made insufficient use of private leverage, bank's lenders would not be able to credibly threaten the bank with liquidation in the event of sustained underperformance in the marketplace. On the other hand, if management relied heavily on the use of private leverage, such conditions could foster an environment-enhanced motivation to take excessive risks in search of abnormal profits. In a banking institution such abnormal profits are typically obtained at a cost to depositors (to whom payments are discretionary) or in favor of private creditors (to whom payments are contractually required). As a solution,

Acharya et al., (2012) proposed a two-tiered capital structure for use in the banking industry. The first tier is designed to deter excessive risk taking and the second tier belongs to bank shareholders as long as the bank is solvent. However, this second tier could revert to the bank regulators (instead of the private creditors) in the event of insolvency.

This idea also underscores the Basel agreements (I, II, and III), which are internationally agreed-upon banking regulations that introduced their first installment in the 1980s. Specifically, Basel I (adopted in 1988) identified credit risk as the determining factor in the amount of capital required to be set aside to protect against losses in the event of failure of an asset. In 2004, a supervisory review and disclosure requirement was added and an operational risk component became part of the framework imposed by Basel II. Further, Basel III was initially adopted in January 2013 with plans for the guidelines to be phased in over the next six years. This accord introduced a new bank specific capital ratio and modified Basel II guidelines that attempted to mitigate moral hazard observed in the 2008 crisis. Specifically, Basel III imposed much stricter requirements regarding capital and liquidity on the balance sheets of US commercial banks in the years after 2013. Despite the goal of the Basel regulations to more properly account for bank risk with capital, research has shown that Basel II, which was enacted just a few years before the crisis to enhance protection against bank failure, actually magnified procyclicality in bank lending (Repullo et al., 2012).

It is true that government action may yield unintended consequences. It was long argued that FDIC, the taxpayer-backed insurance fund that protects deposits up to \$250,000, reduced depositor discipline and potentially augmented moral hazard on the part of bank executives. Regulators had to choose the lesser of the evils between bank runs and loss of depositor discipline. The concept of moral hazard has also been addressed as a consequence of other government guarantees, such as banking industry bailouts. In the European Union, significant public debate has arisen around large-scale public support of the financial sector, favoring provisions that force banks to bear a portion of costs to discourage irresponsible behavior. Allen, et al. (2015) propose that while government guarantees can be an effective tool in prevention of nationwide panic runs, it is conceivable that those same guarantees may provide perverse incentives for individual financial institutions to gamble with depositors' funds if the general public rather than the institution's own shareholders is on the hook for depositor losses. This is similar to the argument made by Acharya et al. (2012) and Allen et al. (2015), who argue that a regulatory shift that places a portion of depositor losses on banks' shareholders would help in reducing this source of moral hazard.

Given the rich literature examining causes of financial crisis, government bailouts and moral hazard, it is appropriate to study bank performance during the years post the 2008 bank bailout. This research identifies changes to bank balance

sheets and income statements and reveals whether there's evidence of moral hazard or a reversion to risk moderation in depository banking.

**Table 1**

Definition of constructed commercial bank sector's financial ratios.

<b>Panel A: Profitability Variables</b>	
Return on equity (ROE)	Total Income/total equity capital (%)
Return on assets (ROA)	Total Income/total assets (%)
Net interest margin	(Interest income – Interest expense)/earning assets (%)
Profit margin	Net income/(non-interest income + interest income) (%)
Non-interest income ratio	Non-interest income/total operating income (%)
<b>Panel B: Capital Adequacy</b>	
Capital ratio	Total equity capital/total assets (%)
Loan ratio	Total loans/total equity capital (%)
Deposit ratio	Total deposits/total equity capital (%)
<b>Panel C: Liquidity</b>	
Loans to assets ratio	Total loans/total assets (%)
Loans to deposits ratio	Total loans/total deposits (%)
Cash to total assets	(Cash + balances due from institutions)/total assets (%)
Government securities to total assets	Government securities/total assets (%)
Liquidity ratio	(Cash + securities)/total assets (%)
Deposits to liabilities	Total deposits/total liabilities (%)
<b>Panel D: Asset Quality</b>	
Expenses to revenue	Non-interest expense/non-interest revenue (%)
Loan loss allowance to total loans	Loan loss allowance/total loans (%)
Non-interest expense ratio	Non-interest expense/total assets (%)
<b>Panel E: Operating Efficiency</b>	
Fixed assets ratio	Fixed assets/total assets (%)
Personnel expense	Total personnel expense/total assets (%)
Assets to employees	Total assets/total employees (multiple)
Income per employee	Net income/total number of employees (multiple)
Service charges to total assets	Service charges/total assets (%)
<b>Panel F: Growth</b>	
Deposit growth	(Total assets <sub>t</sub> – Total assets <sub>t-1</sub> )/Total assets <sub>t-1</sub> (%)
Asset growth	(Total deposits <sub>t</sub> – Total deposits <sub>t-1</sub> )/Total deposits <sub>t-1</sub> (%)



### 3. Data and Derivation of Relevant Variables

#### 3.1. Financial ratios

Quarterly balance sheets and income statements spanning from the last quarter of 2000 to the end of 2017 for the commercial bank sector are retrieved from the website of the Federal Deposit Insurance Corporation ([www.fdic.gov](http://www.fdic.gov)). Twenty-four financial ratios are then constructed and then classified into six categories, reflecting the sector's profitability, capital adequacy, asset quality, liquidity, operating efficiency and growth, respectively. Table 1 lists the categorized ratios and Table 2 presents their descriptive statistics over the entire sample period, Q4 2000–Q4 2017.

The full sample period is then split into two sub-sample periods, with enactment of the Emergency Economic Stabilization Act of 2008 on Oct. 3 of the year (the bailout hereafter) as the dividing point in order to detect any significant mean difference for the 24 constructed ratios between the two subsample periods, Q4 2000–Q3 2008 and Q4 2008–Q4 2017. As a result, *Sub*, a dummy variable, is created, which assumes a value of one for the post bailout period and zero otherwise. In its response to government's aggressive expansion of regulation post the Great Recession to safeguard the financial system and soften, if not prevent, any future potential financial meltdown, the commercial bank sector is expected to go through dramatic structural changes with respect to its business model. If so, significant mean differences should be observed between the two periods for most, if not all, of the 24 formulated financial ratios.

#### 3.2 Monetary policy stance measure

While commercial banks' reliance on fee-based income has increased over time, it still accounts for no more than one third of total operating income. The dominance of loan related interest income to the sector's bottom line makes the sector highly interest rate sensitive. Consequently, Fed monetary policy stance dictating a rising rate or a falling rate environment can have a significant impact on commercial banks. Thus, the study also intends to examine the impact of monetary policy change on the sector's structural shift between the two subsample periods. Following Jensen et al., (1996), Johnson et al., (1998), and Johnson et al., (1999), discount rate changes set by the Federal Reserve are adopted as the monetary policy switch indicator.

A series of quarters is assumed to be under the same monetary policy until a discount rate change reverses its direction. Accordingly, monetary environments are categorized as expansive (restrictive) during a rate decreasing (increasing) period. Time series data of discount rate are taken from the website of the Federal Reserve Bank of New York (<http://www.newyorkfed.org>). *DR* denotes the dummy variable of changes in the discount rate. It takes a value of one during expansive monetary periods and zero otherwise. Over the entire sample period of 69 quarters, there were seven discount rate-change series in total, three expansive periods consisting of 22 quarters and four restrictive periods composed of 47 quarters. Table 3 depicts the duration of each monetary expansion and restriction.

**Table 2**

Descriptive statistics of constructed commercial bank sector's financial ratios, Q4 2000-Q4 2017.

	Mean	Maximum	Minimum	Std Dev
<b>Panel A: Profitability Variables</b>				
Return on equity (ROE)	0.0568	0.1354	-0.0102	0.0354
Return on assets (ROA)	0.0059	0.0124	-0.0011	0.0035
Net interest margin	0.0213	0.0379	0.0075	0.0095
Profit margin	0.1567	0.2247	-0.0340	0.0640
Noninterest income ratio	0.3095	0.3627	0.2433	0.0328
<b>Panel B: Capital Adequacy</b>				
Capital ratio	0.1050	0.1151	0.0849	0.0090
Loan ratio	5.4281	7.2195	4.5251	0.7706
Deposit ratio	6.6616	7.7608	6.1252	0.3831
<b>Panel C: Liquidity</b>				
Loans to assets ratio	0.5632	0.6126	0.5172	0.0328
Loans to deposits	0.8142	0.9356	0.6890	0.0988
Cash to total assets	0.1295	0.2410	0.0482	0.0683
Government securities to total assets	0.1270	0.1533	0.0861	0.0173
Liquidity ratio	0.3196	0.4481	0.2062	0.0830
Deposits to total liabilities	0.7796	0.8683	0.7113	0.0605
<b>Panel D: Asset Quality</b>				
Expenses to revenue	1.5593	1.7893	1.3674	0.1317
Loan loss allowance to total loans	0.0182	0.0363	0.0108	0.0067
Noninterest expense ratio	0.0183	0.0325	0.0064	0.0082
<b>Panel E: Operating Efficiency</b>				
Fixed assets ratio	0.0092	0.0118	0.0071	0.0013
Personnel expense	0.0081	0.0137	0.0031	0.0035
Assets to employees	6067.02	8388.39	3898.06	1374.42
Income per employee	34.74	82.20	-6.77	21.79
Service charges to total assets	0.0018	0.0036	0.0005	0.0009
<b>Panel F: Growth</b>				
Deposit Growth	0.0149	0.0353	-0.0091	0.0101
Asset Growth	0.0126	0.0369	-0.0228	0.0123

## 4. Methodology

### 4.1. Mean difference assessment

First, for each of the 24 financial ratios constructed for the commercial bank sector, its respective means for the two subsample periods, pre-bailout period and post-bailout period, are calculated. The t-test is then performed for the mean difference. Under the null hypothesis, the mean difference is equal to zero. Rejection of the null hypothesis supports the notion of structural changes undertaken by the commercial bank sector in its adaption to the operational environment post bailout.

**Table 3**  
Federal Reserve discount rate change series, 1999-2018.

Series	Increasing or decreasing	Monetary stance	Periods	Sample quarters in series	DR
1	Increasing	Restrictive	8/1999–12/2000	1	0
2	Decreasing	Expansive	1/2001–12/2002	8	1
3	Increasing	Restrictive	1/2003–5/2003	1	0
4	Decreasing	Expansive	6/2003–5/2004	4	1
5	Increasing	Restrictive	6/2004–7/2007	13	0
6	Decreasing	Expansive	8/2007–1/2010	10	1
7	Increasing	Restrictive	2/2010–	32	0

#### 4.2. Industry structural shift over time

To launch a formal investigation of the impact of operating environment in the post bailout era on commercial bank sector's standing on the six evaluation areas, nine of the 24 constructed financial ratios are identified as the performance metrics. To be more specific, ROE and noninterest income to total operating income for profitability, capital ratio (total equity to total assets) and loan ratio (total loans to total equity) for capital adequacy, loan loss allowance to total loans is selected for the measure of asset quality, total loans to total assets and liquidity ratio defined as the sum of cash and securities over total assets for liquidity, total assets to total employees for operating efficiency and asset growth were selected to evaluate bank performance. For each of the identified key financial ratios, a simple regression in the form of Equation (1) is then performed. In total, nine simple regressions are to be executed.

$$FR_t = \alpha_1 + \beta_1 Sub + \varepsilon_{1t}, \quad (1)$$

where  $FR$  is one of the nine identified key financial ratios,  $Sub$  is the dummy variable for the subsample periods, which is assigned with a value of one during the post bailout period and zero otherwise. Given dramatic changes adopted by the sector to be in full compliance with aggressive regulation mandates in the era after the financial meltdown,  $\beta_1$ , the regression coefficient loaded on  $Sub$ , is expected to be statistically significantly different from zero. Furthermore, the associated sign of the regression coefficient would shed additional light on the effect of changing operating landscape on the sector's performance over time.

Undeniably, commercial bank sector's shakeup in the past decade has been mainly driven by heavy, post-crisis regulations. Banks are required to beef up their capital and liquidity and strengthen their balance sheets to withstand enhanced rigor of stress testing. This should drive up asset quality proxied by loan loss allowance to total loans, capital ratio, and liquidity ratio, leading to a positive number for  $\beta_1$  in Equation (1). Given the demise of the subprime mortgage loans and their pivotal role

to the 2007-2009 financial crisis, commercial banks are expected to adopt a conservative approach in loan underwriting. Loan volume, in turn, is anticipated to decline from the pre-crisis level. So are total assets due to banks' writing off hundreds of millions of nonperforming assets. Both factors, along with hefty regulation compliance costs, will undoubtedly put a downward pressure on the banks' bottom line and force them to rely more heavily on fees/noninterest income for its earnings generating power post bailout. As a result, asset growth, loan ratio, total loans to total assets, and ROE are all anticipated to fall in the post-crisis period, yielding a negative  $\beta_1$ , while noninterest income as a percentage of total operating income shall rise over the same time period, producing a positive  $\beta_1$ .

Other major developments featuring the operating landscape of the banking sector in general include rapid technology evolvement and relentless competition imposed by mushrooming technology-savvy fintech firms. To keep up with technology, to meet tech-adapting consumers' banking needs, and to fend off the intensified competition, the sector is expected to invest heavily to overhaul its operational and technology infrastructure. This would further squeeze the sector's bottom line. The sector, operating on a thinner margin, most likely would be prompted to trim its work force to reduce its operating costs and drive up its operating efficiency. In turn, total assets to total employees is expected to rise over time. This implies that  $\beta_1$  in Equation (1) should carry a positive sign.

#### 4.3. Differential impact of monetary policy on the structural shift over time

To test whether monetary policy regime change adds any additional explanatory power to the structural shift experienced by the commercial bank sector over time, a dummy variable,  $DR$ , is created to capture the monetary policy environment. As stated in the previous section, the variable bears a value of one during expansive monetary periods and zero otherwise. Chen (2012) looked into business cycle, contraction vs. expansion, as a potential differentiating factor to the impact of monetary policy on hospitality stock returns. He constructed two interaction dummies,  $DR \times BC$  and  $DR \times (1 - BC)$ , with  $DR$  and  $BC$  equal to one for restrictive monetary regime and business contraction, respectively, and zero otherwise, and included both as independent variables in his multiple regression analysis. Chen, based on his test results, concluded that monetary policy stance has a stronger impact on hospitality stock returns when businesses were contracting than when they were expanding. Following Chen, a set of nine multiple regressions in the form of Equation (2) will be implemented.

$$FR_t = \alpha_2 + \beta_{21}Sub \times DR + \beta_{22}Sub \times (1 - DR) + \varepsilon_{2t}. \quad (2)$$

As defined previously,  $Sub$  here takes a value of one for the post-bailout period. Thus, both  $\beta_{21}$  and  $\beta_{22}$  should bear the same sign as their corresponding  $\beta_1$  in Equation (1).  $DR$ , as noted earlier, carries a value of one under the expansive monetary policy stance and zero otherwise. Therefore,  $\beta_{21}$  and  $\beta_{22}$  capture, respectively, the influence of expansive and restrictive monetary policies on the shift

of commercial bank sector's key financial ratios over time. In turn, the spread between  $\beta_{21}$  and  $\beta_{22}$  represents the differential impact of changing monetary policy stance on the key ratios post bailout. A positive difference between the absolute values of  $\beta_{21}$  and  $\beta_{22}$  (i.e.,  $|\beta_{21}| - |\beta_{22}| > 0$ ) signifies that the sector's structural shift over time is more pronounced in an expansive monetary environment than in a restrictive monetary environment. The opposite can be asserted given a negative difference. Subsequently, a Wald test is in order to see if the aforementioned difference is statistically different from zero.

#### 4.4. A look at the impact of the announcement and subsequent enactment of the Dodd-Frank legislation on bank performance

Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank hereafter) was enacted on July 10, 2010 as a sweeping financial regulation intended to impact most of the financial services industry. In large part, its aim was to curb appetite for risk in commercial banking and to offer stronger protections to consumers, depositors, taxpayers, and investors. The legislation was announced in July 2009, so banks had a nine-month long window to respond to the upcoming legislation before it was enacted. Because the basic goal of Dodd-Frank was to prevent another Great Recession, this research looks at the impact of the legislation on the ratios that measure performance of all U.S. depository institutions around the announcement and passage of Dodd-Frank. Indeed, even as the bank rescue was going to augment potential for moral hazard, Dodd-Frank would create a formidable counterbalance. For the investigation of the impact of Dodd-Frank on the key financial ratios closely studied in this research, a set of nine multiple regressions in the form of Equation (3) will be performed.

$$FR_t = \alpha_3 + \beta_{31}DF_1 + \beta_{32}DF_2 + \varepsilon_{3t}, \quad (3)$$

where  $FR$  is one of the nine key financial ratios,  $DF_1$  and  $DF_2$  are two dummy variables that capture the time period of post Dodd-Frank announcement and pre Dodd-Frank enactment and the sample period of post Dodd-Frank enactment, respectively. Thus,  $DF_1$  takes on the value of one Q3 2009 to Q2 2010 and zero otherwise;  $DF_2$  equals to one in the post Dodd -Frank enactment period and zero otherwise. The statistical significance or lack thereof of the regression coefficients loaded on the two dummy variables and their associated signs should provide insights into the effect of Dodd-Frank announcement and enactment on the banking sector's financial performance.

### 5. Empirical Results

In this section, empirical results generated from implementing tests proposed in the section of methodology are presented.

#### 5.1 Mean difference testing results

Table 4 presents results of t-tests that gauge the differences in the means of performance ratios between the two subsample periods. The reported results for the

**Table 4**

Mean difference testing on constructed commercial bank sector's financial ratios between pre and post-bailout periods.

	Sample period mean	Pre 2008 Mean	Q4- Post 2008 Mean	Mean difference
<b>Panel A: Profitability Variables</b>				
Return on equity (ROE)	0.0568	0.0713	0.0442	-0.0271***
Return on assets (ROA)	0.0059	0.0069	0.0050	-0.0019**
Net interest margin	0.0213	0.0218	0.0209	-0.0009
Profit margin	0.1567	0.1522	0.1607	0.0085
Non-interest income ratio	0.3100	0.2881	0.3281	0.0400***
<b>Panel B: Capital Adequacy</b>				
Capital ratio	0.1050	0.0972	0.1117	0.0145***
Loan ratio	5.4281	6.1608	4.7944	-1.3664***
Deposit ratio	6.6616	6.7472	6.5875	-0.1597
<b>Panel C: Liquidity</b>				
Loans to assets ratio	0.5632	0.5962	0.5347	-0.0615***
Loans to deposits ratio	0.8142	0.9136	0.7283	-0.1852***
Cash to total assets	0.1295	0.0619	0.1879	0.1260***
Government securities to total assets	0.1270	0.1205	0.1326	0.0121***
Liquidity ratio	0.3196	0.2395	0.3889	0.1494***
Deposits to liabilities	0.7796	0.7230	0.8286	0.1056***
<b>Panel D: Asset Quality</b>				
Expenses to revenue	1.5593	1.4345	1.6672	0.2327***
Loan loss allowance to total loans	0.0182	0.0146	0.0212	0.0067***
Non-interest expense ratio	0.0183	0.0188	0.0178	-0.0010
<b>Panel E: Operating Efficiency</b>				
Fixed assets ratio	0.0092	0.0102	0.0082	-0.0020***
Personnel expense	0.0081	0.0083	0.0079	-0.0004
Assets to employees	6067.02	4807.28	7156.52	2349.24***
Income per employee	34.74	32.56	36.63	4.07
Service charges to total assets	0.0018	0.0021	0.0015	-0.0005**
<b>Panel F: Growth</b>				
Deposit growth	0.0149	0.0187	0.0117	-0.0070***
Asset growth	0.0126	0.0195	0.0068	-0.0127***

Notes: See Table 1 for respective ratio definitions. The asterisks \*\* and \*\*\* denote statistical significance at the 5% and 1% significance levels, respectively.

mean difference between two subsample groups are significantly different from zero with most registering at the 1% level. By examining the results of the table, the direct impact of higher capital and liquidity requirements is readily evident. The capital ratio increased from 9.7% pre bailout to 11.2% post bailout and the liquidity ratio improved from 23.9% to 38.9%. These results indicate that US banks responded

to the bailout and the passage of Basel III by improving both liquidity and capitalization.

U.S. banks also experienced a dramatic increase in the amount of cash as a percentage of total assets (from 6.2% to 18.8%). Considering that cash is a nonearning asset, the rise of cash relative to total assets from 6.2% to 18.8% signals a major shift in the composition of balance sheets and behavior of bank managers. Additionally, the loan ratio dropped post bailout from 6.161 to 4.794. Thus, banks lowered the weight of their investment in the loan portfolio, which is the most lucrative and risky component of the balance sheet. Further, deposits to total liabilities ratio increased from 72.3% to 82.9%. Thus, post bailout, banks demonstrate a greater reliance on core funding versus purchased funds. These results indicate an increased risk aversion by commercial banks as they elect to keep a larger percentage of their assets in cash and a lower percentage in loans while demonstrating a greater reliance on core deposits than on purchased funding. During the Great Recession, access to purchase funds dissipated and those institutions that relied more heavily on purchasing money to fund operations experienced greater losses.

Further, according to Table 4, these additional safety measures resulted in lower ROE ratios post bailout, with the mean falling from 7.1% pre Q4 2008 to 4.4% post Q3 2008. Other results from Table 4 show an increase in non-interest income ratio from 28.8% to 32.8% and an increase in the expenses to revenue ratio from 1.434 to 1.667. Thus, post bailout, banks were producing a higher proportion of their operating income from non-interest income even as the proportion of non-interest expense to non-interest revenue continued to grow. As the interest rates declined and spread narrowed, it seems appropriate that banks became more focused on increasing their non-interest income.

The operating efficiency ratios also reveal some interesting shifts. From Table 4, commercial banks decreased the proportion of assets devoted to fixed assets from 1% to 0.8% and increased the ratio of assets to employees from 4807.28 pre bailout to 7156.52 post bailout. On top of the two noted changes, the U.S. banking sector has also shown the ability to produce higher levels of net income per employee, raising the ratio from 32.560 pre bailout to 36.627 post bailout. These results suggest greater levels of operational efficiency in the post-bailout sample period. Finally, Table 4 demonstrates that the stricter regulations governing bank risk and shifting economic and regulatory environments stunned both deposit and asset growths. Both saw a decrease over the two subsample periods from 1.90% to 1.20% and from 2.00% to 0.70%, respectively. In short, test results reported in Table 4 clearly document a drastic structural shift undertaken in the commercial banking sector during the post-bailout period. This illustrated structural shift is formally investigated in a set of regressions and the regression results contained in Table 5 are presented next.

## **5.2 Regression results with *Sub* as the independent variable**

Table 5 shows results of nine regression models which examine the impact of dummy variable *Sub* on bank indicators selected from the six ratio categories presented in Table 1. The independent variable *Sub* is equal to one for the subsample period dated post Q3 2008 and equals zero for the pre Q4 2008 period.

**Table 5**

Regression results of commercial bank sector's key financial ratios on dummy variable

$$Sub. \quad FR_t = \alpha_1 + \beta_1 Sub + \varepsilon_{1t}$$

	$\beta_1$	F	Adj R <sup>2</sup>
ROE	-0.0272***	11.69***	0.136
Non-interest income ratio	0.0400***	40.37***	0.367
Capital ratio	0.0145***	125.91***	0.648
Loan ratio	-1.3664***	257.30***	0.790
Loans to assets ratio	-0.0615***	541.33***	0.888
Liquidity ratio	0.1494***	302.13***	0.816
Loan loss allowance to total loans	0.0067***	22.10***	0.237
Assets to employees	2349.24***	187.99***	0.733
Asset growth	-0.0127***	24.09***	0.256

Notes: Dummy variable *Sub* is equal to one for the subsample period dated post Q3 2008 and zero otherwise. The asterisk \*\*\* denote statistical significance at the 1% significance level.

Glossary:

ROE = Total Income/total equity capital (%)

Non-interest income ratio = Non-interest income/total operating income (%)

Capital ratio = Total equity capital/total assets (%)

Loan ratio = Total loans/total equity capital (%)

Loans to assets ratio = Total loans/total assets (%)

Liquidity ratio = (Cash + securities)/total assets (%)

Loan loss allowance total loans = Loan loss allowance/total loans (%)

Assets to employees = Total assets/total employees (multiple)

Asset growth =  $(Total\ deposits_t - Total\ deposits_{t-1})/Total\ deposits_{t-1}$  (%)

As evidenced in Table 5,  $\beta_1$ 's on both capital and liquidity ratios were positive (0.0145 and 0.1494, respectively), indicating a higher degree of risk aversion by the sector in response to tighter capital and liquidity regulations in the post bailout era. In contrast, the negative  $\beta_1$  on ROE (-0.0272), indicates that bank performance deteriorated post bailout. Further,  $\beta_1$  is positive for non-interest income ratio (0.0400), suggesting that banks were in greater reliance on activities that generate non-interest income as a percent of their total operating income post bailout. This may have been caused by lower levels on interest rates in the period post bailout and/or a stated objective by banks to diversify their income.

The significantly positive regression coefficient on loan loss allowance to total loans ratio (0.0067), despite a significantly negative coefficient on loans to total assets



measure ( $-0.0615$ ), provides further support to the commercial banking sector's increased risk aversion. This result also demonstrates that banks were more prudent in assessing the potential defaults in their loan portfolios post 2008, a move not mandated by enhanced regulations. Additionally, the loan ratio is negatively related to  $\beta_1$  ( $-1.3664$ ), which means that the proportion of loans to total equity declined post 2008. This is another example of increased risk aversion by commercial banks post bailout.

The significantly positive  $\beta_1$  documented in Table 5 on the assets to employees ratio (2349.24) shows that banks were infusing their operations with new forms of efficiencies. The greater efficiency levels may be the function of lower profitability post bailout and continued evolution of technological advancements in the banking arena. Additionally,  $\beta_1$  is negatively related to asset growth ( $-0.0127$ ). This relationship indicates that banks were expanding at a slower pace post bailout versus the pre bailout time period.

### 5.3 Regression results of Federal Reserve monetary policy impact on the shift of bank performance

Table 6 presents the results of the analysis that tests the impact of Federal Reserve policies on the shift in bank performance ratios evidenced over the two subsample periods. The independent variables in the regression models are  $Sub \times DR$  and  $Sub \times (1 - DR)$ , which measure the impact of operational environment and changes in bank behavior post Great Recession during periods of expansive and restrictive Federal Reserve policies, respectively.  $DR$ , as defined previously, is a dummy variable and bears a value of one during expansive monetary periods and zero otherwise.

According to Table 6,  $\beta_{21}$  and  $\beta_{22}$  associated with the liquidity are positive, 0.0689 and 0.1620, respectively. The two regression coefficients are also positive, 0.0068 and 0.0157, respectively, for the capital ratio. Thus, the liquidity and capital levels improved post 2008. The increased liquidity and capital levels were part of the Basel III regulations and  $\beta_1$  was positive and significant for both variables in Table 5, so the results in Table 6 for these two variables were anticipated. However, the absolute value of  $\beta_{22}$  is higher than that of  $\beta_{21}$  for both liquidity and capital ratios and the coefficient differences for both are significantly different from zero at the 1% level. This result suggests that the impact of changes to bank behavior in regard to improving liquidity and capital post 2008 was stronger during periods of restrictive policies by the Fed. These findings indicate that bank behavior was most notably affected when the economy was healthy enough for the Fed to adopt restrictive policies, which historically is the time for banks to increase their appetite for risk. This signals a significant shift in operational behavior by commercial banks.

Results in Table 6 further illustrate that ROE is negatively related to both dummy variables, with regression coefficients  $\beta_{21}$  and  $\beta_{22}$  equal to  $-0.0746$  and  $-0.0197$ , respectively. The negative signs are expected, given  $Sub$  assuming a value of one for

the post-bailout period and  $\beta_1$  associated with ROE in Table 5 being negative. The absolute value of  $\beta_{21}$  is greater than that of  $\beta_{22}$  and the difference between the two coefficients is significant at the 1% level. These results indicate that post 2008 bailout, U.S. commercial banks produced lower ROE in both expansive and restrictive Federal Reserve environments and the influence of the Fed policies on the ratio was more pronounced during expansive periods. Since expansive Fed policies are introduced during weak economic conditions, it is expected that  $\beta_{21}$  is much greater than  $\beta_{22}$ .

**Table 6**

Regression results of commercial bank sector's key financial ratios on the two interaction dummy variables,  $Sub \times DR$  and  $Sub \times (1 - DR)$ .

$$FR_t = \alpha_2 + \beta_{21}SUB \times DR + \beta_{22}SUB \times (1 - DR) + \varepsilon_{2t}$$

	$\beta_{21}$	$\beta_{22}$	$ \beta_{21}  -  \beta_{22} $	F	Adj R <sup>2</sup>
ROE	-0.0746***	-0.0197**	0.0549***	14.24***	0.280
Non-interest income ratio	0.0238*	0.0426***	-0.0188	21.72***	0.379
Capital ratio	0.0068***	0.0157***	-0.0089***	82.74***	0.706
Loan ratio	-0.8408***	-1.4485***	-0.6077***	164.56***	0.828
Loans to assets ratio	-0.0453***	-0.0641***	-0.0188***	337.23***	0.908
Liquidity ratio	0.0689***	0.1620***	-0.0931***	292.54***	0.896
Loan loss to total loans	0.0134***	0.0056***	0.0078***	16.39***	0.312
Assets to employees	1574.21***	2470.34***	-896.00***	106.99***	0.757
Asset growth	-0.0267***	-0.0105***	0.0162***	19.73***	0.359

Notes: Dummy variable  $Sub$  is equal to one for the subsample period dated post Q3 2008 and zero otherwise.  $DR$  is a dummy variable that equals one during expansive monetary periods and zero otherwise. The asterisk \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% significance levels, respectively.

Glossary:

ROE = Total Income/total equity capital (%)

Non-interest income ratio = Non-interest income/total operating income (%)

Capital ratio = Total equity capital/total assets (%)

Loan ratio = Total loans/total equity capital (%)

Loans to assets ratio = Total loans/total assets (%)

Liquidity ratio = (Cash + securities)/total assets (%)

Loan loss allowance total loans = Loan loss allowance/total loans (%)

Assets to employees = Total assets/total employees (multiple)

Asset growth =  $(Total\ deposits_t - Total\ deposits_{t-1})/Total\ deposits_{t-1}$  (%)

Additionally, as with the corresponding result presented in Table 5,  $\beta_{21}$  and  $\beta_{22}$  in Table 6 for the loan ratio are both negative, equal to  $-0.8408$  and  $-1.4485$ , respectively. Moreover, the absolute value of  $\beta_{22}$  is almost twice as large as that of  $\beta_{21}$  and that difference is statistically significant at the 1% level. This result implies that reduction of risk post 2008 through lower proportion of loans to equity was

stronger during expansive than during restrictive Fed environments. The expansive periods typically correlate with weaker economic conditions so the greater reduction in the loan ratio during such periods is expected, especially in light of the challenging economic environment post bailout.

Also clearly documented in Table 6 are the significantly negative coefficients,  $-0.0453$  and  $-0.0641$  loaded on the two dummy variables, respectively, for the loans to assets ratio. The absolute value of  $\beta_{22}$  is significantly higher than that of  $\beta_{21}$ , and the difference is significant at the 1% level. This result suggests that there was a reduction in proportion of loans to assets post bailout as evidenced in Table 5 and that the change was especially evident during restrictive periods.

While bank loan portfolios declined in size on commercial banks' balance sheets, the loan loss to total loans ratio increased post bailout. According to Table 6, loan loss to total loans ratio loaded positively on both dummy variables, yielding  $0.0134$  for  $\beta_{21}$  and  $0.0056$  for  $\beta_{22}$ . The difference between the absolute values of the two coefficients is positive and significant at the 1% level. These results suggest that, post bailout, banks were aggressive in recognizing credit risk of their loan portfolios by setting aside larger dollar amounts for nonperforming loans. The increase in loan loss to total loans ratio was particularly notable during periods of expansive policy by the Fed. That result is expected because expansive Fed policies are designed to combat slow economic environments, which tend to coincide with a greater number of defaults by borrowers. Further, these results indicate a clear adjustment in bank lending post third quarter of 2008, both in the reduction of loan portfolios and the greater sensitivity to the risk of default, especially in slow economic climates.

Consistent with findings in Tables 4 and 5, results contained in Table 6 show that the two regression coefficients are negative for asset growth,  $-0.0267$  and  $-0.0105$ , respectively, and positive for assets to employees,  $1574.21$  and  $2470.34$ , respectively. Further, the absolute value of  $\beta_{21}$  is larger than that of  $\beta_{22}$  for asset growth but smaller for assets to employees, and both differences are significant at the 1% level. These results indicate that changes in bank behavior post 2008 with respect to slowing asset growth is more pronounced during expansive Fed periods while the impact of the shift in bank behavior post 2008 in respect of improved efficiency due to the increase of assets to employees ratio is more noticeable during restrictive Fed periods. As the economy recovered post bailout and the Fed shifted to restrictive policies, the banks were not in a hurry to hire workers even as their assets began to grow. The growth of bank assets after 2008 was slower, especially during the expansive period that followed the Great Recession as the banking industry sought to rebuild itself in the aftermath of the crisis.

#### **5.4 Regression results of the Dodd-Frank legislation on bank performance**

Table 7 presents regression results that measure the respective impact of the announcement and the enactment of Dodd-Frank on financial ratios that measure bank profitability, capital, lending, liquidity, projected loan losses, efficiency, and

growth. As noted before, the two dummy variables in Table 7,  $DF_1$  and  $DF_2$ , are designed to capture the impact of Dodd-Frank announcement and enactment effects, respectively.  $DF_1$  is equal to one for Q3 2009-Q2 2010 and zero otherwise and  $DF_2$  takes on a value of one post Q2 2010 (enactment of Dodd-Frank) and zero otherwise.

The results in Table 7 show that  $DF_1$  is insignificantly related to ROE. Thus, the announcement of Dodd-Frank did not impact bank performance. However,  $DF_2$  yields a significantly negative coefficient of  $-0.058$ , which means that banks do post lower performance post enactment of Dodd-Frank. The legislation did magnify the regulatory burden on U.S. banks and the post Dodd-Frank period encapsulated the recovery from the financial crisis. Interestingly, the non-interest income ratio, which measures non-interest income as a percentage of total income, increased significantly both post announcement and enactment of the legislation with respective coefficients of  $0.0430$  and  $0.0261$  for the two dummy variables. Either as a result of shrinking interest income in response to falling rates and decreased lending, or a greater bank focus on diversifying their non-interest income opportunities, the proportion of non-interest income in terms of total income increased. Further, the capital ratio, which measures total equity to total assets and therefore, assesses the depth of the cushion that offers protection against risk, also increased statistically post announcement of Dodd-Frank, with  $DF_1$  coefficient of  $0.0156$  and after its enactment, with  $DF_2$  coefficient of  $0.0129$ . Thus, banks did not wait for the law to become effective in order to boost their capitalization and certainly raised their equity even more after July 2010.

Table 7 also shows that the loan ratio (total loans to total equity) and loans to assets declined significantly post announcement of Dodd-Frank with respective  $DF_1$  coefficients of  $-1.4100$  for the loan ratio and  $-0.0614$  for the loans to assets ratio. Both also saw further, significant drops post enactment of the legislation with associated coefficients on  $DF_2$  equal to  $-1.2000$  and  $-0.0511$ , respectively. Reduction of proportion of loans to both assets and equity demonstrates a shift by banks to decrease the risk of their operations. Admittedly, though, the evidenced significance could be a reflection on banks' recognizing unrecoverable loans that were made in the run-up to the Great Recession.

Because many banks were caught off guard by the frozen credit markets, they were suddenly unable to purchase liquidity that they were accustomed to prior to the meltdown. Therefore, it is important to examine whether the Great Recession that led to Dodd-Frank prompted banks to boost liquidity. The liquidity ratio, which measures cash and securities as a percentage of total assets, in relation to  $DF_1$  and  $DF_2$ , is also examined in Table 7. Both regression coefficients are positive and highly significant,  $0.1614$  for  $DF_1$  and  $0.0899$  for  $DF_2$ . Indeed, banks began raising levels of liquidity post Dodd-Frank announcement and fortified their stores of liquidity post legislation's enactment.

Three more ratios are analyzed by the model and associated regression results are also presented in Table 7 as they relate to Dodd-Frank legislation and its goal to curb risk in financial services industry and to offer consumers as well as taxpayers

greater protection from what some would call greedy behavior on the part of inadequately incentivized bank executives beholden to Wall Street. From Table 7, loan loss allowance to total loans has positive and highly significant coefficients of 0.0037 on  $DF_1$  and 0.0181 on  $DF_2$ . It appears that banks were more critical in assessing potential default rates of their loan portfolios post announcement and enactment of Dodd-Frank. Further, while assets to employees ratio presents regression coefficients of 2384.21 for  $DF_1$  and 1507.39 for  $DF_2$ , asset growth presents coefficients of -0.0079 and -0.0186, respectively for the two dummy variables. These results indicate that banks decreased their overhead both after the announcement of Dodd-Frank and post its enactment by reducing their workforce. Interestingly, assets to employees ratio increased post Dodd-Frank even as banks were writing down large portions of their asset portfolios. As banks were searching for greater efficiencies, they also appear to be growing at slower rates in the post-crisis and Dodd-Frank period.

Table 7

Regression results of commercial bank sector's key financial ratios on dummy variables  $DF_1$  and  $DF_2$ .  $FR_t = \alpha_3 + \beta_{31}DF_1 + \beta_{32}DF_2 + \varepsilon_{3t}$

	$\beta_{31}$	$\beta_{32}$	F	Adj R <sup>2</sup>
ROE	-0.0112	-0.0580***	5.71***	0.122
Non-interest income ratio	0.0430***	0.0261*	22.94***	0.392
Capital ratio	0.0156***	0.0129***	89.75***	0.723
Loan ratio	-1.4100***	-1.2000***	153.95***	0.818
Loans to assets ratio	-0.0614***	-0.0511***	204.44***	0.857
Liquidity ratio	0.1614***	0.0899***	298.49***	0.816
Loan loss allowance to total loans	0.0037***	0.0181***	21.92***	0.381
Assets to employees	2384.21***	1507.39***	84.74***	0.711
Asset growth	-0.0079***	-0.0186***	7.10***	0.154

Notes: Dummy variable  $DF_1$  is equal to one for Q3 2009-Q2 2010 and zero otherwise and  $DF_2$  takes on a value of one post Q2 2010 (enactment of Dodd-Frank) and zero otherwise. The asterisk \* and \*\*\* denote statistical significance at the 10% and 1% significance levels, respectively.

## Glossary:

ROE = Total Income/total equity capital (%)

Non-interest income ratio = Non-interest income/total operating income (%)

Capital ratio = Total equity capital/total assets (%)

Loan ratio = Total loans/total equity capital (%)

Loans to assets ratio = Total loans/total assets (%)

Liquidity ratio = (Cash + securities)/total assets (%)

Loan loss allowance total loans = Loan loss allowance/total loans (%)

Assets to employees = Total assets/total employees (multiple)

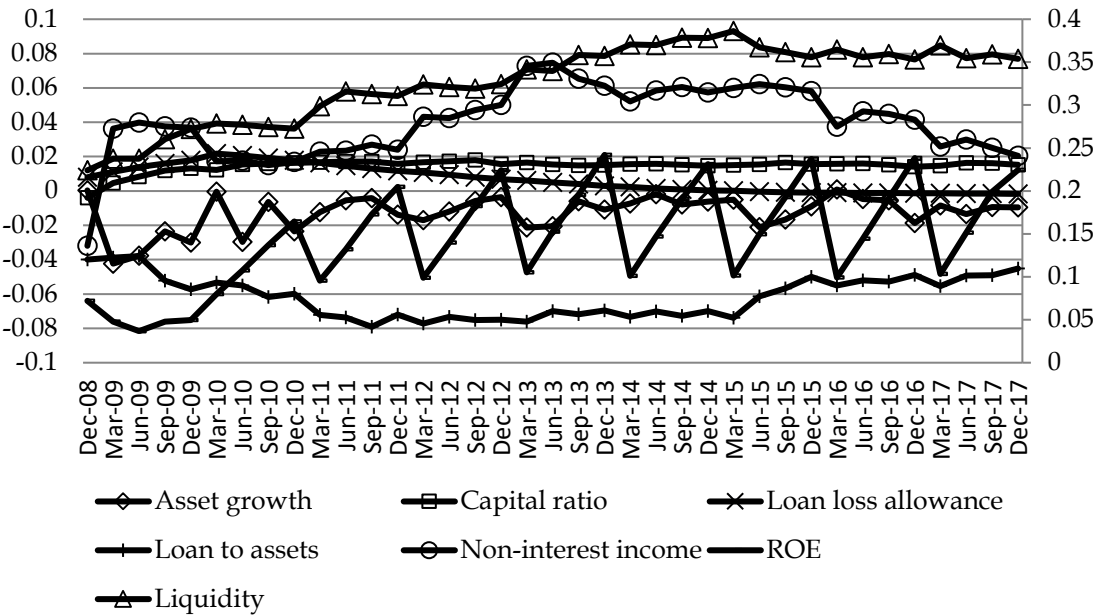
Asset growth =  $(Total\ deposits_t - Total\ deposits_{t-1})/Total\ deposits_{t-1}$  (%)

## 5.5 A time-lapse look at the financial performance of depository institutions post Emergency Economic Stabilization Act of 2008

In order to better visualize the impact of the bank bailout over time, graphs were generated that depict the post Q3 2008 quarterly movement of the nine key bank financial ratios examined in this study relative to their respective mean over the pre-bailout subperiod. As stated above, Q3 2008 marks the passage of the Emergency Economic Stabilization Act, also known as the bank bailout. More specifically, the graphs corresponding to the nine financial ratios presented in Figures I and II were generated by subtracting the average of a given bank ratio for the period prior to Q4 2008 from each of its post Q3 2008 quarter's original value. The analysis reveals the speed of reaction to bailout at the depth of the credit crisis and subsequent trends in the ratios in the decade post the crisis. For instance, from Figure I, it is evident that the capital ratio increases immediately post bailout and then stabilizes over time. Loan loss allowance to total loans as illustrated in the figure resembles the ascending pattern of the capital ratio, reflecting the banking industry's response in the aftermath of the financial crisis. The ratio then peaks out by the first half of 2010 and gradually declines over time since. This should not come as a surprise. As the capital ratio strengthens and stabilizes, the economy improves, and banks slash their appetite for risky loans, loan losses and consequently, loan loss allowances are expected to decline. Additionally, Figure I shows that the liquidity ratio begins to climb right after the crisis before it stabilizes in the final two years of the sample period. Some of the ratios in the figure, such as non-interest income ratio, which increases, and loans to assets and asset growth, which decrease post bailout, show a slight reversal in 2016 and 2017 as the economy steadily improved, never to the same precarious level before the bailout, though. It is possible that banks may lose some of their aversion to risk as more time elapses from the era of Great Recession. Figure I also displays a dramatic decline of the ROE in the midst of the crisis. ROE bottoms out in the second quarter of 2009 even though it does not surpass its pre-bailout average level until the end of 2011. In future research, it will be interesting to measure whether banks will continue to remain cognizant of the lessons learned in 2008. Figure II, for instance, features a drastic and immediate drop in the loan ratio followed by an upward trajectory overtime, and an immediate and consistent climb in the assets to employees ratio after the crisis. Figures I and II demonstrate the speed of adjustment of bank ratios and then a time lapse of their trajectories in nearly a decade since 2008. Also, consistent with test results evidenced here, all graphs show that banks as a whole have demonstrated better financial performance, higher operational efficiency, and less aggressive risk-seeking behavior post Great Depression. Above all, the immediate post-bailout ratio adjustments documented in Figures I and II suggest that banks have learned their lesson, resorting actively to conservative remedies upon the financial crisis as opposed to waiting until the mandate imposed by legislation to react passively.

**Figure I**

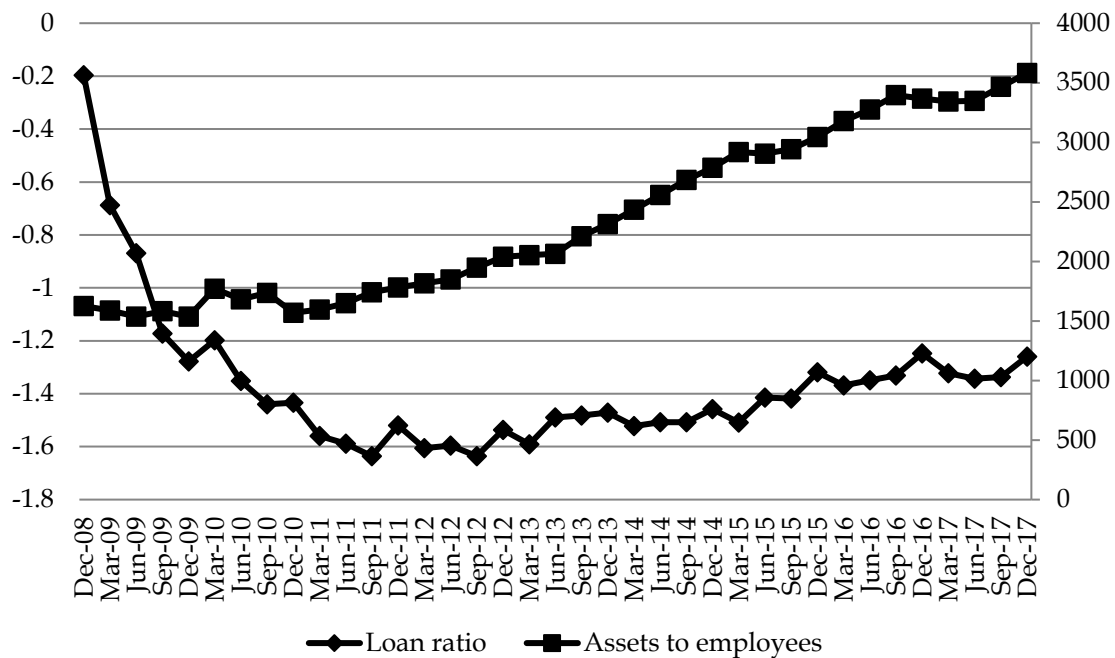
Post-bailout quarterly movement of asset growth, capital ratio, loan loss allowance, loan to assets, non-interest income, ROE, and liquidity in relation to respective pre-bailout means.



Note: See Table 1 for the definition of depicted ratios.

**Figure II**

Post-bailout quarterly movement of loan ratio and assets to employees in relation to respective pre-bailout means.



Note: See Table 1 for the definition of depicted ratios.

## 6. Conclusion

The goal of this research is to analyze the impact of Great Recession, passage of the \$700 billion Emergency Economic Stabilization Act of 2008, stricter regulations, and more challenging operational environment on performance of the commercial banking sector. The month of October in 2018 marks a 10-year anniversary of the bill that bailed out the U.S. banking industry. The analysis is conducted on a sample of quarterly commercial bank data. The sample period was subdivided into two periods surrounding the passage of the bank bailout bill on October 3, 2008. The first period covered the Q4 of 2000 through the Q3 of 2008 and the second period covered the Q4 of 2008 through 2017. The results show a dramatic reduction in risk appetite by US banks post 2008 as demonstrated by higher liquidity and capital levels as well as lower loans to equity and loans to assets ratios. The proportion of bank deposits to total liabilities also rose significantly while deposit growth and asset growth contracted post 2008. The slower asset growth notwithstanding, banks also exhibited higher levels of efficiency post 2008 by reporting a higher level of assets to employees and lower ratio of fixed assets to total assets.

Because the financial crisis prompted Dodd-Frank, a sweeping financial regulation aimed to magnify the regulatory burden on the banking industry, to reduce, if not to eliminate Too Big To Fail, and to offer protections to consumers, this research examines whether Dodd-Frank, in addition to the scare created by the credit freeze, influenced risk reduction at banking firms. Results of this research show that even if the bailout served to augment moral hazard in the banking industry by rewarding bad players, Dodd-Frank became a formidable and effective counterbalance.

The analysis in this study also assessed the impact of Federal Reserve policy regimes (expansive or restrictive) on bank ratios in pre and post-bailout environments. The results indicate that the shift in bank behavior as measured by performance ratios was more pronounced in expansive environments for some performance metrics and less for others. For instance, ROE declined post 2008. However, the reduction in ROE was more prominent during expansive periods than during restrictive periods. While liquidity and capital ratios were higher after 2008, the impact of Great Recession was stronger on these ratios when the Federal Reserve pursued a restrictive monetary policy.

This paper demonstrates how bank balance sheets, to a greater extent, and income statements, to a lesser extent, changed as a result of Great Recession and the subsequent bank bailout by the federal government. According to the results of this study, there is no evidence of increase in moral hazard on behalf of the commercial bank sector that resulted from the capital infusion by the federal government. On the contrary, U.S. commercial banks seem to have altered their appetite for risk by increasing their reliance on deposits, increasing their cash and liquidity positions, and reducing percentage of their assets devoted to risky loan portfolios. Thus, strong new regulations and recent brush with insolvency, at least in the first decade past the



crisis, made moral hazard imperceptible in terms of key banking performance ratios. This information is useful to regulators, central banks, investors, and industry professionals. Even though some of the changes on the balance sheets and income statements were induced by enactment of stringent regulations such as Dodd-Frank, this study shows that there may be deeper structural changes to bank balance sheets and income statements in response to the lessons learned from the Great Recession.

## References

- Acharya, V.V., Mehran, H., Scheurmann, T., Thakor, A., 2012, Robust capital regulation. *Centre for Economic Policy Research*, Discussion Paper 8792. London EC1V 3PZ, UK.
- Acharya, V. V., Schnabl, P. and Suarez, G. (2013). Securitization without risk transfer. *Journal of Financial Economics*, 107(3), 515-536.
- Aggarwal, R., & Jacques, K. T. (2001). The impact of FDICIA and prompt corrective action on bank capital and risk: Estimates using a simultaneous equations model. *Journal of Banking & Finance*, 25(6), 1139-1160.
- Allen, F. and Gale, D., 2000, Bubbles and crises. *The Economic Journal* 110 (January), 236-255.
- Allen, F., Carletti, E., Goldstein, I., Leonello, A., 2015, Moral hazard and government guarantees in the banking industry. *Journal of Financial Regulation* 1, 30-50.
- Bayazitova, D., and Shivdasani, A. (2012). Assessing Tarp. *Review of Financial Studies*, 25(2), 377-407.
- Beatty, A., and Liao, S. (2011). Do delays in expected loss recognition affect banks' willingness to lend?. *Journal of accounting and economics*, 52(1), 1-20.
- Beltratti, A. and Stulz, R. M. (2012). The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics*, 105(1), 1-17.
- Blinder, A., 2009. Crazy compensation and the crisis. *Wall Street Journal*, May 28.
- Blinder, A., Zandi, M., 2010, How the great recession was brought to an end. *Moody's Economy.com*, West Chester, PA.
- Caprio, G., Klingebiel, D., 1996, Bank insolvency: Bad luck, bad policy or bad banking? In Boris Pleskovic and Joseph Stiglitz (Eds.), *Annual World Bank conference on Development Economics*, Washington, DC: The World Bank. 79-104.
- Cassell, C. A., Huang, S. X., Manuel Sanchez, J. and Stuart, M. D. (2012). Seeking safety: The relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. *Journal of Financial Economics*, 103(3), 588-610.
- Chen, M.H., 2012, State dependence in the influence of monetary policy regime shifts on hospitality index returns. *International Journal of Hospitality Management* 31, 1203-1212.
- Diamond, D., Rajan, R., 2011. Fear of fire sales, illiquidity seeking, and the credit freeze. *Quarterly Journal of Economics* 126, 557-591.
- Duchin, R. and Sosyura, D. (2014). Safer ratios, riskier portfolios: Banks' response to government aid. *Journal of Financial Economics*, 113(1), 1-28.
- Edmans, A. and Liu, Q. (2011). Inside debt. *Review of Finance*, 15(1), 75-102.
- Ellul, A. and Yerramilli, V. (2013). Stronger risk controls, lower risk: Evidence from US bank holding companies. *The Journal of Finance*, 68(5), 1757-1803.
- Eisdorfer, A., Giaccotto, C. and White, R. (2015). Do corporate managers skimp on shareholders' dividends to protect their own retirement funds? *Journal of Corporate Finance*, 30, 257-277.

- Fahlenbrach, R., Prilmeier, R., Stulz, R., 2011, This time is the same: Using bank performance in 1998 to explain bank performance during the recent financial crisis. *National Bureau of Economic Research: Working Paper Series* 17038.
- Fahlenbrach, R. and Stulz, R. M. (2011). Bank CEO incentives and the credit crisis. *Journal of Financial Economics*, 99(1), 11-26.
- Fратиани, M., Marchionne, F., 2010, The banking bailout and the subprime crisis: Size and effects. *PSL Quarterly Review* 63, (254), 187-233.
- Gilbert, R. A., Wheelock, D. C., 2013. Big banks in small places: Are community banks being driven out of rural markets? *Federal Reserve Bank of St. Louis Review* 95(3), 199-218.
- Gorton, G., 2009. Information, liquidity, and the (ongoing) panic of 2007. *American Economic Review* 99, 567-572.
- Gorton, G., Metrick, A., 2012. Securitized banking and the run on repo. *Journal of Financial Economics* 104, 425-451.
- Guo, L., Jalal, A. and Khaksari, S. (2015). Bank executive compensation structure, risk taking and the financial crisis. *Review of Quantitative Finance and Accounting*, 45(3), 609-639.
- Huizinga, H. and Laeven, L. (2012). Bank valuation and accounting discretion during a financial crisis. *Journal of Financial Economics*, 106(3), 614-634.
- Jacques, K., & Nigro, P. (1997). Risk-based capital, portfolio risk, and bank capital: A simultaneous equations approach. *Journal of Economics and business*, 49(6), 533-547.
- Jensen, G.R., Mercer, J.M., Johnson R.R., 1996, Business conditions, monetary policy and expected security returns. *Journal of Financial Economics* 40, 213-237.
- Johnson, R.R., Buetow, G. W., Jensen, G. R., 1999, International mutual funds and Federal Reserve policy. *Financial Services Review* 8, 199-210.
- Johnson, R.R., Jensen, G. R., 1998, Stocks, bonds, bills, and monetary policy. *Journal of Investing* 7, 30-36.
- Kaminsky, G., Reinhart, C., 1999, The twin crises: The causes of banking and balance of payment problems. *American Economic Review* 89, (3), 473-500.
- Kashyap, A. K., Raghuram G. R., Stein, J. C., 2008, Rethinking capital regulation, Federal Reserve Bank of Kansas City Symposium on "Maintaining Stability in a Changing Financial System," Jackson Hole, Wyoming.
- Laeven, L., Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2), 259-275.
- Murphy, K., 1999. Executive compensation. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, vol. 3b. North-Holland, Amsterdam, pp. 2485-2563.
- Repullo, R., Suarez, J. (2013). The procyclical effects of bank capital regulation. *Review of Financial Studies*, 26(2), 452-490.
- Tung, F., Wang, X. (2012). Bank CEOs, inside debt compensation, and the global financial crisis. Boston Univ. School of Law Working Paper, 11-49.

