Do banks decrease their asset value following higher regulatory costs?

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master thesis Accounting, Auditing & Control

Track: Accounting and Auditing

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Abstract

I test if banks devalue their assets to prevent regulatory costs related to the enactment of the Dodd-Frank Act of 2010. I analyze the differences in asset valuation of banks below $10 billion assets value, banks with an asset value between $10 billion and $50 billion and systemically important banks with more than $50 billion assets, in the period 2008 till 2017. Additional analyses test differences between banks close to the $10 billion and $50 billion asset value threshold compared to banks further away. The analyses use a sample of traditional banks and a sample of investment banks in addition to traditional banks. I show that traditional banks with asset values just below $10 billion could undervalue their assets. Banks close to the $50 billion asset value threshold show significant coefficients but have inconsistent results. Regulators could use these results for future regulation, either by reducing the differences in regulatory costs between size groups or by not basing regulation requirements on just one accounting capital measure.

JEL classification:
G21
G24
G28

Key words:
The Dodd-Frank Act
Systemically Important Financial Institutions
Asset management
One Size Fits All regulation

Table of Contents

1. Introduction

On 21 July 2010 passed the Dodd-Frank Wall Street Reform and Consumer Protection Act[1] (DFA) Congress and is signed into law. The DFA sharpens the rules for all financial institutions and imposed more rules for systemically important financial institutions (SIFIs), also known as large complex financial institutions (LCFIs). This thesis focuses only on the regulatory changes for banks, not on other financial institutions. The changes following the DFA bring costs for all banks, they have to meet stricter leverage rules and undergo more sustainability checks. The extent to which these rules apply depends on the consolidated asset value of the bank. The Dodd-Frank Act has three size categories, each with their own regulatory requirements. The first category is for small banks with less than $10 billion asset value. These banks are subject to the most lenient requirements. Banks with asset value between $10 billion and $50 billion are subject to stricter requirements. These banks are called medium banks in this thesis. The last group are the big banks, banks with $50 billion asset value or more. These banks are classified as SIFIs and subject to the strictest rules. This group must cooperate with regulatory requirements like stress tests. These stress tests have strict deadlines and are conducted by the Federal Reserve. These stress tests bring costs and can bring public scrutiny when the results of these tests are substandard. This main objective of this thesis is to examine whether banks decrease their asset value following the high regulatory costs related to exceeding an asset value threshold implemented by the Dodd-Frank Act.

Prior literature shows that bank officials manage accounting capital that is measured by regulators (Moyer, 1990) or manage balance sheet items to reach capital requirements (Beatty, Chamberlain, & Magliolo, 1995). The DFA implements a lot of capital requirements and rules, most of which are based on the total asset value. I therefore expect banks to devalue their assets to prevent high costs and have more lenient capital requirements. If banks indeed manage their assets to prevent costs, this knowledge could help regulators to target SIFIs more successfully. This thesis could also provide insights on the effectiveness of an “one size fits all” policy for future regulations. There are complains about the high costs of the additional requirements by banks and governmental companies that check these banks since the enactment of the DFA (Reuters, 2018). This leads to the enactment of the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018[2], which eases regulations imposed by the DFA on small banks

[1] This thesis deals with the Dodd-Frank Wall Street Reform and Consumer Protection Act, enacted in Public Law 111-203, 124 Stat. 1376, on 21 July 2010. I refer to this law using Dodd-Frank Act or DFA interchangeable.

[2] References to the Economic Growth, Regulatory Relief, and Consumer Protection Act, enacted in Public Law 115-174, S.2155-115th Congress, on 24 May 2018.

and increased the threshold for big banks to $250 billion (U.S. Congress, 2018). This suggests that the costs associated with the DFA are too high compared to their usefulness and is one of the reasons why I expect that banks close to the threshold undervalue their assets to postpone these costs.

I compare banks above the thresholds implemented by de DFA with banks below these thresholds, to test whether banks devalue their assets following the high regulatory costs of the Dodd-Frank Act. This thesis analyses both the asset value changes around the $10 billion as the $50 billion threshold. I use two samples to check the robustness of my results for the years 2008 till 2017. The first sample only includes commercial banks and savings institutions (traditional banks) and the second sample includes investment banks in addition to the traditional banks. I proxy asset value using both the market-to-book ratio and the total asset growth relative to their prior three-year average. I compare both proxies for banks above the threshold with banks below the threshold to test if there is a significant difference after the enactment of the DFA. In subsequent analyses, I also compare banks that are very close to the threshold with banks that are further away from the threshold to test if the assets of banks near a threshold are valued differently.

The study finds insufficient evidence that banks in different (size) categories value their assets differently. The subsequent analyses show that the average traditional bank below the $10 billion threshold might undervalue their assets compared to other traditional banks in years following the enactment of the DFA. The analyses of banks close to the $50 billion results in inconsistent results, thus it remains unclear if banks close to this threshold decrease their asset value to prevent higher regulatory costs.

This thesis will contribute to the literature stream on earnings management following regulation. Prior literature mainly focuses on the effect of monitoring on earnings management (Chung, Firth, & Kim, 2002) or the effect of regulation on earnings management (Ramesh & Revsine, 2001). This thesis uses a timeframe and industry with regulation changes and high levels of external monitoring due to the financial banking crisis. Therefore, this thesis provides useful information for literature on the effect of regulation on earnings management in an industry with high levels of monitoring. This study also contributes to literature on unintended consequences of the Dodd-Frank Act. Prior literature mainly aims at the prevention of the too-Big-to-Fail (TBTF) problem. The unintended consequences of the DFA are primarily analyzed for the biggest banks, as they impose the most risk to the financial market as a whole (Wilmarth, 2011). Instead my study focusses primarily on the banks close to the threshold, thus extending the knowledge of possible unintended consequences of the DFA. Additionally, there is to my

knowledge no prior research on cost prevention of the regulatory costs related to the DFA. And lastly, analyzing the response of banks on the implementation of the asset value threshold adds to the literature stream on the "one size fits all" banking regulation. Using a one size fits all approach for banking regulation comes with difficulties that can lead to high economic costs (Greenspan, 1998). If banks actively manage their assets because of a threshold, it provides incentives for regulators to implement regulation on an individual basis.

Understanding how banks respond to regulation is beneficial for regulators, as they could use this knowledge to implement more efficient regulation. This thesis suggests that traditional banks could undervalue their assets to prevent the regulatory costs related to exceeding $10 billion asset value. Additionally, traditional banks close to the $50 billion threshold seem to change their asset values as well, but this should be further examined as the reasoning is unclear. Comparing results of the traditional bank sample with the sample including investment banks shows differences. This suggest that investment banks could respond different to regulation than commercial banks and saving institutions. Regulators could investigate the reasoning why traditional banks might undervalue their assets to prevent the costs associated with the $10 billion threshold, but traditional banks close to the $50 billion threshold appears to not undervalue their assets.

2. Theoretical background

2.1. Origin and goal of the Dodd-Frank Act

This section describes the origin and the goal of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act or DFA hereafter). Section 2.2 provides a more indebt analysis of the provisions implemented to reach the objective. Section 2.3 describes the banks that are specifically targeted by the DFA and the economic consequences for those banks. Section 2.4 provides insights on the literature stream that analyses behavior changes following regulation.

The DFA is seen as one of the most impactful financial regulatory change in the United States (U.S.) since the reforms following the Great Depression in 1933 and 1934 (Acharya, 2012). The DFA passes Congress and is enacted on 21 July 2010. The act is implemented to prevent another financial crisis like the one in 2008, to protect consumers and American taxpayers. The DFA accomplishes its goal by creating a more transparent financial market and increasing accountability of financial institutions (U.S. Congress, 2010). The DFA itself is

extensive as it contains 16 titles which impose 225 new or changed rules across 11 different agencies (Richardson, 2012). As the DFA contains far more changes for the financial market than is of interest for this research, only relevant sections will be touched upon. The DFA aims to improve the stability of the financial market, as this market almost collapsed when large financial institutions were close to bankruptcy during the financial crisis of 2008. The act tries to improve the stability by limiting the risk-taking behavior of banks and reducing the too- Big-to-Fail (TBTF) problem. The overall success of the Dodd-Frank Act is debatable. The general consensus is that the DFA improves the financial stability but fails to address certain factors that lead to financial instability (Wilmarth, 2011; Gao, Liao & Wang, 2018).

2.1.1. The origin of the Dodd-Frank Act

The DFA is a response to the financial crisis of 2008 and most rules of the DFA are based on this global financial crisis. The cause of this crisis is therefore important to understand. Crotty (2009) argues that the main reasons for the crisis are the subprime mortgage market, the shadow banking system and government bailout guarantees. The subprime mortgage market grew substantially because of deregulation of the financial institutions. Increased competition from Japan and Europe led to deregulation in the U.S. to compete with international competitors (Acharya, Richardson, Sylla, Walter & Cooley, 2011). For this study is the most important consequence of the deregulation the growth in size and complexity of financial institutions. To compete with international competitors, they extraordinarily grew and total asset value doubled in the 4 year prior to the crisis (Saunders, Smith, & Walter, 2009). This abnormal growth was driven by the subprime mortgage market (Acharya, 2012) and increased investments in securities compared to loans (International Monetary Fund, 2009). In short, the financial crisis is the result of deregulation which leads to large and complex financial institutions with too risky strategies and mispriced assets. This shows that miss-pricing assets is not unheard of in the banking industry to obtain benefits. This study therefore examines whether banks misprice assets to prevent costs.

2.1.2. Goal of the DFA

The core objective of the DFA, improving the stability of the financial market, relies on reducing the risk-taking behavior of banks. Risk in the banking sector can be divided into two categories, idiosyncratic risk and systemic risk. Idiosyncratic risk is less important for the stability of the financial industry as a whole and therefore not the main focus of the Dodd-Frank Act. The DFA focuses on improving the stability of the financial system. Systemic risk is the

impact of bankruptcy of one bank on the financial system as a whole (Weiss, Bostandzic, & Neumann, 2014). Systemic risk is measured as the expected capital shortfall for the next crisis (New York University Volatility Laboratory, 2019). The growth in complexity as a result of the deregulation leads to an increase in systemic risk. In 2008, the high level of systemic risk has resulted in a global crisis (De Jonghe, 2010). The Dodd-Frank Act limits systemic risk and the overall excessive risk taking of financial institutions by addressing issues that have led to the global financial crisis. Rules are implemented, reducing the freedom of financial institutions in risk taking behavior and reducing the overall systemic risk of financial institutions by addressing their size and complexity problems. These rules come with high costs and are separated by asset value thresholds. I examine whether the costs related to the implemented rules lead to undervalued assets.

2.2 Provisions introduced by the Dodd-Frank Act targeting risk-taking behavior of all banks

This section summarizes the most important general provisions implemented by the Dodd-Frank Act. These measures target the overall risk-taking behavior of all banks regardless of their size. I refer to section 2.3 for a summarization of provisions that only targets banks that exceed certain asset values.

The Dodd-Frank Act implements measures to address issues that have led to the financial crisis. The DFA has established the Financial Stability Oversight Council (FSOC). The FSOC is specially established to identify and adequately respond to systemic risk threats. The FSOC obtains periodic reports of bank holding companies through the Office of Financial Research (OFR) to estimate the overall risk to the financial system. The purpose of the OFR, as stated in the Dodd-Frank Wall Street Reform and Consumer Protection Act section 153 subsection a (DFA 153(a))[3], is to support the FSOC to fulfill its duties. They use obtained information to identify the rising threats and gaps in regulation and to recommend the Board of Governors to impose higher level standards (i.e. leverage and/or liquidity requirements). This board must annually report its work to the Congress to ensure that they obtain as much useful information as possible (DFA 112). The watchdog function of this Council and the Research Office reduces the opportunities of banks to take excessive risk.

[3] "DFA 153(a)" references to the Dodd-Frank Wall Street Reform and Consumer Protection Act, enacted in Public Law 111-203, 124 Stat. 1376, enacted 21 July 2010. The number 153(a) references to section 153, subsection a. Further references in this thesis will follow the same notation.

The next general provision to tackle risk taking of banks are minimum capital requirements. The DFA implements two capital requirements for all banks regardless of size. It implements a minimum leverage ratio and a risk-based capital requirement (DFA 171), restricting banks in debt financing and obtaining high-risk capital.

A third provision of the DFA to reduce risk taking behavior of financial institutions is the liquidation order. Failing financial institutions can be ordered to liquidate. The purpose of the liquidation authority is to reduce moral hazard and systemic risk. The liquidation order makes sure that shareholders and creditors bear most costs and management will be dealt with accordingly (DFA 204).

To reduce information asymmetry the Dodd-Frank Act disallows banks to engage in proprietary trading as well as own or acquire equity of hedge funds or private equity funds (DFA 619). Title VII of the DFA, the Wall Street Transparency and Accountability Act of 2010, further enhances the transparency by limiting the over the counter trading and imposing restrictions on the swap market. Both markets are strictly monitored by the commodity Futures Trading Commission and the Securities and Exchange Commission.

A provision to reduce the overall risk of banks following the financial crisis is the improvement of the mortgage market. Residential mortgages require stricter minimum standards, increasing the costs for all banks. Furthermore, financial institutions that provide mortgages and other forms of securitization are required to carry at least 5 percent of the credit risk (Richardson, 2012).

Dodd-Frank Act sections 922, 923 and 924 describe a provision intended to reduce risk taking behavior of banks by providing incentives for whistleblowers. Whistleblowers can receive protection for legal costs and receive money for providing information that leads to legal action. This increases incentives for employees, while simultaneously decrease the incentives to manage earnings as the risk increases. The monetary benefit can compensate for the decision costs (i.e. losing their job) that prevent people of uncovering the fraud (Smith & Walker, 1993).

Summarizing, the DFA implements multiple general provisions to reduce the general risk of banks. The focus lies on the key factors that have caused the financial crisis, while increasing the supervision on banks. Increased regulation, stricter capital requirements and additional oversight are the main changes of the DFA. The increased regulation and capital requirements lead to high costs. Section 2.3 provides a more indebt analysis on targeted provisions based on bank size and their economic consequences.

2.3 Targeted banks and the economic consequences

Section 2.3 describes which banks are targeted by additional requirements and regulations in addition to the general provisions described in section 2.2. This section starts with background information on why these banks are targeted in particular. The remainder of section 2.3 provides information on the increased regulation for particular banks and the consequences of being affected by this increased regulation.

2.3.1. Targeted banks based on systemic risk

The stability of the financial market is often measured by systemic risk. The Dodd-Frank Act describes systemic risk as a situation where a disruption or failure of a financial institution can threaten the United States' stability or the financial system as a whole. Systemic risk of a financial institution is determined by the total monetary value of transactions, the exposure and interdependency of the financial market utility and the likely effect a failure or disruption of that company would have (DFA 803). The Dodd-Frank Act uses consolidated asset value as the measure for systemic risk, as it is easy and cheap to observe. Using only an asset value threshold to determine the level of regulation can lead to inadequate regulations for banks below a threshold and unnecessarily high compliance costs for banks above the threshold with low systemic risk (Greenspan, 1998).

The DFA targets banks that impose systemic risk the most. These banks are often referred to as systemic important financial institutions (SIFIs) or large complex financial institutions (LCFIs). The DFA, section 115, states that the FSOC may classify any bank as a SIFI if seems fit to subdue a medium sized bank to stricter regulation because of their systemic risk or to use the recommended threshold of $50 billion assets. As of 2018 the FSOC did not use their right to classify a medium sized bank as a SIFI (Board of Governors of the Federal Reserve System, 2018). I therefore classify banks with $50 billion in consolidated assets or more as big banks, which are subject to the highest level of regulation (DFA 121). The act also distinguishes between small and medium banks: banks with less than $10 billion asset value are partly exempt from stricter rules and requirements. Medium banks, banks with total asset value between $10 billion and $50 billion, are subject to more regulation than small banks but less than the big banks. Sections 2.3.2-2.3.4 discuss the rules and requirements that do not apply for all financial institutions.

2.3.2. General rules and regulation

The Dodd-Frank Act has restructured the financial market as a whole. It has introduced multiple provisions to reduce overall excessive risk-taking behavior and improve the stability of the financial industry (see sections 2.2). All medium and big banks are required to establish a risk committee. The risk committee oversees the risk management practices of the company, consisting of independent directors and a minimum of 1 risk management expert with sufficient experience (DFA 165). The DFA states in section 113 and 166 that all bank holding groups will have stricter requirements than before the crisis to reduce the overall risk. Banks with assets of more than $ 50 billion must adhere to even stricter rules and requirements. The bankruptcy of these banks imposes much risk to the stability of the financial system, therefore, they must have higher levels of equity, liquidity and solvency (Lastra, 2011; Gao et al., 2018). The DFA requires big banks to have a debt to equity ratio of maximal 15 to 1 as a response to the highly leveraged banks prior to the financial crisis (DFA 165(j); Mehran, Morrison & Shaprio, 2011). These large banks must include all off-balance sheet activities in the calculation of the capital requirements where small and medium banks can exclude some off-balance sheet activities in the calculation of their ratios (DFA 165(k)). The other ratios are not specified in the DFA as they can be adjusted accordingly based on the systemic risk that these banks impose. Other requirements that the FSOC can adjust depending on systemic risk are: higher margin and collateral requirements, increased risk management policies and procedures, capital and financial resource requirements and increased requirements for timely clearing and settlements of transactions (DFA 805). Lastly, the FSOC may require large banks to submit additional reports of their financial structure to increase transparency and decrease complexity (DFA 116).

2.3.3. Stress tests

The expansion of stress tests by the DFA led to many consequences for medium and big banks. Stress tests have originated on a small scale in the eighties, while the DFA implements these stress tests on a large scale (Kapinos, Martin, & Mitnik, 2018). These tests check whether banks can withstand a macroeconomic shock. These tests show a bank what would happen during such a shock and are aimed to raise awareness. It also helps regulatory bodies to determine the systemic risk of banks. The more extreme the reaction of a bank to a certain shock, the more systemic risk they impose for the financial industry. These test results are made public, reducing information asymmetry and reducing the complexity of big banks by providing insights on how they perform. Because stress tests are made mandatory and performed at least annually, banks are reminded to the fact that bad economic situations could happen, making

them especially beneficial in quiet economic times (Board of Governors of the Federal Reserve System, 2018).

There are two kind of stress tests: Stress tests performed by the Board of Governors and stress tests performed by the company itself. Stress tests that are performed by the Board of Governors are take annually by banks with more than $50 billion in assets. This stress test, called the Dodd-Frank Act supervisory stress testing (DFAST), measures whether banks can absorb the expected losses resulting from an economic shock. These tests also reveal risk management and operational failures, meaning that big banks can fail the tests even though their capital is above the required thresholds (Kapinos et al., 2018). The stress tests that are performed by the company itself are different for medium and large banks. Large banks are required to perform semi-annual stress tests, while medium sized banks perform annual stress tests. All banks are required to make the results of the stress tests publicly available (DFA 165(i)). These stress tests require a lot of documentation and can become expensive to do. Stress tests are a big part of the regulatory costs associated with the DFA thresholds. By devaluing assets banks can prevent the costs related to stress tests.

2.3.4. Resolution plans and credit exposure reports

To further increase the financial systems' stability, the DFA has introduced resolution plans and credit exposure reports. The resolution plans are commonly referred to as living wills, as they describe how a bank can be resolved when threatened by bankruptcy. The idea behind the resolution plans is to prevent complexity of big banks, thus reducing the Too-Big-to-Fail (TBTF) problem. During the financial crisis some banks were too complex and too large to oversee the consequences of bankruptcy so governmental bailouts were needed to prevent a disastrous situation (Gao et al., 2018). Because living wills mainly prevent problems associated with size and complexity, only banks with more than $50 billion in assets are required to make these plans. Once a bank exceeds $50 billion total assets, it must make these resolutions plans. This is required as long as its assets do not fall below $45 billion in the most recent financial statement or on average over the last four quarterly reports (Board of Governors of the Federal Reserve System, 2019).

The Board of Governors requires the living wills to elaborate how a bank protects itself against risks arising from non-bank activities. The resolution plans also include a part that breaks down the collateral of the bank. Lastly, these plans include a comprehensive description of the ownership structure, their balance sheet structure and their contractual obligations (DFA 165(d)). Making resolution plans are costly and time consuming, as there are no guidelines that

have been proven sufficient and every bank has its own risk that is constantly changing due to macroeconomic and microeconomic changes (Rozansky, Schodek, Bhashyam, & LLP, 2012).

Apart from the resolution plans each large bank is required to submit a credit exposure report. This report includes a description of large bank holding companies and non-bank-SIFIs that have credit exposure to the bank filling the report. It also includes the credit exposure of the reporting bank to other large banks and non-bank-SIFIs. If the credit exposure or the resolution plans are not deemed good enough, there are costly consequences (DFA 165(d)). The requirement of making a living will and credit exposure plans accounts for most cost differences between big banks and small banks.

2.4. Behavior changes following regulation and increased monitoring

2.4.1. Response to regulation and regulatory costs

This section provides an overview of prior literature on behavior changes following regulation changes or increased monitoring. The effectiveness of regulation depends on multiple factors: the cost of intervention, the timing and complexity of the setting and the pace of innovation of the regulated companies (UK department for business, energy & industrial strategy, 2018). Regulation often has unintended consequences as it is hard to account for all possible situations. Jaggi, Chin, Lin and Lee (2006) show that disclosure regulation results in more earnings management. While the regulation's intended goal was to increase the reported earnings quality. Beatty et al. (1995) show that banks sometimes manage balance sheet items to reach regulatory capital requirements. Especially in the banking industry this can be beneficial, as banks are closely monitored with accounting-based measures. Failing to meet certain capital requirement leads to additional costs of regulatory intervention and scrutiny. The same results are found by Moyer (1990). She shows that bank managers are more likely to manage accounting capital measures used by legislators, especially when near a required minimum. An analysis by Slovik (2011) shows that regulation can also change the core business practices of banks. He shows that SIFIs shifted away from assets that having a higher level of risk as the regulatory framework is based on risk-weighted assets. SIFIs gradually reduce their high risk-weighted assets over time, suggesting that regulation does not only have an initial effect but can also have a long-term effect.

Regulatory costs do not necessarily lead to earnings management, the choice of accounting method can also be changed to reduce costs. Ramesh and Revsine (2001) analyzed a situation where banks had a choice when to adopt SFAS 106. They show that banks with

lower regulatory capital requirement have different approaches of implementing new rules compared to banks with higher levels of regulatory requirements. They conclude that this difference can be explained by a reduction of contracting and regulatory costs. The overall response following regulation seems to change behavior in order to prevent costs. The costs related to the DFA is largely dependent on the size of a bank. Therefore, I expect that banks might devaluate their assets to prevent these costs.

2.4.2. Response to increased levels of external monitoring

When a certain industry experiences regulation changes, it will be monitored more closely. Shareholders, researchers and regulators will closely monitor the regulated industry to gauge the actual effect of the new regulation. This also applies for the financial industry when the DFA was introduced. Banks are being monitored strictly, since they have played a major role in the global crisis in 2008 and even more after the enactment of the DFA. Prior research shows that high levels of external monitoring decreases the likelihood of earnings management (Chung et al., 2002). Monitoring can prevent real and accrual earnings management by banks. Wongsunwai (2013) shows that high levels of monitoring will reduce the likelihood of performing earnings management, even though earnings management could be beneficial. Not only monitoring by regulatory bodies is efficient, banks that monitor borrowing companies more closely, lead to less earnings management by these firms as well (Ahn & Choi, 2009). Chung, Firth and Kim (2005) show that being audited by a big audit firm will lead to a reduction in earnings management, confirming the fact that monitoring reduces the amount of earnings management of managers.

The overall effect on behavior after changes in regulations is difficult to determine. Prior literature shows that companies can change their behavior or manage earnings to prevent regulatory or compliance costs. On the other hand, regulation comes with increased levels of external monitoring, which reduces the number of behavior changes and earnings management. The Dodd-Frank Act provides a perfect setting to test the response following regulation changes as almost all costs are based on asset thresholds. Because the costs of crossing the consolidated asset value threshold imposed by the DFA are high, it could provide incentives to manage asset value to prevent these costs.

3. Hypothesis development

The enactment of the Dodd-Frank Act brings high compliance costs for all financial institutions. Although the provisions mentioned in section 2.2 make progress towards improving the stability of the financial market, it is arguably not enough or inadequate. Some academics believe that the DFA fails to charge the right firms (see section 2.3) for their systemic risk as size is not perfectly correlated with systemic risk (Acharya & Richardson, 2012). Others say that it fails to stop the TBTF problem (Wilmarth, 2011) and there is concern that the Act gives the FSOC too much power as they can classify any financial firm as systemically important to gain increased control (Skeel, 2010). This suggests that the DFA does not work as intended.

According to the DFA banks with more than $10 billion consolidated assets are required to set up a risk committee with predetermined size and skilled people. These banks are also subdued to annual stress tests. These stress tests are made public and lead to increased external monitoring and scrutiny (Kapinos et al., 2018). Prior literature shows that companies are more likely to manage their earnings to prevents scrutiny costs (Patten & Trompeter, 2003). Exceeding the $10 billion in assets threshold results in more regulatory intervention, higher capital requirements and stricter risk management requirements. Earnings management is more likely to happen if it reduces or prevents costs (Jaggi, Chin, Lin, & Lee, 2006). Another act implemented in the US, the Federal Deposit Insurance Act (FDIA), is redesigned to prevent asset management. The original design distinguishes the asset value of subsidiaries and parents. Because of concerns that companies would distribute their assets over multiple subsidiaries with assets just below the $10 billion threshold to avoid the compliance costs, the final FDIA is implemented based on the aggregated asset level (Federal Deposit Insurance Corporation, 2012). The DFA already uses the consolidated level, but the change in the FDIA suggests that managing assets to prevent compliance costs is a concern. I argue that medium sized banks could devalue their assets to prevent or postpone compliance costs. There are little benefits of passing the $10 billion threshold, only that the increased regulation can lead to a certain level of security for investors and borrowers. To test whether medium banks devalue their assets to prevent regulatory costs despite the high levels monitoring in the banking industry, is the following hypothesis formulated:

H1: Medium sized banks (total consolidated assets between $10 billion and $50 billion) will undervalue their assets as the result of the Dodd-Frank Act

The Dodd-Frank Act introduces a second asset value threshold, banks with $50 billion in consolidated assets will be classified as systemically important financial institutions (SIFIs). They are subject to the highest levels of regulatory scrutiny, because their failure harms the stability of the financial market the most. SIFIs have stricter capital requirements (see section 2.1), leading to high compliance costs. These big banks are subject to both types of stress tests (section 2.2), which are costly for regulators and banks (Kapinos et al., 2018). So costly that in the beginning of 2019 there was an announcement that it would be eliminated for most SIFIs (Reuters, 2019). The requirement to make resolution plans and credit exposure plans lead to additional costs for big banks (see section 2.3). This living will requirement cost a lot of time, effort and money. And has been a point of critique of the SIFIs and the agencies that have to review the living wills (Reuters, 2018). Because of this, I argue that big banks could devalue their assets to reduce or eliminate these costs.

On the other hand, big banks could benefit from the Too-big-to fail (TBTF) status. Because of their size and complexity, failure would lead to such negative consequences for the financial market that the government is likely to provide financial aid (De Jonghe, Diepstraten & Schepens, 2015; Laeven, Ratnovski & Tong, 2016). Skeel (2010) argues that being one of the big banks has its benefits. It could provide a competitive advantage over smaller banks for lending money to big clients and TBTF banks could benefit from the special treatment the government gives big banks in order to push political policies. Banks that are very likely to fall under the TBTF category, the largest SIFIs, do not have an incentive to undervalue their assets. Some of these big banks are so big that undervaluing their assets to the threshold would be impossible, as some have over $3 trillion total assets. Because of the contradicting incentives, is the second hypothesis (alternative form) tested two-sided. To test whether big banks manage their assets following regulatory costs as related to the $50 billion threshold, is the following hypothesis formulated:

H2: Big banks (total consolidated assets above $50 billion) will under- or overvalue their assets as the result of the Dodd-Frank Act

Because the DFA uses asset thresholds, banks that are close to the threshold are more inclined to manage assets. The less you have to manage, the lower the risk is of being caught. And earnings management is performed more often if it is close to requirements, therefore I argue that it would be more common for banks close to a threshold (Beatty et al., 1995). Banks that have far exceeded the threshold have little incentive trying to drop their asset value below

the threshold as the risk of repercussions outweighs the benefits. As the group medium banks used for hypothesis one includes banks close to $50 billion, is it hard to isolate the behavior near one threshold. I therefore conduct a more detailed analysis using banks close to the threshold. As the DFA uses strict borders, the banks know what value they must or must not exceed to end up on the preferred side of the border. Each bank can determine which side of the threshold would be the most beneficial for them (Goodhart & Lastra, 2010).

Banks above the threshold have higher costs, as described in section 2, but it can also lead to benefits. The bigger the bank, the less likely it is to declare bankruptcy as governmental guaranties are more likely. This can provide shareholders and customers with a sense of security. That is why smaller banks get hit harder by a crisis. Customers are more likely to withdraw money from small banks that are less likely to get governmental support (Goodhart & Lastra, 2010). Being subject to the highest regulatory requirements of the DFA will provide customers and shareholders more information and reduces their risk. However, not all regulatory costs can be prevented by simply devaluing assets. Banks that had $50 billion in consolidated assets on 1 January 2010 were subject to stricter rules. If banks drop below the $50 billion threshold in following years, they temporarily are subject to the rules of non-bank financial companies supervised by the Board of Governors. This weakens some rules, but still have increased regulation. They can, however, appeal their status annually to eliminate the additional costs (DFA 113).

Banks that are far away from thresholds are less likely to manage their assets following the DFA while banks close to the threshold have more incentive to manage their assets. By performing tests for banks closest to the threshold, more insightful results are expected. Although there are some arguments that suggest that bank managers would want to be subject to the stricter rules, prior literature shows that earnings management is mainly driven by preventing costs or achieving goals. The increase in scrutiny, compliance and regulatory costs is very big when the $10 billion or $50 billion threshold is met, providing bank managers an incentive to manage their assets. For banks that are close to the thresholds, it is unlikely that the benefits outweigh the increasing costs. Given these insights the following hypotheses are formulated:

H3: Banks close to the $10 billion threshold will undervalue their assets as the result of the Dodd-Frank Act

H4: Banks close to the $50 billion threshold will undervalue their assets as the result of the Dodd-Frank Act

Hypotheses 1 and 2 will provide a more general view of the responds of banks given the two thresholds implemented by the DFA. Hypotheses 3 and 4 use banks belonging to the 1% of the sample that are closest to the threshold in absolute value. This provides better-suited results to answer the research question:

Research Question: Do banks decrease their asset value following higher regulatory costs?

4. Sample selection and methodology

4.1. Sample selection

This study uses all U.S. listed banks for ten years from 2008 to 2017. 2017 is the end date, because the Economic Growth, Regulatory Relief, and Consumer Protection Act is enacted in law in 2018. This act eases the requirements for small banks and increased the threshold for SIFIs to $250 billion instead of $50 billion (U.S. Congress, 2018). To answer the research question, I use two samples as the banking industry is split up in two divisions, namely commercial banks and investment banks. Both divisions have different business models and provide different services. Traditional banks' profit mainly comes from providing loans and mortgages or taking deposits, while investment banks earn money by being the financial intermediary for investments or act as an advisor or broker. Most banks do not combine the different services. The first and most important sample is the traditional bank sample. This sample includes commercial banks (sic 6020) and saving institutions (sic 6030). The second sample is named the 'full sample'. The full sample includes the same banks as the traditional bank sample, but also includes finance services banks (sic 6199) and investment banks (sic 6211). The traditional bank sample is subject to more regulation, and most banks in this sample are insured by the Federal Deposit Insurance Corporation (FDIC), while investment banks are not insured. Only investment banks that are classified as a SIFI are insured by the FDIC (Federal Deposit Insurance Corporation, 2019).

I obtain data of the traditional bank sample from the Compustat Bank Fundamentals Annual database, which only includes banks with sic codes 6020, 6034 and 6035. The full sample uses Compustat Fundamentals Annual database, of which I only use banks with sic codes 6020, 6034, 6035, 6199 and 6211. New York University's Volatility Lab (2019) provided

me with data for the calculation of *Systemic risk*. Table 1 reports the sample selection procedure of both samples. Observations with less than 5 consecutive observations are dropped as the independent variable *Total asset growth* requires 5 consecutive years of accounting data. Non-listed or inactive firms are dropped, because I need the share price to calculate the market value which I use to calculate the *Market-to-Book value*.

The Compustat Bank Fundamentals Annual database does not include share price and total shares outstanding. I obtain these by merging the traditional bank sample data with the Compustat Fundamentals Annual database. To include *Systemic risk*, I merge both databases with a database provided by NYU Stern V-Lab (2019). I merge all the databases one-on-one using Cusip and fiscal year as unique identifiers.

Table 1

Sample selection process

	Traditional bank sample		Full sample	
	Bank years	Unique banks	Bank years	Unique banks
Full sample banks	**9,966**	**1,193**	**10,755**	**1,285**
Less: Observations with <5 consecutive years	-1,263	-419	-1,346	-451
Less: Observations of inactive firm year or non-listed firms	-2,573	-277	-2,757	-297
Subsample of listed active firms	**6,130**	**497**	**6,652**	**537**
Less: Observations with missing values	-2,252	-102	-2,441	-107
Less: banks with observations in less than half of the years (N<6)	-253	-21	-318	-27
Banks with available data for this thesis	**3,625**	**374**	**3893**	**403**

Table 1 reports the sample selection process. The traditional bank sample includes U.S. public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample.

4.2. Model specification

4.2.1. Dependent variables

In order to measure whether assets are under- or overvalued, I use two different outcome variables, *Market-to-book* (*MTB*) and *Total asset growth* (*TAG*). *MTB* and *TAG* are measures of growth opportunities and asset growth. Changes in *MTB* and *TAG* compared to the previous three years are calculated using equation (1) and (2) respectively.

$$MTB_{i,t} = \frac{Shares_{i,t} * Price_{i,t}}{Book\ value_{i,t}} - \sum \left(\frac{Shares_{i,t-j} * Price_{i,t-j}}{Book\ value_{i,t-j}} \right) / 3 \quad (1)$$

Where *t* = year (2008…2017); *j* = 1,2,3; *i* = 1…N, with N is the total number of U.S. public listed banks. *Shares* is the total number of common stock outstanding at the end of fiscal year *t*. *Price* is the share price of a common stock at the last trading day of fiscal year *t*. *Book value* is the book value of common equity as stated in the annual report of fiscal year *t*.

$$TAG_{i,t} = \frac{TA_{i,t} - TA_{i,t-1}}{TA_{i,t-1}} - \sum \left(\frac{TA_{i,t-j} - TA_{i,t-j-1}}{TA_{i,t-j-1}} \right) / 3\,, \qquad (2)$$

Where *t* = year (2008…2017); *j* = 1,2,3; *i* = 1…N, with N is the total number of U.S. public listed banks. *TA* is the total consolidated assets as stated in the annual report of fiscal year *t*.

To observe whether asset value changes for banks following the enactment of the DFA are both outcome variables the difference between the outcome variable in year t and the average outcome variable of prior three years. Where *t* indexes time from 2008 to 2017. The Market-to-book ratio (MTB-ratio) is often used to measure financial health (Barth, Beaver, & Landsman, Relative Valuation Roles of Equity Book Value and Net Income as a Function of Financial Health, 1998) or profitability of a company (Fama & French, 1995; Malone & Rose, 2006). Assuming that the market value is on average equal to the underlying value suggests that a market-to-book ratio above 1 could suggests that a bank undervalues its assets. By comparing the MTB-ratio with the average MTB-ratio of prior years, I can test if banks value their assets different following the DFA. A positive sign of *MTB* means that the current year MTB-ratio is above short-term average. This suggests that the current year, given the assumption that the market value is equal to the underlying value of stocks, has more undervalued assets.

The percentage of asset growth is often used to measure asset growth of a company (Cooper, Gulen & Schill, 2008; Lam & Wei, 2011). Again, I use the current year assets growth minus the prior three years average asset growth to test whether the DFA impacts the asset growth of banks. A positive value of *TAG* indicates that banks have above short-term average assets growth in the current year. It is expected to have a negative sign, as banks are expected to postpone the regulatory costs by not exceeding the threshold value.

4.2.2. Model specification and independent variables

In order to test if banks size affects asset value following the Dodd-Frank Act, I analyze banks that are categorized by different size brackets. Appendix C reports the operational framework of this thesis using Libby Boxes. To test whether banks that exceed the $10 billion or $50 billion asset threshold behave differently and to test hypothesis 1 and 2, I use the following model:

$$Outcome\ variable_{it} = \propto_1 + \beta_1 Bank\ size_{it} + \beta_2 DFA_{it} + \beta_3 Bank\ size_{it} * DFA_{it} + \beta_4 Derivative\ gains_{it} + \beta_5 Earnings_{it} + \beta_6 Leverage_{it} + \beta_7 Size_{it} + \beta_8 Systemic\ risk_{it} + \beta_9 TBTF_i + \beta_{10} Tier\ 1\ Capital\ ratio_{it} + \sum \beta_f (Industry, Year) + \varepsilon_{it} \quad (3)$$

Model (3) uses panel data, where *t* = year (2008…2018); *i* = 1…N, with N is the total number of banks in the sample. *Outcome variable* is *MTB* or *TAG*, which I calculate using equation (1) and (2). *Bank size* equals one if the bank is a *Medium bank* (total asset value between $10 billion and $50 billion) for testing hypothesis 1 and zero for non-medium banks. *Bank size* equals one if the bank is a *Big bank* (total asset value equal or above $50 billion) for testing hypothesis 2 and zero for small and medium banks. *DFA* equals one if an observation relates to a year after the enactment of the DFA, 2011-2017, and zero if it relates to pre-enactment years, 2008-2010. The *DFA* is expected to be positively associated with *MTB*. The trust in banks is very low during the financial crisis of 2008. The Dodd-Frank Act is enacted after the worst part of the crisis and is aimed at reducing the risk of banks, both are likely paired with increased market value of shares and therefore have a positive association with *MTB*. *DFA* is also expected to be positive for *TAG*, as the pre-enactment years (2008-2010) are during the financial banking crisis. It is expected that asset growth increases after the low point of the financial banking crisis. *Bank size * DFA* is the interaction term of *Medium bank/Big bank* and *DFA*. The coefficient β_1

captures the assets value changes of *Bank size* prior to the enactment of the Dodd-Frank Act. β_2 captures the effect of the Dodd-Frank Act on the control group's asset value changes. β_2 is expected to be positive, as the enactment is likely to improve the trust in the banks and bank shares were relatively low due to the financial crisis. The DFA aims to protect the consumers, so it is likely that the market value increases due to the extra regulation put in place. My variable of interest, β_3, captures the incremental effect on asset value changes of being a *Medium bank*, relative to before the enactment of the Dodd-Frank Act and compared to non-medium banks for hypothesis 1. β_3 captures the incremental effect on asset value changes of being a *Big bank*, relative to before the enactment of the Dodd-Frank Act and compared to non-big banks for hypothesis 2.

As discussed in section 3, banks that are far above the thresholds have less incentive to manage their assets. To test this statement, I use the following model:

$$Outcome\ variable_{it} = \propto_1 + \beta_1 Close\ to\ \$X_{i,t} + \beta_2 DFA_{i,t} + \beta_3 Close\ to\ \$X_{i,t} * DFA_{i,t} + \sum \beta_k \text{Control variables}_{i,t} + \sum \beta_f (Industry, Year) + \varepsilon_{it} \quad (4)$$

Model (4) uses panel data, where *t* = year (2008…2017); *i* = 1…N, with N is the total number of U.S. listed banks in the sample. *Outcome variable* is *MTB* or *TAG*, which I calculate using equation (1) and (2). *Close to $X* is a dummy variable for banks that are near a threshold. *Close to $X* is *Close to $10 billion* to test hypothesis 3 and *Close to $50 billion* to test hypothesis 4. Both variables are equal to one for banks that are close to the threshold and zero otherwise. I define close as the 1% (n=4) of banks with the smallest absolute difference between their total assets value and the asset value threshold. *Close to $X* is determined each year, enabling me to test if banks close to the threshold value their asset differently to previous years. In model (4) captures β_1 the assets value changes of banks close to $10 billion or $50 billion prior to the enactment of the Dodd-Frank Act. β_2 captures the effect of the Dodd-Frank Act on banks further away from the thresholds. β_3, the variable of interest in model (4), captures the incremental effect on asset value changes of banks close to the thresholds, relative to before the enactment of the Dodd-Frank Act and compared to banks further away from the thresholds. The control groups enable me to mitigate confounding factors that influence banks, unrelated to the implementation of the DFA. Using a sample of control firms who are further from the threshold and the interaction variable *Close to $X * DFA* permits testing whether banks close to the

threshold have higher or lower *MTB* and *TAG* than banks relatively far from the thresholds following the enactment of the DFA (Landsman, Maydew, & Thornock, 2012).

4.2.3. Control variables

I include control variables to reduce endogeneity concerns of my thesis. I refer to appendix A for a compact overview of all variable definitions. This section includes the reasoning and the expected signs of the control variables used. Model (4) includes the same control variables as model (3). The control variables mainly reduce the possible omitted variable bias between assets value changes and banks, as mandatory regulation changes are less subject to endogeneity problems (Fu, Kraft, & Zhang, 2012). The implementation of the DFA is a intertemporal change in regulation with no possibility of voluntary adoption, therefor come most endogeneity concerns from omitted variable bias related with *Bank size* and *Close to $X*.

The DFA leads to increased costs, as discussed in section 2, these costs increase with interconnectedness and size of a bank. To account for this, I follow Gao, Liao and Wang (2018) and use *Derivative gains* as a proxy for complexity and include a control variable for *Size*. I use yearly quartile ranks of the total fair value of credit derivatives sold divided by total assets. *Size* is the natural logarithm of total assets. *Size* is expected to have a negative coefficient as Gao et al. (2018) show that bank size has a negative association on the stock market, thus reducing the *MTB*. Asset growth is influenced by multiple factors, Cooper et al. (2008) construct a total asset growth model including retained earnings growth and financing structure. I include *Earnings* and *Leverage* to capture these determinants of asset growth. *Earnings* is the annual reported earnings before extraordinary items scaled by total assets. *Earnings* is expected to have a positive coefficient, as higher earnings are likely to result in higher asset growth. *Leverage* is total assets divided by total consolidated liabilities. *Leverage* is expected to have a negative coefficient for *MTB* as external financing is associated with negative stock returns, reducing the market value of the *MTB* (Cooper et al., 2008). *Systemic Risk* is included because the DFA aims at reducing systemic risk of banks (DFA 716). Banks that have more systemic risk are expected to be influenced more by the DFA than banks with relatively little systemic risk. *Systemic risk* is expected to have a negative association with asset valuation, as the costs of the DFA are higher for banks with more systemic risk. The Dodd-Frank Act also intends to end the TBTF problem. Banks that are likely to be a *Too-Big-to-Fail* bank could respond differently to the enactment of the act. I follow Johnson and Kwak (2011) and use the big 6 banks as firms with high likelihood of being saved by governmental bailouts. *Too-Big-to-Fail* is an indicator

variable with a value of one for banks that are included in the big 6 banks in the United States[4]. This variable is expected to have a positive association with asset value, as these banks receive more potential benefits than other banks. *Tier 1 Capital ratio* is the total tier 1 capital divided by adjusted risk-weighted assets. This variable is controlled for because changes in asset value happen as a result of a shift towards less risky assets to meet the requirements implemented by the DFA. *Tier 1 Capital ratio* is only included for regressions using the traditional bank sample, as Compustat does not have this data available for finance services banks and investment banks.

4.2.4. Additional tests

I winsorized all continuous variables at the 1% and 99% level to mitigate the effect of spurious outliers (Cooper et al., 2008). I also test if collinearity is a problem using pairwise correlation tables, Variance Inflation Factor (VIF) tests and Condition Number analyses. Appendix B displays the pairwise correlation table of all variables used in model (3). Panel A shows the pairwise correlation coefficients of the traditional bank sample and Panel B reports the pairwise correlation coefficients of the full sample. The highest correlation coefficients are as expected, *Big bank* is expected to be correlated with *Size, Derivative gains* and *Systemic risk.* As the correlation of some variables is relatively high, I perform two multicollinearity tests. Appendix D, table 8 shows the test results of the VIF tests and the condition number analyses. Panel A-D correspond to the models used to test hypothesis 1 - 4 respectively. In general, a VIF score above 5 or 10 indicates multicollinearity problems (James, Witten, Hastie, & Tibshirani, 2013). Panel B shows a VIF score of 5.53 for *Big Bank.* I expect *Big bank* to have a higher score because of the interaction variable and *Size*. As the VIF score is far below 10, I assume that *Big bank* still provides useful information for testing hypothesis 2. The second column shows the results from the condition number analyses, where a condition number above 15 is often used as the threshold where multicollinearity is a concern (Belsley, Kuh, & Welsch, 2013). Overall, the mean VIF score and conditional numbers are low and suggest no collinearity problems.

Appendix E, table 9 reports the output of tests used to determine which regression model should be used. These tests check for fixed effects, heteroskedasticity and autocorrelation. Panel A provides Chi^2 statistics and p-values of the Hausman test. The Hausman test determines whether a random or fixed effects regression model is better suited. As all but one has

[4] The big 6 banks include: JPMorgan Chase & Co, Bank of America Corp., Citigroup Inc., Wells Fargo & Co, Godman Sachs Group Inc. and Morgan Stanley

significant test statistics, I use a multivariate fixed population-average linear model (Stata - xtreg, fe). I follow prior literature and control for industry specific characteristics that may affect asset growth by including industry fixed effects (De Jonghe et al., 2015) and macroeconomic events using time fixed effects (Erkens, Gan, & Yurtoglu, 2018). Panel B of table 9 presents test statistics of the Breusch-Pagan Chi^2-test for heteroskedasticity. All p-values are below 0.01, indicating heteroskedasticity of the residuals (Breusch & Pagan, 1979). To account for this, I use heteroscedasticity-consistent standard errors. Panel C presents the test statistics of the Wooldridge test for autocorrelation in panel data. A significant test statistic indicates the presence of autocorrelation (Wooldridge, 2010). I follow prior literature to account for autocorrelation and heteroscedasticity using standard errors clustered by bank (Goh, Li, Ng & Yong, 2015; Gao et al., 2018).

5. Results

5.1. Descriptive statistics

Table 2 reports the number of banks above each threshold. *Small banks* are banks with less than $10 billion assets, *medium banks* are banks with an asset value between $10 billion and $50 billion and *big banks* have more than $50 billion in asset value. Panel A uses the traditional bank sample, while Panel B uses the full sample. Panel C reports descriptive statistics of the distribution of total consolidated assets of both samples. It is important to notice that *Medium bank* includes banks close to both thresholds, hence the need to narrow down the group of interest as is done for hypothesis 3. The difference between banks near the $50 billion threshold and the biggest banks is so big that narrowing that sample down provides more useful results, hence hypothesis 4 would provide better results to answer the research question.

Table 3 provides descriptive statistics of all variables used in model (3) except *Bank size* as that is provided in Table 2. Panel A presents the descriptive statistics of the observations included in the traditional bank sample. Panel B presents the statistics of the full sample. All continuous variables are winsorized at the 1% and 99% to reduce the effect of outliers. I refer to Appendix A for variable definitions.

Table 2

Distribution of bank size

Panel A: Number of banks in each size category by year using the traditional bank sample

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Big banks	42	43	44	44	48	48	47	47	47	46
Medium banks	30	31	34	37	38	38	42	44	51	56
Small banks	258	268	279	284	288	288	284	282	274	263
Total number of banks	330	342	357	365	374	374	373	373	372	365

Panel B: Number of banks in each size category by year using the full sample

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Big banks	50	51	52	51	55	55	55	55	56	54
Medium banks	33	34	38	42	43	44	47	51	57	62
Small banks	271	282	295	301	305	304	298	293	285	285
Total number of banks	354	367	385	394	403	403	400	399	398	390

Panel C: Descriptive statistics of total asset value (in millions) per bank size for both samples

Total assets in millions	Traditional bank sample			Full sample		
	Small banks	Medium banks	Big banks	Small banks	Medium banks	Big banks
Mean	2,296.84	21,925.76	737,042.60	2,263.67	23,083.43	749,529.30
SD	2,374.21	10,050.12	843,900.80	2,372.55	10,941.27	812,337.70
Minimum	64.55	10,020.89	50,317.80	3.816	10,020.89	50,317.80
Median	1,244.85	19,094.24	282,047.4	1,224.76	20,167.70	324,299.10
Maximum	9,879.46	49,599.00	3,510,975.00	9,879.46	49,599.00	3,510,975.00

Table 2 provides additional analyses of bank size. Panel A reports the number of banks for each size category per year of the traditional bank sample. This sample includes public listed commercial banks (sic 6020) and savings institutions (sic 6030). Panel B reports the number of banks for each size category per year of the full sample. This sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. Panel C provides descriptive statistics of total asset value per size category. The numbers in Panel C are in millions. I refer to Table 1 for the sample selection procedure.

5.2. Overall asset value changes following the Dodd-Frank Act

I start with tests on the overall effect of the enactment of the DFA on banks in certain size groups (*Small bank, Medium bank, Big bank)*. I test whether banks above a threshold value their assets differently compared to banks of other size categories. More specifically, I examine

Table 3

Descriptive statistics of main variables included in model (3) and (4)

Panel A: Descriptive statistics for analyses with traditional bank sample (sic-codes 6020, 6030)

	Mean	SD	Minimum	Median	Maximum
Market-to-Book ratio	-0.0344	0.4441	-1.4592	0.0354	1.2388
Total assets growth	-0.0045	0.1380	-0.3952	-0.0069	0.5593
DFA	0.7161	0.4509	0.0000	1.0000	1.0000
Derivative gains	1.4783	1.0984	1.0000	1.0000	4.0000
Earnings	0.0063	0.0084	-0.0345	0.0076	0.0280
Leverage	1.1167	0.0392	1.0353	1.1121	1.2925
Size	8.2208	2.1790	4.7956	7.6610	14.6738
Systemic risk	2.4495	13.5820	-1.5784	0.0000	99.9221
Too-Big-to-Fail	0.0083	0.0906	0.0000	0.0000	1.0000
Tier 1 Capital Ratio	12.3602	3.9098	0.0000	12.3500	23.7000
Number of Observations	3625				

Panel B: Descriptive statistics for analyses with full sample (sic-codes 6020, 6030, 6199 and 6211)

	Mean	SD	Minimum	Median	Maximum
Market-to-Book ratio	-0.0350	0.4693	-1.6002	0.0307	1.4572
Total assets growth	-0.0070	0.1578	-0.5420	-0.0073	0.6345
DFA	0.7159	0.4510	0.0000	1.0000	1.0000
Derivative gains	1.4963	1.1148	1.0000	1.0000	4.0000
Earnings	0.0058	0.0111	-0.0566	0.0075	0.0350
Leverage	1.1409	0.1609	1.0346	1.1131	2.4415
Size	8.2839	2.2767	4.4743	7.6950	14.6706
Systemic risk	2.8591	14.3063	-2.1475	0.0000	100.6003
Too-Big-to-Fail	0.0154	0.1232	0.0000	0.0000	1.0000
Number of Observations	3893				

Table 3 provides descriptive statistics for all variables used in model (3) except bank size, which is reported in Table 2. Panel A reports descriptive statistics of the traditional bank sample, while Panel B reports descriptive statistics of the full sample. The traditional bank sample includes public listed commercial banks (sic 6020) and savings institutions (sic 6030). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. Market-to-Book (MTB) ratio is calculated as the difference between the MTB ratio of year t and the average MTB ratio of t-1, t-2 and t-3. Total assets growth is the difference between the percentage total consolidated assets growth of year t minus the average percentage total consolidated assets growth of year t-1, t-2 and t-3. DFA is an indicator variable with value 1 if the year is 2011 or later. 2011 is the first year after the implementation of the Dodd-Frank Act in 2010. Tier 1 Capital Ratio is not available for investment banks, only for traditional banks and therefore excluded from the full sample. All continuous variables are winsorized at 1% and 99%. I refer to Appendix A for the descriptions of control variables and table 1 for the sample selection procedure.

whether medium sized banks devalue their assets following the implementation of provisions for banks with more than $10 billion consolidated assets (H1). Furthermore, I examine whether big banks value their asset differently as a result of the additional costs for SIFIs (H2). To obtain more robust results, I test asset value changes using two proxies. The dependent variable is either *Market-to-book (MTB)* or *Total asset growth (TAG)*, obtained using

equation (1) and (2) respectively. I also differentiate between traditional banks and investment banks or finance service banks using two samples for each hypothesis and asset value proxy. I estimate model (3) using a multivariate fixed population-average linear model (Stata – xtreg, fe model) to test hypotheses 1 and 2. I refer to Table 1 for the sample selection process and Tables 2-3 for descriptive statistics of the variables used in model (3).

Table 4, Panel A reports the multivariate results of model (3) to test whether medium sized banks devalue their assets following the enactment of the Dodd-Frank Act (H1). *Medium Bank* has no significant coefficient, suggesting that the change in *MTB* of year prior to the enactment of the Dodd-Frank Act (2008-2010) is not significant different for medium banks compared to small and big banks. β_2 shows significant positive coefficients for *MTB* ($p<0.01$) for both samples, confirming that the enactment of the Dodd-Frank Act has a positive association with *MTB* for the control group. This is in line with prior research showing that the Price-to-book ratio of banks in the United States have an upwards shift since 2011 (Bank for International Settlements, 2018, pp. 26, Graph 17). The effect of the Dodd-Frank Act on *TAG* is only significant for the traditional bank sample ($p<0.05$). Suggesting that traditional banks experience more asset growth relative to investment banks and financial service banks for years following the DFA. The variable of interest, β_3, is negative and significant ($p<0.05$) for the traditional bank sample using *MTB* as the dependent variable. This suggests that a medium sized bank has, on average, a lower market-to-book ratio after the enactment of the Dodd-Frank Act compared to small and big banks. A lower market-to-book ratio is either due to a reduction of the market value of equity or an increase of the book value of common equity. Assuming a near perfect market, the decrease in the market-to-book ratio reflects overvalued assets rather than undervalued assets. Therefore, Table 5, Panel A does not provide sufficient evidence to reject H1. There is not sufficient evidence that banks between $10 billion and $50 billion assets undervalue their assets following the regulatory costs related to the DFA.

There are two possible explanations for this. The first possibility is that the market value of equity is influenced by other value-relevant information that is not included in model (3). As the stock market is not perfect and complete, there are unrecognized net assets that can influence the market-to-book ratio (Barth, Beaver, & Landsman, 1996). The second possible explanation is the fact that the average medium sized bank is not close to the threshold. Table 2, Panel C shows that the average medium bank has a total asset value of $21,925.76 million ($23,083.43 million) in the traditional (full) sample. The average medium bank has more than double the asset value, therefore, the β_3 represents the effect of banks that are unlikely to devalue their assets below $10 billion. The signs of significant control variables are congruent with prior

Table 4
Overall effect of Dodd-Frank Act on asset value.

Panel A: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book *(MTB)* and total assets growth (*TAG)* for banks with total consolidated assets between $10 billion and $50 billion

	Traditional bank sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Medium Bank	0.066	0.038	-0.027	0.017
	(0.72)	(1.26)	(-0.27)	(0.57)
DFA	0.964***	0.035**	0.544***	0.021
	(22.43)	(2.54)	(14.59)	(1.57)
DFA * Medium bank	**-0.148****	**-0.028**	**-0.072**	**-0.014**
	(-2.18)	**(-1.62)**	**(-0.92)**	**(-0.74)**
Derivatives gains	-0.006	0.003	-0.000	0.006**
	(-1.03)	(1.14)	(-0.07)	(2.06)
Earnings	8.481***	2.715***	5.414***	3.368***
	(4.10)	(6.49)	(3.55)	(6.92)
Leverage	-2.008***	-0.185	-0.418	0.013
	(-2.73)	(-1.36)	(-1.53)	(0.14)
Size	-0.199***	-0.005	-0.206***	0.001
	(-4.84)	(-0.24)	(-4.50)	(0.06)
Systemic risk	-0.000	-0.001	-0.000	-0.001
	(-0.07)	(-0.90)	(-0.39)	(-1.18)
Too-Big-to-Fail	0.010	0.090	-0.002	0.011
	(0.76)	(1.56)	(-0.05)	(0.72)
Tier 1 Capital Ratio	0.001	0.000	-	-
	(0.19)	(0.30)	-	-
Constant	3.122***	0.195	1.464**	-0.079
	(3.57)	(0.93)	(2.43)	(-0.39)
Year & industry fixed effects	Yes	Yes	Yes	Yes
Observations	3,625	3,625	3,893	3,893
F-Test statistic	105.58	14.24	105.85	16.11
Prob. > F-test	0.000	0.000	0.000	0.000
Adjusted R^2	0.481	0.052	0.444	0.063

Panel B: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book *(MTB)* and total assets growth (*TAG)* for banks with more than $50 billion in total consolidated assets

	Traditional bank sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Big Bank	-0.143	-0.008	-0.091	-0.061
	(-0.68)	(-0.31)	(-0.60)	(-1.41)
DFA	0.955***	0.021	0.535***	0.009
	(22.24)	(1.55)	(14.38)	(0.67)
DFA * Big bank	**-0.002**	**0.069*****	**0.012**	**0.070*****
	(-0.03)	**(4.23)**	**(0.22)**	**(3.73)**

(continued on next page)

Table 4 (continued)

Panel B: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book *(MTB)* and total assets growth (*TAG)* for banks with more than $50 billion in total consolidated assets

	Traditional bank sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Derivatives gains	-0.006	0.003	-0.001	0.006*
	(-1.03)	(0.96)	(-0.10)	(1.93)
Earnings	8.348***	2.845***	5.395***	3.444***
	(4.05)	(6.90)	(3.54)	(7.14)
Leverage	-2.062***	-0.125	-0.421	0.015
	(-2.81)	(-0.93)	(-1.55)	(0.15)
Size	-0.212***	0.001	-0.222***	0.007
	(-5.38)	(0.04)	(-4.88)	(0.35)
Systemic risk	-0.000	-0.000	-0.000	-0.001
	(-0.06)	(-0.53)	(-0.27)	(-0.75)
Too-Big-to-Fail	0.098*	0.008	0.007	0.009
	(1.76)	(0.66)	(0.14)	(0.62)
Tier 1 Capital Ratio	0.002	-0.000	-	-
	(0.30)	(-0.19)	-	-
Constant	3.305***	0.097	1.600***	-0.121
	(3.83)	(0.45)	(2.66)	(-0.58)
Year & industry fixed effects	Yes	Yes	Yes	Yes
Observations	3,625	3,625	3,893	3,893
F-Test statistic	105.65	15.73	104.78	16.23
Prob. > F-test	0.000	0.000	0.000	0.000
Adjusted R^2	0.479	0.057	0.443	0.068

*Table 4 presents tests for the implementation of the Dodd-Frank Act on the valuation of assets by banks. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. The dependent variable Market-to-Book (MTB) is the MTB ratio of the observation minus the average MTB of the prior three years. Total assets growth is the percentage growth of total consolidated assets minus the average percentage growth of total consolidated assets of the prior three years. DFA is an indicator variable that equals 1 for observations in the years following the enactment of the Dodd-Frank Act. Therefore, observations in the year 2011 or later are equal to 1 and 0 otherwise. Panel A reports multivariate OLS regressions used to test hypothesis 1. Medium bank is an indicator variable that equals 1 for banks with total consolidated asset value between $10 billion and $50 billion and 0 otherwise. Panel B reports multivariate OLS regressions used to test hypothesis 2. Big Bank is an indicator variable that equals 1 for banks with $50 billion in total consolidated asset value and 0 otherwise. All continues variables are winsorized at the 1% and 99% levels. I refer to Appendix A for the description of control variables. Appendix D and E provide results of test of the assumptions of an OLS regression and additional tests. The standard errors are robust and clustered at firm-level. T-values are in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level (two-tailed).*

literature. For instance, the positive coefficient of *Earnings* is congruent with the research of Barth, Elliott and Finn (1999). They show that firms with increasing earnings have higher multiples.

Panel B of Table 4 provides the multivariate regression estimates of model (3) using *Big bank* as independent variable for *Bank size* to test whether big banks under- or overvalue their assets following the enactment of the Dodd-Frank Act (H2). Panel B reports model (3) using both dependent variables (*MTB* and *TAG*) and both samples. *Big bank* has no significant values, suggesting that there is no significant difference between big banks and banks with less than $50 billion asset value prior to the DFA. *DFA* is significant for models with *MTB* as dependent variable ($p<0.01$). Again, congruent with prior literature by the Bank for International Settlements (2018). The interaction term *DFA * Big bank* is not significant for models using *MTB* as dependent variable, suggesting that the average big bank does not under- or overvalue their assets compared to small and medium banks after the implementation of the DFA regulations. β_3, of model (3) using *TAG*, is positive and significant ($p<0.01$) which suggests that the average big bank has more asset growth than small and medium banks for years after the DFA. The observed significant asset growth could be due to the costs for small banks to deliver all services after the stricter regulation that the DFA imposes. Peirce, Robinson and Stratmann (2014) observe that small banks change their service and product offerings as a result of increased regulatory costs of the Dodd-Frank Act. As the small bank group is a large part of the control group, it is possible that the observed asset growth is not due to effect of DFA on big banks, but due to the negative effect of the DFA on the asset growth of a big part of the control group. The increased regulation can provide investors with a sense of security, which eases the acquirement of financing for big banks. Although there are significant asset growth differences for big banks opposed to small and medium banks, because there are no significant differences between the market-to-book ratio of big banks and non-big banks, is there not enough significant evidence to reject H2. The signs of significant control variable coefficients are comparable with the *Medium* bank sample. *Too-Big-to-Fail* is also slightly significantly positive now ($p<0.10$), which is in line with Gao et al. (2018, pp. 215, Table 2 Panel B). They also report a positive sign for their TBTF proxy (although not significant). Their model shows that the Big 6 banks[5] could have positive association with higher stock returns. This is in line with my model, that suggests that the market-to-book value of these banks is higher.

5.3. Asset changes of banks close to the Dodd-Frank thresholds

To test whether banks manage their assets to escape high regulatory costs, I use model (4). Model (4) uses *MTB* and *TAG* as dependent variables for both the traditional banks

[5] The banks that are classified as *Too-Big-to-Fail* in this thesis are called the "Big 6" in the paper of Gao, Liao and Wang (2018)

Table 5
Effect of Dodd-Frank Act on asset value on banks close to the thresholds

Panel A: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book ratio and total assets growth for the 1% of banks closest to the $10 billion threshold each year

	Traditional banks sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Close to $10 billion	0.002	0.059	-0.008	0.056
	(0.01)	(1.15)	(-0.06)	(1.11)
DFA	0.954***	0.032**	0.538***	0.020
	(22.85)	(2.30)	(14.89)	(1.55)
DFA * Close to $10 billion	**-0.031**	**-0.078**	**-0.033**	**-0.082**
	(-0.18)	**(-1.37)**	**(-0.19)**	**(-1.42)**
Derivatives gains	-0.006	0.003	-0.001	0.006**
	(-1.04)	(1.14)	(-0.09)	(2.06)
Earnings	8.413***	2.718***	5.402***	3.369***
	(4.08)	(6.54)	(3.54)	(6.94)
Leverage	-2.043***	-0.166	-0.419	0.015
	(-2.82)	(-1.21)	(-1.54)	(0.15)
Size	-0.214***	-0.001	-0.224***	0.003
	(-5.43)	(-0.07)	(-4.96)	(0.14)
Systemic risk	-0.000	-0.001	-0.000	-0.001
	(-0.06)	(-0.92)	(-0.33)	(-1.19)
Too-Big-to-Fail	0.094*	0.007	0.007	0.009
	(1.66)	(0.51)	(0.13)	(0.61)
Tier 1 Capital Ratio	0.001	0.000	-	-
	(0.25)	(0.25)	-	-
Constant	3.287***	0.152	1.605***	-0.094
	(3.84)	(0.70)	(2.68)	(-0.45)
Year & industry fixed effects	Yes	Yes	Yes	Yes
Observations	3,625	3,625	3,893	3,893
F-Test statistic	106.57	14.67	104.98	16.56
Prob. > F-test	0.000	0.000	0.000	0.000
Adjusted R^2	0.479	0.051	0.443	0.063

Panel B: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book ratio and total assets growth for the 1% of observations closest to the $50 billion threshold each year

	Traditional banks sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Close to $50 billion	0.264**	-0.036	0.225	-0.030
	(2.31)	(-0.83)	(1.29)	(-0.90)
DFA	0.957***	0.032**	0.542***	0.019
	(22.90)	(2.28)	(14.83)	(1.43)
DFA * Close to $50 billion	**-0.481****	**0.031**	**-0.459***	**0.060**
	(-2.27)	**(0.55)**	**(-1.92)**	**(1.12)**

(continued on next page)

Table 5 (continued)

Panel B: Multivariate tests for the effect of the implementation of the DFA on asset value proxies Market-to-Book ratio and total assets growth for the 1% of observations closest to the $50 billion threshold each year

	Traditional banks sample		Full sample	
	Market-to-Book	Total assets growth	Market-to-Book	Total assets growth
Derivatives gains	-0.006	0.003	-0.001	0.006**
	(-1.09)	(1.13)	(-0.17)	(2.07)
Earnings	8.517***	2.698***	5.507***	3.356***
	(4.12)	(6.44)	(3.59)	(6.87)
Leverage	-2.113***	-0.164	-0.436	0.015
	(-2.89)	(-1.20)	(-1.60)	(0.16)
Size	-0.210***	-0.003	-0.225***	0.002
	(-5.27)	(-0.14)	(-4.96)	(0.09)
Systemic risk	-0.000	-0.001	-0.000	-0.001
	(-0.06)	(-0.92)	(-0.33)	(-1.19)
Too-Big-to-Fail	0.093	0.006	0.006	0.009
	(1.62)	(0.41)	(0.12)	(0.58)
Tier 1 Capital Ratio	0.002	0.000	-	-
	(0.37)	(0.23)	-	-
Constant	3.323***	0.161	1.630***	-0.086
	(3.88)	(0.75)	(2.71)	(-0.41)
Year & industry fixed effects	Yes	Yes	Yes	Yes
Observations	3,625	3,625	3,893	3,893
F-Test statistic	107.42	14.15	105.11	17.15
Prob. > F-test	0.000	0.000	0.000	0.000
Adjusted R^2	0.482	0.051	0.445	0.063

*Table 5 presents multivariate tests statistics for the implementation of the Dodd-Frank Act on the valuation of assets by banks. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. The dependent variable Market-to-Book (MTB) is the MTB ratio of the observation minus the average MTB of the prior three years. Total assets growth is the percentage growth of total consolidated assets minus the average percentage growth of total consolidated assets of the prior three years. DFA is an indicator variable that equals 1 for observations in the years following the enactment of the Dodd-Frank Act. Therefore, observations in the year 2011 or later are equal to 1 and 0 otherwise. Panel A reports multivariate OLS regressions used to test hypothesis 3. Close to $10 billion is an indicator variable that equals 1 for observations that belong to the 1% observations closest to the $10 billion total asset value in the year t and 0 otherwise. Panel B reports multivariate OLS regressions used to test hypothesis 4. Close to $50 billion is an indicator variable that equals 1 for observations that belong to the 1% observations closest to the $50 billion total asset value in the year t and 0 otherwise. All continues variables are winsorized at the 1% and 99% levels. I refer to Appendix A for the description of control variables. Appendix D and E provide results of test of the assumptions of an OLS regression and additional tests. The standard errors are robust and clustered at firm-level. T-values are in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level (two-tailed).*

sample and the full sample. The *Close to $X* is the 1% of banks with the smallest absolute difference between their asset value and the threshold for each year (n=4 per year, n=40 in total). To extend the analysis of the reported coefficients of Table 5 is the indicator variable *Close to $X* split up in banks below the threshold and banks above the threshold. Equation (4)

is used with *Below $X* (n=20) and *Above $X* (n=20). These are banks that are equal to one for the *Close to $X* variable and are below or above the threshold respectively. These results are reported in Table 6 (Table 7) to examine the behavior around the $10 billion assets threshold ($50 billion threshold).

Table 5, Panel A reports multivariate test statistics used for hypothesis 3. Panel A reports no evidence supporting the hypothesis that banks close to the $10 billion threshold manage their assets more than other banks. The control variables are comparable with Table 4, Panel A. Panel A, Table 6 reports multivariate statistics of the *Close to $10 billion* group split into banks below and above the threshold for the traditional bank sample and Panel B reports the results of the full sample. Panel A shows a significantly positive coefficient on *DFA * Below $10 billion* ($p<0,05$). Meaning that traditional banks that have just below $10 billion assets have a higher market-to-book ratio. This suggests that traditional banks just below the $10 billion threshold undervalue their assets compared to other traditional banks. The full sample also has a positive coefficient, but insignificant. The multivariate regressions using *TAG* as dependent variable has no significant values. The group of banks just above the $10 billion threshold shows no significant coefficients but do has negative signs.

The results of Table 5, Panel A, provide insufficient evidence to reject the hypothesis and say that banks close to the $10 billion asset threshold undervalue their assets more than other banks. Table 6, however, shows that there is a difference between banks closely below the threshold compared to banks closely above the threshold. Table 6, Panel A suggests that traditional small banks undervalue their assets to postpone the increased regulatory costs. There is no indication that banks that exceeded the threshold still devalue their assets. DFA section 113 can be the reason why, as this section states that dropping below the $10 billion threshold will not immediately result in less regulation. A bank can appeal the regulatory requirements, but is not guaranteed to reduce its regulatory costs (DFA 113). Increasing in asset value above the $10 billion will result in increased regulation and costs the next year. This can explain the difference in asset management between the *Below* and *Above* banks.

Table 5, Panel B presents tests on asset changes as a result of the $50 billion asset value threshold implemented by the Dodd-Frank Act. On average has a bank close to the $50 billion a significantly lower market-to-book ratio in years following the enactment of the DFA. This positive association is significant for the traditional bank sample ($p<0.05$) and the full sample ($p<0.10$). There is no significant evidence that these banks have significantly different asset growth compared to banks further from the asset threshold value. These results suggest that the

Table 6
Comparison of banks just below and above the $10 billion assets threshold

Panel A: Close to $10 billion split up in below and above the threshold groups using the traditional bank sample

	Traditional bank sample			Traditional bank sample	
	MTB	TAG		MTB	TAG
Below $10 billion	-0.024	-0.019	Above $10 billion	0.035	-0.050
	(-0.26)	(-0.41)		(0.36)	(-0.75)
DFA	0.955***	0.032**	DFA	0.955***	0.032**
	(22.87)	(2.31)		(22.85)	(2.32)
DFA * Below $10 billion	**0.155****	**-0.054**	**DFA * Above $10 billion**	**-0.095**	**-0.062**
	(2.11)	**(-0.71)**		**(-0.78)**	**(-1.45)**
Controls and year & industry fixed effects	Yes	Yes	Controls and year & industry fixed effects	Yes	Yes
Observations	3,625	3,625	Observations	3,625	3,625
F-Test statistic	105.78	15.19	F-Test statistic	105.97	15.32
Prob. > F-test	0.000	0.000	Prob. > F-test	0.000	0.000
Adjusted R^2	0.480	0.051	Adjusted R^2	0.479	0.052

Panel B: Close to $10 billion split up in below and above the threshold groups using the full sample

	Full sample			Full sample	
	MTB	TAG		MTB	TAG
Below $10 billion	-0.028	-0.022	Above $10 billion	-0.020	-0.106
	(-0.28)	(-0.46)		(-0.19)	(-1.39)
DFA	0.537***	0.020	DFA	0.538***	0.019
	(14.88)	(1.50)		(14.87)	(1.49)
DFA * Below $10 billion	**0.094**	**-0.126**	**DFA * Above $10 billion**	**-0.110**	**-0.065**
	(1.02)	**(-1.39)**		**(-0.88)**	**(-1.45)**
Controls and year & industry fixed effects	Yes	Yes	Controls and year & industry fixed effects	Yes	Yes
Observations	3,893	3,893	Observations	3,893	3,893
F-Test statistic	104.71	17.00	F-Test statistic	104.93	16.94
Prob. > F-test	0.000	0.000	Prob. > F-test	0.000	0.000
Adjusted R^2	0.443	0.065	Adjusted R^2	0.443	0.065

*Table 6 presents tests for asset changes for banks just below $10 billion assets threshold and asset changes for banks just above the $10 billion assets threshold. This table uses the same banks as Table 5, Panel A, but separated. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. The dependent variable Market-to-Book (MTB) is the MTB ratio of the observation minus the average MTB of the prior three years. Total assets growth is the percentage growth of total consolidated assets minus the average percentage growth of total consolidated assets of the prior three years. DFA is an indicator variable that equals 1 for observations in the years following the enactment of the Dodd-Frank Act. Therefore, observations in the year 2011 or later are equal to 1 and 0 otherwise. The standard errors are robust and clustered at firm-level. T-values are in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level (two-tailed).*

net assets are relatively overvalued for banks close to the $50 billion threshold compared to other banks.

Table 7, Panel A shows a negative significant coefficient ($p<0.01$) for traditional banks just below the $50 billion threshold. This suggests that these banks have a lower *MTB* than banks further below or above the threshold for years following the enactment of the DFA. A lower *MTB* is either due to undervalued stocks or overvalued net assets. Interestingly, traditional big banks that are above the threshold have a positively significant coefficient ($P<0.05$). This suggests that traditional banks just above the threshold seemingly undervalue their net assets, while banks just below the threshold overvalue their assets. These contradicting coefficients are not intuitive and should be further analyzed in future research. It is likely that there is an omitted variable bias or that the market value is imperfect which biases the coefficients. This bias is more likely due the small number of observations (n=20). There is no significant difference in total asset growth of traditional banks close to the $50 billion threshold. The full sample has no significant coefficients, but the signs are the opposite of the traditional bank sample. This suggests that investment banks close to the threshold could behave differently than traditional banks, but due to the small number of observations used in the regressions of Table 7 (n=20) could it also be influenced by outliers. The difference between the two samples could also be due to an omitted variable that captures the difference between investment banks and commercial banks but is not controlled for. Another possibility is that the market overvalues investment stocks that are more likely to be classified as a SIFI. As the Federal Depository Insurance Corporation does only provides insurance for investment banks that are systemically important opposed to all commercial banks (Federal Deposit Insurance Corporation, 2019).

There is some indication that banks overvalue their assets to cross the $50 billion threshold. I do find contradicting results when comparing the below and above the threshold groups. Therefore, I have insufficient evidence that the average bank close to the $50 billion under- or overvalues their assets as a result of the enactment of the Dodd-Frank Act. Because of the insufficient evidence, I cannot reject hypothesis 4. The high regulatory costs of being classified as a SIFI does not seem to outweigh the risk of asset management. Another possibility is that the high levels of monitoring prevent banks from consistently managing their assets. Managing assets will prevent regulatory costs, but the efficient external monitoring reduces the likelihood of real assets (Wongsunwai, 2013). As the financial sector is one of the most closely monitored industries, the opportunities for asset managing are scarce (Chung, Firth & Kim, 2002, 2005). It could also be that big banks that stay close below the $50 billion threshold get stricter regulation anyway, as the Financial Stability Oversight Council (FSOC) can adjust ratio’s

Table 7

Comparison of banks just below and above the $50 billion threshold

Panel A: Close to $50 billion split up in below and above the threshold groups using the traditional bank sample

	Traditional bank sample			Traditional bank sample	
	Market-to-Book	Total assets growth		Market-to-Book	Total assets growth
Below $50 billion	0.384	0.001	Above $50 billion	-0.132	-0.021
	(1.55)	(0.03)		(-0.49)	(-0.70)
DFA	0.957***	0.032**	DFA	0.955***	0.032**
	(22.94)	(2.29)		(22.88)	(2.31)
DFA * Below $50 billion	**-0.673*** **	**-0.005**	**DFA * Above $50 billion**	**0.156** **	**-0.054**
	(-3.66)	**(-0.10)**		**(2.12)**	**(-0.71)**
Controls and year & industry fixed effects	Yes	Yes	Controls and year & industry fixed effects	Yes	Yes
Observations	3,625	3,625	Observations	3,625	3,625
F-Test statistic	106.88	14.06	F-Test statistic	106.06	14.39
Prob. > F-test	0.000	0.000	Prob. > F-test	0.000	0.000
Adjusted R^2	0.482	0.051	Adjusted R^2	0.480	0.051

Panel B: Close to $50 billion split up in below and above the threshold groups using the full sample

	Full sample			Full sample	
	Market-to-Book	Total assets growth		Market-to-Book	Total assets growth
Below $50 billion	0.029	-0.008	Above $50 billion	-0.150	-0.047
	(0.16)	(-0.15)		(-0.71)	(-1.18)
DFA	0.537***	0.019	DFA	0.538***	0.020
	(14.89)	(1.47)		(14.88)	(1.51)
DFA * Below $50 billion	**0.094**	**0.034**	**DFA * Above $50 billion**	**-0.110**	**-0.126**
	(1.03)	**(0.41)**		**(-0.87)**	**(-1.38)**
Controls and year & industry fixed effects	Yes	Yes	Controls and year & industry fixed effects	Yes	Yes
Observations	3,893	3,893	Observations	3,893	3,893
F-Test statistic	104.50	16.22	F-Test statistic	104.88	16.53
Prob. > F-test	0.000	0.000	Prob. > F-test	0.000	0.000
Adjusted R^2	0.443	0.063	Adjusted R^2	0.444	0.065

*Table 7 presents tests for asset changes for banks just below $50 billion assets threshold and asset changes for banks just above the $50 billion assets threshold. This table uses the same banks as Table 5, Panel B, but separated. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. The dependent variable Market-to-Book (MTB) is the MTB ratio of the observation minus the average MTB of the prior three years. Total assets growth is the percentage growth of total consolidated assets minus the average percentage growth of total consolidated assets of the prior three years. DFA is an indicator variable that equals 1 for observations in the years following the enactment of the Dodd-Frank Act. Therefore, observations in the year 2011 or later are equal to 1 and 0 otherwise. The standard errors are robust and clustered at firm-level. T-values are in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level (two-tailed).*

according to risk (DFA 805). These banks can be classified as a SIFI if the FSOC wants, reducing the incentives to devalue assets.

6. Conclusion and discussion

This study utilizes the enactment Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) in 2010 to test if banks devalue their assets to reduce regulatory costs. The implementation of the DFA provides an ideal setting, as most regulatory costs are determined by the total consolidated asset value of a bank. The DFA implements two thresholds, at $10 billion and $50 billion assets. Exceeding these thresholds lead to higher levels of monitoring and compliance costs. These costs are significant and has received critique over the years. This critique has led to an increase of the threshold value since 2019 (Reuters, 2018/2019). This thesis compares banks above the DFA thresholds to banks below the threshold for the years 2008 till 2017, using *Market-too-book* ratio and *Total asset growth* compared to the prior three-year average as proxies for asset valuation. This thesis uses two separate samples, one with only traditional banks (commercial banks and saving institutions) and one with financial service and investment banks in addition to the traditional banks.

The overall comparison of medium banks opposed to small and big banks suggests that, on average, a medium sized traditional bank has overvalued net assets or undervalued stocks. This is not observed for the sample including investment banks. There is no significant difference in asset growth after the enactment of the DFA for medium banks opposed to small and big banks. I do not find sufficient evidence that big banks under- or overvalue their assets after the DFA, but they do have a significant higher asset growth for years following the enactment of the DFA compared to non-big banks.

Subsequent analysis uses banks close to the threshold. Asset management is the most likely for banks close to the threshold, as prior research indicates (Moyer, 1990; Beatty, Chamberlain and Magliolo, 1995). Banks close to the $10 billion threshold do not show significant different *MTB* or *TAG* compared to other banks. However, analysis of the subset of banks that are just below the $10 billion threshold suggests that traditional banks could undervalue assets. This could be due to the costs associated with exceeding the $10 billion threshold like setting up a risk committee, stricter capital requirement or the costs of stress tests (DFA sections 113, 165 and 166).

The analysis of banks close to the $50 billion threshold suggests that, on average, these banks are more likely to overvalue their assets compared to banks further away from the $50

billion threshold. Analyzing the group of banks just below and above the threshold suggest that medium banks just below $50 billion asset value overvalue their assets and big banks just above $50 billion asset value undervalue their assets. The sample including investment banks shows no significant effect, but has opposite signs compared to the traditional bank sample.

This thesis could add to the literature stream on border problems. Prior literature shows that companies choose which side of a threshold is more beneficial for them (Goodhart & Lastra, 2010). Most results in this thesis suggest that banks do not devalue assets to fall below the threshold once they exceeded the threshold. This is likely due the fact that reducing the asset value will not immediately result in weakened regulation. Once they exceed the threshold big banks are required to make living wills and credit exposure reports until they drop below $45 billion asset value (Board of Governors of the Federal Reserve System, 2019). Using these insights adds to the border problems literature. My findings provide additional insights for the literature stream about the effect of regulatory changes on asset management. It seems that regulation changes paired with efficient monitoring prevents most of the expected asset management. This thesis also contributes to the literature stream on the effectiveness and unintended consequences of the DFA. This thesis suggests that the implementation of the asset value thresholds can lead to undervalue assets for small banks just below the $10 billion threshold, but there is not sufficient consistent evidence that big banks manage their assets for this purpose. As a consequence, big banks stay classified as a SIFI even though these have high compliance costs. Most importantly, this thesis provides insights for the one size fits all debate on bank regulation. My results suggest that the use of a threshold can lead to asset management. The results suggest that a threshold that prevents banks from easily preventing the regulatory costs, like the living will requirement, decreases the use of asset management.

While reading this thesis, it should be noted that the use of proxies for undervalued assets has its limitations. First, the use of the *MTB* proxy limits the conclusions I can make. Given a perfect market, the market-to-book ratio should be close to one, and any deviation would be due to under- or overvalued assets. Unfortunately, the market value is not perfect and therefore it is impossible to conclude that the difference in *MTB* is purely because of under- or overvalue assets (Barth, Beaver, & Landsman, 1996). Market value could for instance be influenced by CEO characteristics. A change of CEO is often related with a reduction of the market value (Beatty & Zajac, 1987). Second, the banking industry has high levels of monitoring. Prior literature shows that monitoring prevents the use of earnings management, and will likely also reduce the use of asset management (Wongsunwai, 2013). Using control variables for monitoring differences between certain banks could lead to useful insights. Besides monitoring

by the government, could media coverage or analyst coverage also reduce the likelihood of asset management. Third, during the used research period other regulatory changes are implemented (i.e. Basel). Some rules are the same for all banks and do not influence my results, but rules and regulations that are not based on asset value can bias the results**.** The data includes non-U.S. banks that are cross-listed in the U.S. as they are subdued to the DFA rules as well, but I do not adjust for regulatory changes in their domestic country.

Despite these limitations does this research provide implications for shareholders and regulators. There are significant differences between banks close to the threshold compared to other banks, suggesting that the benefits or costs from exceeding the threshold value, could lead to asset management. It is unclear why medium banks below the $50 billion threshold have overvalued net assets or undervalued stocks while big banks above this threshold have undervalued net assets or overvalued stocks. It also remains unclear what causes the differences between investment banks and traditional banks. Future research could extend this thesis by including proxies for monitoring or include more control variables that influence the price of stocks. Future research could also examine the response to regulatory costs by comparing the U.S. banks following the DFA compared to similar non-U.S. listed banks as control group. Especially the group close to the $50 billion asset value needs to be examine in further research because, as stated previously, these results are likely biased.

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8. Appendix A. Variables definition

Variable	Description
Dependent variable	
Market-to-Book	The MTB ratio is the Market-to-Book value at time t minus the average Market-to-Book ratio of the prior 3 years. The Market-to-Book value is calculated by dividing the market value (Compustat's fiscal year end closing price [prcc_f] * shares outstanding [csho]) by the book value of common equity (Compustat - ceq). Calculated using equation (1).
Total assets growth	Current year percentage asset growth compared to the average percentage asset growth of the prior 3 years. Asset growth is calculated using Compustat's total assets (at) = (at/ at_{t-1})-1. Calculated using equation (2).
Independent variable	
DFA	Equals 1 for observations following the implementation of the Dodd-Frank Act, and 0 otherwise. The years following the DFA are 2011 till 2017.
Big bank	Equals 1 for banks with equal or greater than $50 billion consolidated asset value as of the end of the fiscal year, and 0 otherwise.
Medium bank	Equals 1 for banks with consolidated asset value between $10 billion and $50 billion, and 0 otherwise.
Small bank	Equals 1 for banks with consolidated asset value below $10 billion, and 0 otherwise.
Close to $10 billion	Equals 1 for observations that belong to the 1% closest to the $10 billion consolidated asset threshold in the year t, and 0 otherwise. The 1% corresponds to the four observations that have the lowest absolute difference between the total consolidated asset value and $10 billion.
Close to $50 billion	Equals 1 for observations that belong to the 1% closest to the $50 billion consolidated asset threshold in the year t, and 0 otherwise. The 1% corresponds to the four observations that have the lowest absolute difference between the total consolidated asset value and $50 billion.
Below $X	Equals 1 for observations that are equal to one for *Close to $10 ($50)billion* and have less than $10 ($50) billion asset value for hypothesis 3 (4).
Above $X	Equals 1 for observations that are equal to one for *Close to $10 ($50)billion* and have more than $10 ($50) billion asset value for hypothesis 3 (4).
Control variables	
Derivative gains	Is a proxy for the interconnectedness of banks. Measured in quartiles of the total fair value of credit derivatives sold (Compustat – CIDERGL) divided by total assets (Compustat – at).
Earnings	Is the annual earnings before extraordinary items (Compustat – ib) divided by total assets (Compustat – at).
Leverage	Leverage is the total consolidated assets (Compustat – at) divided by total consolidated liabilities (Compustat – lt).
Size	Is the natural logarithm of the total consolidated assets at the end of the fiscal year (Compustat – at).
Systemic risk	Is the expected capital shortfall of the observation for the next crisis. Numbers of systemic risk are measured in ten-trillions. Obtained from New York University Volatility Laboratory (V-lab) (2019).
Too-Big-to-Fail	Is an indicator variable that equals 1 for banks that belong to the top 6 banks in the U.S. in terms of size, and 0 otherwise.
Tier 1 Capital ratio	Is tier 1 capital divided by adjusted risk-weighted assets (Compustat – CAPR1)

9. Appendix B. Operational framework

Figure 1

Libby boxes

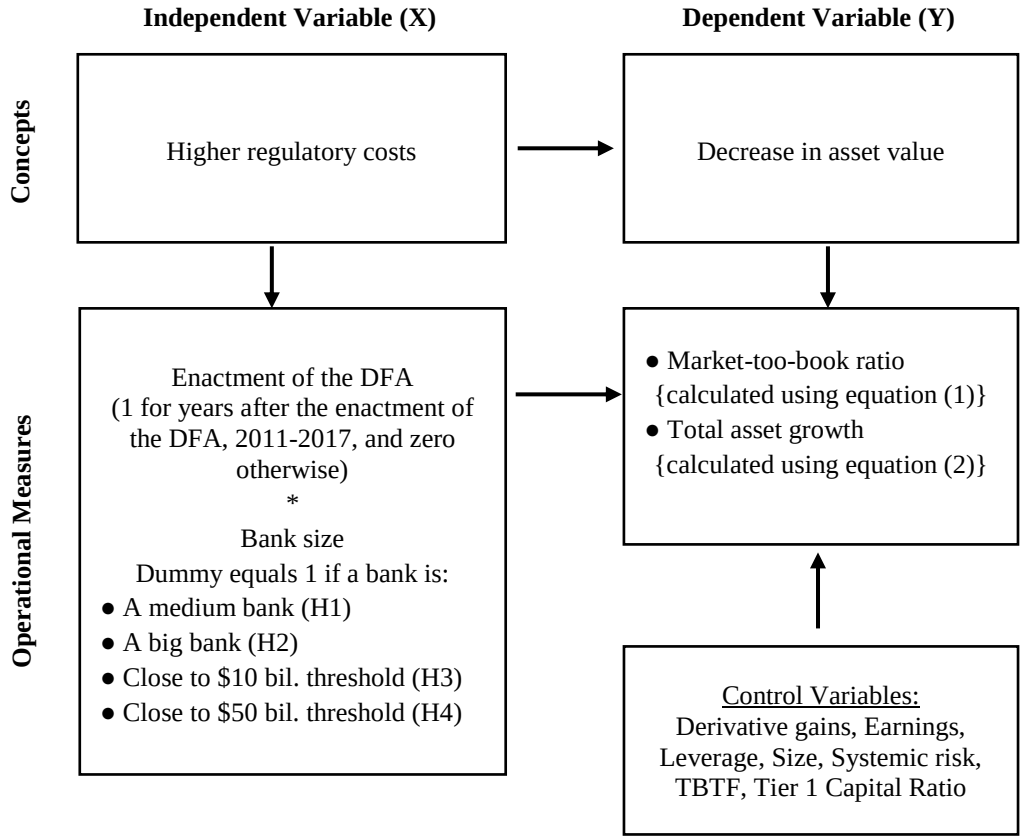

Figure 1 Libby boxes, reporting the operational framework of this thesis

10. Appendix C. Pairwise correlation matrix

Panel A: Pearson Correlation matrix of model (3), using the traditional bank sample

	Market-to-Book	Total assets growth	DFA	Big bank	Medium bank	Small bank	Derivative gains	Earnings	Leverage	Size	Systemic risk	TBTF	Tier 1 Capital Ratio
Market-to-Book	1.000												
Total assets growth	0.153***	1.000											
DFA	0.535***	0.167***	1.000										
Big bank	-0.071***	-0.088***	0.001	1.000									
Medium bank	-0.003	0.013	0.037**	-0.134***	1.000								
Small bank	0.057***	0.059***	-0.028*	-0.682***	-0.634***	1.000							
Derivative gains	0.008	0.005	0.065***	0.223***	0.094***	-0.244***	1.000						
Earnings	0.257***	0.154***	0.277***	-0.012	0.087***	-0.055***	0.002	1.000					
Leverage	0.078***	0.050***	0.146***	-0.214***	0.111***	0.086***	-0.044***	0.238***	1.000				
Size	-0.049***	-0.074***	0.033**	0.796***	0.272***	-0.822***	0.310***	0.080***	-0.140***	1.000			
Systemic risk	-0.066***	-0.070***	-0.027	0.459***	-0.067***	-0.309***	0.127***	-0.097***	-0.239***	0.488***	1.000		
TBTF	-0.008	-0.020	-0.003	0.241***	-0.032*	-0.164***	0.118***	0.015	-0.010	0.263***	0.253***	1.000	
Tier 1 Capital Ratio	0.089***	0.032*	0.128***	-0.082***	-0.088***	0.129***	-0.032*	0.090***	0.336***	-0.118***	-0.016	-0.008	1.000

Panel B: Pearson Correlation matrix of model (3), using the full sample

	Market-to-Book	Total assets growth	DFA	Big bank	Medium bank	Small bank	Derivative gains	Earnings	Leverage	Size	Systemic risk	TBTF
Market-to-Book	1.000											
Total assets growth	0.156***	1.000										
DFA	0.509***	0.155***	1.000									
Big bank	-0.065***	-0.079***	-0.002	1.000								
Medium bank	0.001	0.012	0.041**	-0.144***	1.000							
Small bank	0.051***	0.054***	-0.029*	-0.685***	-0.622***	1.000						
Derivative gains	0.015	0.014	0.061***	0.238***	0.094***	-0.258***	1.000					
Earnings	0.235***	0.196***	0.231***	-0.008	0.095***	-0.063***	0.021	1.000				
Leverage	0.010	-0.033**	0.005	-0.117***	-0.010	0.100***	-0.050***	-0.119***	1.000			
Size	-0.041**	-0.061***	0.034**	0.800***	0.264***	-0.827***	0.324***	0.110***	-0.168***	1.000		
Systemic risk	-0.076***	-0.070***	-0.032**	0.490***	-0.077***	-0.331***	0.152***	-0.071***	-0.093***	0.512***	1.000	
TBTF	-0.026	-0.022	-0.004	0.314***	-0.045***	-0.215***	0.135***	0.006	-0.026	0.325***	0.347***	1.000

This table reports the pairwise correlation coefficients of model (3). ***, **, * denote significance at the 1%, 5%, and 10% level. Panel A reports the correlation coefficients of the traditional bank sample and Panel B reports the correlation coefficients of the full sample.

11. Appendix D. Collinearity analyses

Table 8

Collinearity analyses of main regression variables

Panel A: Collinearity Diagnostics model (3), hypothesis 1:

	Variance inflation factor			Condition Number analyses	
Sample:	Traditional	Full		Traditional	Full
	VIF	VIF		Condition Index	Condition Index
Medium bank	4.31	4.37	1	1.0000	1.0000
DFA	1.22	1.18	2	1.3872	1.0928
DFA*Medium bank	4.29	4.36	3	1.7365	1.3502
Derivative gains	1.12	1.12	4	1.8418	1.4781
Earnings	1.16	1.11	5	1.8747	1.5760
Leverage	1.29	1.05	6	1.9976	1.7034
Size	1.71	1.80	7	2.1486	1.8008
Systemic risk	1.49	1.54	8	2.3591	2.4027
Too-Big-to-Fail	1.11	1.19	9	3.4399	4.2425
Tier 1 Capital Ratio	1.17	-	10	5.1899	-
Mean VIF	1.89	1.97	Cond. Num.	5.1899	4.2425

Panel B: Collinearity Diagnostics model (3), hypothesis 2:

	Variance inflation factor			Condition Number analyses	
Sample:	Traditional	Full		Traditional	Full
	VIF	VIF		Condition Index	Condition Index
Big Bank	5.53	5.58	1	1.0000	1.0000
DFA	1.25	1.23	2	1.3872	1.5691
DFA*Big bank	3.73	3.68	3	1.7365	1.7733
Derivative gains	1.12	1.13	4	1.8418	1.8867
Earnings	1.17	1.13	5	1.8747	1.9069
Leverage	1.29	1.04	6	1.9976	2.0726
Size	3.21	3.28	7	2.1486	2.3036
Systemic risk	1.46	1.49	8	2.3591	3.4454
Too-Big-to-Fail	1.11	1.18	9	3.4399	5.2645
Tier 1 Capital Ratio	1.17	-	10	5.1899	-
Mean VIF	2.10	2.19	Cond. Num.	5.1899	5.2645

Panel C: Collinearity Diagnostics model (4) hypothesis 3:

	Variance inflation factor			Condition Number analyses	
Sample:	Traditional	Full		Traditional	Full
	VIF	VIF		Condition Index	Condition Index
Close to $10 billion	3.56	3.55	1	1.0000	1.0000
DFA	1.12	1.07	2	1.0272	1.0303

(continued on next page)

Table 8 (continued)

Panel C: Collinearity Diagnostics model (4) hypothesis 3:

	Variance inflation factor			Condition Number analyses	
Sample:	Traditional	Full		Traditional	Full
	VIF	VIF		Condition Index	Condition Index
DFA*Close to $10 bil.	3.56	3.56	3	1.1381	1.2472
Derivative gains	1.12	1.12	4	1.3849	1.4061
Earnings	1.16	1.11	5	1.4831	1.4855
Leverage	1.27	1.04	6	1.5378	1.6262
Size	1.53	1.59	7	1.6339	1.7041
Systemic risk	1.44	1.46	8	1.8449	2.1551
Too-Big-to-Fail	1.11	1.18	9	2.1549	3.6034
Tier 1 Capital Ratio	1.16	-	10	3.5998	-
Mean VIF	1.70	1.74	Cond. Num.	3.5998	3.6034

Panel D: Collinearity Diagnostics model (4) hypothesis 4:

	Variance inflation factor			Condition Number analyses	
Sample:	Traditional	Full		Traditional	Full
	VIF	VIF		Condition Index	Condition Index
Close to $50 billion	3.29	3.29	1	1.0000	1.0000
DFA	1.11	1.07	2	1.0501	1.0543
DFA*Close to $50 bil.	3.28	3.28	3	1.1399	1.2556
Derivative gains	1.12	1.12	4	1.4132	1.4193
Earnings	1.17	1.11	5	1.4966	1.4998
Leverage	1.26	1.04	6	1.5535	1.6415
Size	1.55	1.62	7	1.6510	1.7213
Systemic risk	1.45	1.47	8	1.8618	2.1919
Too-Big-to-Fail	1.11	1.18	9	2.1838	3.4856
Tier 1 Capital Ratio	1.17	-	10	3.4790	-
Mean VIF	1.65	1.69	Cond. Num.	3.4790	3.4856

Table 8 reports the possible collinearity problem tests of models used. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. The first columns examine collinearity using a variance inflation factor (VIF) analysis. A VIF above 5 or 10 indicates that there could be collinearity problems. The second column examines collinearity using a Conditional Number analysis. A Conditional Number above 15 suggests that there are multicollinearity problems. Panel A to D show the results of the model used to test hypothesis 1 to 4 respectively.

12. Appendix E. Test regression assumptions

Table 9

Test for regressions assumptions and choice between fixed effects or random effect OLS regressions

Panel A: Hausman Chi^2-test for systematic differences in coefficients

	Market-to-Book		Total assets growth	
	Traditional bank sample	Full sample	Traditional bank sample	Full sample
Model 3 Med. bank	706.90***	316.11***	25.17***	13.45*
	(0.000)	(0.000)	(0.002)	(0.062)
Model 3 Big bank	716.54***	341.86***	29.78***	13.30
	(0.000)	(0.000)	(0.001)	(0.102)
Model 4 Close to $10 billion	714.31***	311.42***	31.19***	16.02**
	(0.000)	(0.000)	(0.000)	(0.042)
Model 4 Close to $50 billion	674.33***	306.45***	31.21***	14.28*
	(0.000)	(0.000)	(0.000)	(0.075)

Panel B: Breusch-Pagan Chi^2-test for heteroskedasticity

	Market-to-Book		Total assets growth	
	Traditional bank sample	Full sample	Traditional bank sample	Full sample
Model 3 Med. bank	114.78***	98.12***	7.05***	77.01***
	(0.000)	(0.000)	(0.008)	(0.000)
Model 3 Big bank	115.48***	96.27***	14.70***	94.57***
	(0.000)	(0.000)	(0.000)	(0.000)
Model 4 Close to $10 billion	117.79***	97.89***	8.13***	78.49***
	(0.000)	(0.000)	(0.004)	(0.000)
Model 4 Close to $50 billion	113.84***	94.99***	9.05***	76.71***
	(0.000)	(0.000)	(0.003)	(0.000)

Panel C: Wooldridge test for autocorrelation in panel data

	Market-to-Book		Total assets growth	
	Traditional bank sample	Full sample	Traditional bank sample	Full sample
Model 3 Med. bank	295.17***	305.24***	207.30***	182.09***
	(0.000)	(0.000)	(0.000)	(0.000)
Model 3 Big bank	291.51***	302.68***	207.38***	180.58***
	(0.000)	(0.000)	(0.000)	(0.000)

(Continued on next page)

Table 9 (continued)

Panel C: Wooldridge test for autocorrelation in panel data

	Traditional bank sample	Full sample	Traditional bank sample	Full sample
Model 4 Close to $10 billion	296.58***	305.21***	208.57***	182.35***
	(0.000)	(0.000)	(0.000)	(0.000)
Model 4 Close to $50 billion	296.79***	304.04***	208.84***	181.59***
	(0.000)	(0.000)	(0.000)	(0.000)

*Table 9 presents the results from different tests used to determine the most informative regression-models. The traditional bank sample includes public listed commercial banks and savings institutions (sic-codes 6020 and 6030 respectively). The full sample includes finance services and investment banks (sic-code 6199 and 6211 respectively) in addition to the traditional bank sample. Column 1 and 2 are tests based on models using the Market-to-Book as dependent variable whereas column 3 and 4 use Total Assets Growth as the dependent variable. Panel A includes the results from a Hausman Chi^2-test, where a significant Chi^2 value means that the regression including fixed effects for time and industry has systematic different coefficients and is therefore more informative. Panel B displays results of the Breusch-Pagan Chi^2-test for heteroskedasticity. A significant Chi^2 value shows that there is conditional heteroskedasticity and that heteroscedasticity-consistent standard errors should be used. Panel C shows the results of the Wooldridge test for autocorrelation in panel data. A significant F-value indicates that there is serial correlation. The P-value is shown in parentheses with * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$.*