



Erasmus School of Economics<sup>1</sup>  
Bachelor Thesis Financial Accounting

## **Goodwill impairments, cause and/or consequence of the financial crisis?**

***An empirical study on the relationship between the 2007–2008 financial crisis and goodwill impairments of US commercial banks.***

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### *Abstract*

In the years prior to the 2007-2008 financial crisis, commercial banks in the United States (hereafter, US) made many acquisitions. This resulted in high goodwill balances. In order to increase financial stability, Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) in 2010. The Dodd-Frank Act contains no legislation related to goodwill. This paper examines whether more goodwill legislation is recommended by studying the relationship between goodwill impairments of US commercial banks and the financial crisis. This is done by estimating multiple regression models. Data of US commercial banks from Compustat North America and Compustat Bank Fundamentals is used. The results show that (a) there were significantly more goodwill impairments during the financial crisis and (b) a goodwill impairment does not affect the stock price of an US commercial bank. No evidence is found that goodwill impairments deepened the recession. Therefore, more goodwill legislation is not recommended.

**Keywords:** goodwill impairment, financial crisis, commercial banks

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<sup>1</sup> The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

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# 1. Introduction

The number of mergers and acquisitions in the United States (hereafter, US) reached record highs in 2017 after decreasing during the financial crisis and its aftermath (Institute for Mergers, Acquisitions and Alliances, 2019). The financial sector accounted for 11.4% of all the acquisitions and was the second largest sector (Institute for Mergers, Acquisitions and Alliances, 2019). As a result of an acquisition, goodwill is booked for the difference between the amount paid and the fair value of the acquired firm's identifiable net assets (Rashty, 2018). It comes as no surprise that US commercial banks have large amounts of goodwill on their balance sheets (Disclosure Insight, 2009). For instance, Bank of America has US\$69 billion worth of goodwill on its 2018 balance sheet, which amounts to 26% of total shareholders' equity (Bank of America, 2019).

Under American Generally Accepted Accounting Principles (hereafter, US GAAP), Goodwill is an intangible asset that companies are required to test annually for impairment (Beatty & Weber, 2006; Jerman & Manzin, 2008). Goodwill needs to be written down if the fair value is below its book value. Overpayment for an acquisition is one of the causes of a goodwill impairment. Overpaying increases the amount of goodwill booked since the gap between the amount paid and the fair value of the acquired firm's assets widens (Olante, 2013). As a result, a bigger part of the goodwill is assigned to elements other than synergies. Previous research has shown that a decrease in the stock price of a company can also result in a goodwill write-down (Chalmers et al., 2011; Camodeca et al. (2013). A decline in accounting performance, e.g., return on assets or net cash flow, also increases the chance of an impairment occurring (Chalmers Godfrey & Webster., 2011; Churyk, 2005). A goodwill impairment often results in a decrease in the stock price of a company (Camodeca, Almici & Bernardi, 2013; Chalmers et al., 2011).

The 2007–2008 financial crisis has resulted in the worst recession since the 1930s (Atkinson, Luttrell & Rosenblum, 2013). This crisis caused stock prices of US banks to decrease precipitously as a result of higher mortgage default rates. Although there were many causes, mortgage lending by commercial banks to uncreditworthy citizens and risky financial instruments take most of the blame (Hausman & Johnston, 2014; Skeel, 2010). In response to the financial crisis, Congress passed the Dodd-Frank Wall Street Reform and Consumer

Protection Act in 2010 (hereafter, Dodd-Frank Act) to increase financial stability. The Dodd-Frank act targets mainly commercial and investment banks (Dimitrov, Palia & Tang, 2015; Skeel, 2010). The Dodd-Frank Act does not contain any legislation on goodwill impairments. Moreover, goodwill is not mentioned once<sup>2</sup>.

Since goodwill impairments may result in a decrease in the stock price of a company, the possibility exists that they are one of the underlying causes of the financial crisis. During the financial crisis, US consumer confidence declined rapidly (OECD, 2009). Goodwill impairments decrease consumer confidence because they are negatively correlated with stock prices (Jansen & Nahuis, 2003). Consumer confidence predicts the economy since it is highly correlated with household spending (Fisher & Statman, 2003; Matsusaka & Sbordone, 1995).

It is also possible that goodwill write-downs were a result of the financial crisis. The years during and after the financial crisis are known for their poor economic performance. Because of the poor business environment, the return on assets and net cash flow of most US commercial banks decreased, which could have led to impairments. If this view is found true, it would be concluded that goodwill impairments were a consequence of the financial crisis. As a result of these impairments, stock prices decreased further. This would mean that goodwill impairments deepened the recession by decreasing consumer confidence.

Goodwill impairments can also be both a cause and result of the financial crisis if a positive feedback loop exists. Goodwill impairments often cause stock prices to decline, which in turn decreases consumer and investor confidence (Jansen & Nahuis, 2003). As a result of the lower consumer and investor confidence, stock prices of other banks may also decline. This increases the chance of other banks also having to impair goodwill.

There are many papers devoted to finding the causes of the 2007–2008 financial crisis (Acharya & Richardson, 2009; Crotty, 2009; Foster & Magdoff, 2009). These papers yield many different causes. A preliminary search found none that focus on the relationship between the financial crisis and goodwill impairments. During the easy credit bubble, a period with record low interest rates, many acquisitions that generated goodwill were made by US commercial banks (Baker, 2008; Disclosure Insight, 2009). By investigating this relationship, it could be

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<sup>2</sup> The amended version of the Dodd-Frank Act from May 24, 2018 is used.

concluded that the Dodd-Frank Act should also contain legislation on accounting for goodwill and its impairments. This could prevent another recession with years of high unemployment and low consumption (Atkinson et al., 2013).

This paper will research the relationship between goodwill impairments and the financial crisis by estimating multiple regressions. Panel data of commercial banks from Compustat North America and Compustat Bank Fundamentals is used. The main research question of this study is listed as follows:

*To what extent were goodwill impairments of US commercial banks the cause and/or result of the 2007–2008 financial crisis?*

The following four sub-questions will support the main research question:

1. What is goodwill and how is goodwill accounted for under US GAAP?
2. What are goodwill impairments and what are the causes and consequences?
3. What are the causes and consequences of the financial crisis?
4. What is the relationship between US banks and the financial crisis?

The rest of this paper is organised as follows. Section 2 presents a literature review in which the sub-questions are answered, and develops the hypotheses. Sections 3 and 4 contain the sample selection and the research design. Section 5 presents and discusses the findings. And finally, section 6 contains the conclusions, limitations, and recommendations for future research.

## 2. Literature review

This section summarizes the findings from previous research to answer the sub-questions. Previous accounting standards related to goodwill and its impairments are reviewed to help determine the time frame of the empirical part of this paper. Subsections 2.1. to 2.5. define goodwill, discuss the causes and consequences of goodwill impairments and explain why management has incentives to delay impairments. Subsection 2.6. covers the causes and consequences of the financial crisis and the relationship between the crisis and US commercial banks. Subsection 2.7. introduces the hypotheses.

### *2.1. Goodwill*

Goodwill is an intangible asset that can be purchased or internally generated (Bloom, 2009). Under US GAAP, goodwill is covered in Accounting Standards Codification (hereafter, ASC) 350, Intangibles – Goodwill and Other and ASC 805, Business Combinations. ASC Topic 350-30-20 defines goodwill as an asset that represents future economic benefits which arises from other assets acquired in a business combination. Leake (1914, as cited in Carsberg, 1966) describes goodwill as the present value of the rights to receive future ‘super-profits’. According to the super-profit definition, goodwill is an item on the balance sheet that represents the present value of the profits that exceed the normally expected return on the firm’s identifiable assets on the balance sheet. Goodwill can contain various items, e.g., the value of synergies or brand names (Falk & Gordon, 1977; Johnson & Petrone, 1998).

#### *2.1.1. Purchased goodwill*

Purchased goodwill is recognized after an acquisition (Johnson & Petrone, 1998). Under US GAAP, goodwill is initially and subsequently measured, using the full goodwill method as stated by ASC 805. Under the full goodwill method, goodwill is booked on the acquisition date for the excess amount that an acquirer is willing to pay over the fair value of the identifiable net assets of the acquiree (Rashty, 2018).

#### *2.1.2. Internally generated goodwill*

Internally developed intangible assets are not recognized under ASC 350. Cost related to internally developed intangible assets are expensed because the value cannot be reliably

measured (Nobes & Norton 1996). This means that internally developed goodwill is not recognized in the financial statements under US GAAP (Zhang, 2013).

## *2.2. Goodwill impairments*

### *2.2.1. APB Opinion No. 17*

Until the introduction of Statement of Financial Accounting Standards (hereafter, SFAS) No. 142 in 2001 (now ASC 350), goodwill was governed by Accounting Principles Board (hereafter, APB) Opinion No. 17 (Li & Sloan, 2017). Under APB Opinion No. 17, goodwill was amortized over an estimated life not to exceed 40 years. Goodwill was also subject to an impairment test to review whether the carrying amount was still recoverable. This impairment test was only required when a certain event occurred or circumstances indicated that the carrying amount was greater than the expected undiscounted future cash flows (Li & Sloan, 2017).

### *2.2.2. SFAS 142*

The introduction of SFAS 142 brought two major changes with it (Chambers, 2007). The first change was the elimination of the periodic amortization of goodwill. The second change was that goodwill would be tested annually for impairments. According to the Financial Accounting Standards Board, an impairment is the condition that exists when the carrying amount of a long-lived asset (asset group) exceeds its fair value. Impairment tests would, instead of the recoverable amount, require a fair value threshold (Beatty and Weber, 2006). The test uses the fair value of the reporting unit to which the goodwill is assigned. Companies are required to determine if the book value of the reporting unit exceeds its fair value. If so, an impairment loss is recognized for the difference between the business unit's fair value and its recorded amount. The impairment is limited to the goodwill assigned to the reporting unit.

Until January 2017, a second step existed. When the book value of the reporting unit exceeded its fair value, a company was required to perform hypothetical acquisition accounting (Munter, 2017). This meant determining the book value of all identifiable assets and liabilities of the reporting unit. This second step was eliminated because of the high costs and accounting complexity that came with it.

### *2.3. Causes of impairments*

Prior theoretical and empirical research shows that there are multiple causes for goodwill impairments. Acquirers sometimes overpay for the target because of agency conflicts in merger and tender offers (Li, Shroff, Venkataraman & Zhang, 2011). Potential reasons for this are management hubris or managers prioritizing their own interest over maximizing shareholder value (Li et al., 2011; Churyk, 2005). Overpaying results in overstated goodwill balances, which can lead to future impairments (Olante, 2013). Managers also seek unrelated diversification at the expense of shareholders (Morck, Shleifer & Vishny, 1990). As a result, a bigger part of goodwill is assigned to elements other than synergies. Lower synergies cause lower improved performance and therefore increase the chance of an impairment occurring (Churyk, 2005).

#### *2.3.1. Accounting performance*

A decline in the stock price, net cash flow or return on assets of the acquirer after the acquisition is finished, increases the chance of a goodwill impairment occurring (Chalmers et al., 2011; Churyk, 2005). Decreasing cash flow increases the likelihood that the recoverable amount of a cash-generating unit falls below the carrying amount. A decrease in stock price reduces the market value of a company. When companies trade below book value, this is often followed by a goodwill impairment (Laux & Leuz, 2010).

### *2.4. Consequences of impairments*

Goodwill impairment losses affect the financial statements. When a company recognizes an impairment, it decreases the book value of the asset and debits the income statement (Zucca & Campbel, 1992). Goodwill impairments do not affect the cash flow statement because no cash payments are made. Companies show significantly worse accounting performance, e.g., return on assets, in impairment years (Darrough, Guler & Wang, 2014).

#### *2.4.1. Share price and compensation*

Impairments affect the financial statements. Therefore, they influence a company's share price. Chalmers et al. (2011) and Camodeca et al. (2013) use a sample of 4310 companies from ten sectors and 85 non-financial companies, respectively, to show that impairments have a negative effect on the share price of a company. Impairments also affect CEO compensation (Henning & Stock, 1997). Goodwill is recognized as the result of business acquisitions, which



are arguably one of the most important decisions a CEO can make (Darrrough et al., 2014). When overpaying for an acquisition results in a goodwill impairment, CEO compensation declines on average (Darrrough et al., 2014). Not only cash compensation drops, but also compensation through stock options. Impairments have a negative effect on the share price and therefore cause the amount of exercisable options to decline. Hirschey and Richardson (2002) conclude that even though goodwill impairments do not cause changes in tangible assets or the cash flow statement, they do provide meaningful, often negative, information regarding future changes in the earnings of a company.

### *2.5. Delaying impairments*

Management has incentives to delay goodwill impairments in order to prevent the stock price and compensation from decreasing (Beatty & Weber, 2006). Other motives that management can have to delay impairments are to prevent costs of violating debt covenants, shield their reputation and prevent credit ratings from falling (Ramanna and Watts, 2012; Sun and Zhang, 2017).

Evidence of banks preventing goodwill impairments comes from a goodwill impairment study by Disclosure Insight (2009). This study by an independent research investment firm uses data of US banks from 2008 and shows that they have questionable goodwill treatment. As mentioned in section 2.4., a decrease in the market value of a company is a powerful indicator for impairment. It is expected that, because the financial crisis caused stock prices to decrease, this would result in more goodwill impairments. However, this is not the case. Over half of the banks that did not impair goodwill traded below book value, while 46% traded below tangible book value. For instance, Bank of America carries US\$80 billion in goodwill on its 2008 balance sheet, which is equal to 50% of its shareholders' equity. It is even more remarkable that banks wrote down only 10% of the total goodwill even though many acquisitions were made during the easy credit bubble (Disclosure Insight, 2009).

Filip, Jeanjean and Paugam (2015) show how managers postpone goodwill impairments. Auditors look at business plans and expected future cash flow predictions developed by management to determine if goodwill should be written down. Management can increase current cash flow by decreasing expenditure on, for instance, research and development or marketing. By doing so, it will seem more reasonable to auditors that future

cash flows will be high enough as well. The results of managing cash flow in order to prevent an impairment are a decrease in the long-term stock return and lower operating performance than companies that do recognize the impairment loss. (Filip et al., 2015).

## *2.6 Financial crisis*

The 2007–2008 financial crisis has resulted in the worst recession since the 1930s (Atkinson et al., 2013). The financial crisis hit, next to the US, almost every country in the world and nearly caused their banking systems to collapse (Hausman & Johnston, 2014; Stockhammer, 2015). Although the crisis does not have a specific starting and ending date, there are several key events. One of them is the collapse of the Lehman Brothers in September 2008. The collapse caused the Dow Jones Industrial Average to lose 500 points (4.4%) on a single day (De Haas & Van Horen, 2012; Hausman & Johnston, 2014).

### *2.6.1. Costs of the financial crisis*

The cost of the 2007–2008 financial crisis and its aftermath is estimated at between US\$6 and US\$14 trillion, or 40 to 90 percent of US output in 2007 (Atkinson et al., 2013). The financial crisis also caused intangible costs. Unemployment rates rose from 4.4% in May 2007 to 10% in October 2009 (Bureau of Labor Statistics, 2019). Unemployed citizens felt stressed, ashamed, and not in control (Atkinson et al., 2013).

### *2.6.2. Causes of the financial crisis*

Mortgage lending to uncreditworthy citizens and risky financial instruments by commercial and investment banks take most of the blame for the financial crisis (Coffee, 2009; Hausman & Johnston, 2014). Mortgage loan originators had incentives to originate as many mortgages as possible, which resulted in riskier mortgages (Coffee, 2009). Receiving a good credit bond rating on the mortgages was not a problem for banks that bought and bundled the mortgages in mortgage-backed securities (MBS) because they paid the rating agencies (Baker, 2008). Credit agencies were supposed to determine the risk and value of these pools of different mortgages but often overstated the value because of rising house prices in the first few years (Baker, 2008; Schwartz, 2009).

### *2.6.3. Consequences for banks*

The performance of the banking sector was, just like other sectors, negatively affected by the financial crisis. In the short-run, the crisis caused mortgage default rates to increase, while in the long-run the increased regulation caused costs to rise. Congress passed the Dodd-Frank Act in 2010 with the aim of increasing financial stability (Dimitrov et al., 2015). Standard & Poor's estimates that the Dodd-Frank Act could reduce pre-tax earnings for the eight largest banks in the US by up to US\$34 billion per year (Albrecht & Manoyan, 2012). The financial crisis and the subsequent recession caused the stock price, net cash flow and return on assets of most US commercial banks to decline. The federal interest rate was reduced as well, causing profits to decrease even further (Bikker & Vervliet, 2018).

## *2.7. Hypothesis development*

The main research question assesses whether goodwill impairments were the cause or result of the stock price meltdown during the financial crisis. Goodwill impairments can also be both a cause and result of the financial crisis if a positive feedback loop exists. In order to answer the research question, two hypotheses are tested.

### *2.7.1. Hypothesis 1*

As mentioned in section 2.3.1., a decrease in net cash flow, return on assets and the stock price of an acquirer, increases the probability of goodwill impairments occurring. The recession caused profitability of banks to decrease and could therefore have led to goodwill impairments (Albertazzi & Gambacorta, 2009). The following hypothesis will test the effect of the financial crisis on goodwill impairments:

*H1: During the financial crisis, goodwill impairments of commercial banks increased in relative size and occurred more frequently than in the years prior to and after the crisis.*

Support for this hypothesis provides evidence that the financial crisis and the subsequent recession caused commercial banks to recognize larger and more frequent impairment losses.

### *2.7.2. Hypothesis 2*

Section 2.6.2. summarizes the causes of the financial crisis. Between October 9, 2007 and March 9, 2009, the US stock market experienced the worst bear market since the Great

Depression. US stocks lost around 56% of their value during this period (Meric, Dunne, McCall & Meric, 2010). As mentioned in section 2.4.1., previous research shows that goodwill impairments result in lower stock prices. However, the datasets used, consist either of companies in different sectors or non-financial companies. Support for H1 does not exclude goodwill impairments from being a cause of the financial crisis because a positive feedback loop could exist. Goodwill impairments could have caused the financial crisis, which in turn led to more goodwill impairments because of decreasing stock prices and operating performance. In order to assess if goodwill impairments were one of the causes of the stock price meltdown during the financial crisis, the following hypothesis is tested:

*H2: Stock prices of US commercial banks decrease after the recognition of a goodwill impairment loss.*

If H1 is rejected and the findings show that more goodwill impairments occurred in the years before the financial crisis, support for H2 provides evidence that goodwill impairments were a cause of the financial crisis.

### 3. Data

I use cross-sectional data to test the hypotheses. The following sections discuss the sample selection, data transformations and descriptive statistics. In addition, I created two time series charts that illustrate the data.

#### *3.1. Sample selection*

I use accounting and banking data to test the hypotheses. This data is obtained from Compustat North America and Compustat Bank Fundamentals, respectively, using the commercial bank Standard Industrial Classification (hereafter, SIC) code 6020. Compustat North America consists of annual and quarterly report data from American listed companies. Compustat Bank Fundamentals contains variables that are specifically interesting for banks e.g., interest income. Commercial banks are used because laws such as the Dodd-Frank Act were created to increase control over financial institutions and commercial banks (Skeel, 2010). SIC code 6020 yields 32,005 quarterly observations between January 2002 and December 2016. This timeframe is chosen because SFAS 142 was required to be applied in fiscal years starting after December 16, 2001, and early adoption of the single step impairment test was allowed from January 1, 2017, onward. Observations that do not contain data about goodwill or other variables used in statistical tests (see section 4.) are removed from the sample. In order to remove outliers, all continuous variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. The final raw sample contains 1012 observations of 155 commercial banks.

#### *3.2. Data transformations*

In order to test the hypotheses, multiple new variables are created. Goodwill impairment is divided by total assets to calculate the relative size of a goodwill impairment. The relative size provides more information because it takes the size of a company into account. The dummy variable impairment is created such that it takes the value 1 if an impairment occurred. The time dummy crisis years is created such that it takes the value 1 for the years 2007 and 2008, and 0 otherwise. Even though the negative stock performance of banks continued in 2009, this year is not seen as a crisis year because the negative stock returns can be attributed to the fear of banks being nationalized (Fahlenbrach, Prilmeier & Stulz, 2012). Return on assets is created by dividing net income by total assets.

In order to test H2, in addition to panel data, time-series data of quarterly stock prices is used. This data is also obtained from Compustat Bank Fundamentals. The variable stock return is defined as the change in the stock price between quarter t and quarter t-1. Appendix A includes a description of all variables.

### *3.3. Descriptive statistics*

Table 1 presents the descriptive statistics. Several elements are illustrated with this table. Firstly, the high standard deviation of the variable size indicates that the dataset contains both small, medium and large banks. The mean (median) is US\$29.8 billion (US\$3.2 billion). The dataset is not biased to small, nor to large-cap banks (Berger, Miller, Petersen, Rajan & Stein, 2005; Fahlenbrach & Stulz, 2011). Secondly, the mean of the dummy variable crisis years shows that almost half of the impairments occurred during the 2007–2008 financial crisis, which is interesting since this period contains only 2 out of 15 years. Thirdly, the mean of the variable stock return shows that the stock prices of US commercial banks decreased on average between 2002 and 2016. The financial crisis is one of the main reasons for this. Dropping observations from 2007 and 2008 results in an average stock return of 6.14%. Finally, the mean of the dummy variable impairment shows that 87% of the observations contain a goodwill impairment. A potential explanation for this is that the Compustat database displays some observations without an impairment as missing, instead of a 0. However, because this is most likely not true for every variable, it is not possible to give these missing values the value 0.

Appendix B contains a correlation matrix of the same 11 variables. The correlation matrix provides an indication of the relationship between two variables. However, this relationship is not always correct, for instance, when omitted variable bias occurs. The variable stock return is negatively correlated with size, relative size, and the occurrence of a goodwill impairment, indicating that an impairment has a negative effect on the stock price of an US commercial bank. The correlation between the variables crisis years and goodwill impairment is slightly positive, meaning that relatively more goodwill got written down during the financial crisis. Correlation between the dummy variable impairment and relative size is positive as well. The negative correlation between crisis years and stock return indicates that during the financial crisis stock prices decreased.

*Table 1 Descriptive statistics US commercial banks between 2002 and 2016*

	Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Goodwill	1012	863.803	16.734	5385.732	0.000	70832.000
Goodwill impairment	1012	-148.760	-9.196	624.056	-511.700	0.000
Impairment	1012	0.870	1.000	0.337	0.000	1.000
Stock return	1012	-12.069	-4.256	42.674	-227.727	312.756
Relative size impairment	1010	0.010	0.003	0.018	0.000	0.175
Crisis years	1012	0.484	0.000	0.500	0.000	1.000
Size	1010	29831.428	3196.039	160996.780	4.399	2219628.000
Net income	1010	-35.002	-0.288	519.784	-915.000	6232.000
Return on assets	1010	-0.003	-0.000	0.068	-0.143	2.128
Cash flow	997	291.369	19.217	2581.441	-15603.000	64490.000
Revenue	988	271.955	33.479	1218.627	0.000	15853.000

### *3.4. Time series charts*

Figures 1 and 2 show the frequency and average relative size of goodwill impairments between 2002 and 2016 per quarter, respectively. Two features should be noticed. Firstly, the relative size of impairments was quite high between 2002q2 and 2002q4. These quarters had two, three, and five impairments, respectively. Because of large impairments by CIT Group in all three quarters, the relative size of the impairments increased. As mentioned in section 3.1., all continuous variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. The time series chart without outliers is provided in Appendix C, figure 3.

A second aspect that has to be noted is that both the frequency and relative size of goodwill write-downs increased rapidly starting from 2007q3, before returning to previous levels around 2013q1. 2009q3 has the highest frequency with 79 write-downs. Managers delaying goodwill impairments could be the reason why the highest frequency was reached after the financial crisis (see section 2.5.). The highest relative size was reached in 2009q1 with goodwill write-downs equalling on average 1.97% of total assets. The start of the run-up and both peaks were near the start and end of the financial crisis.

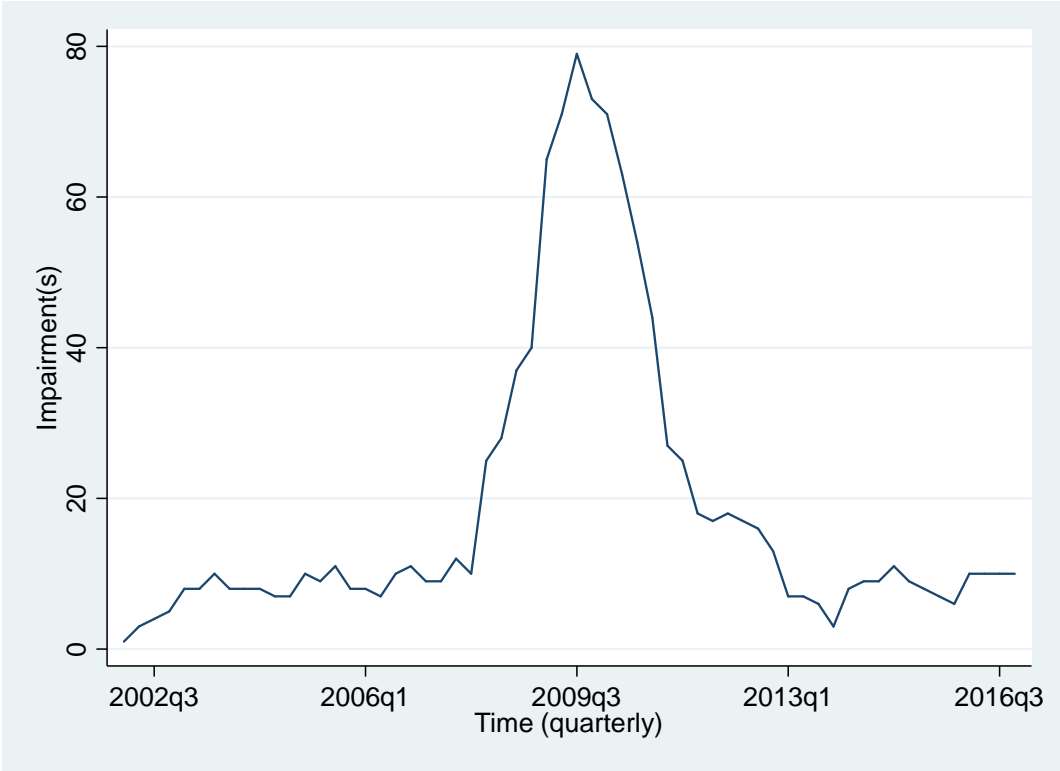
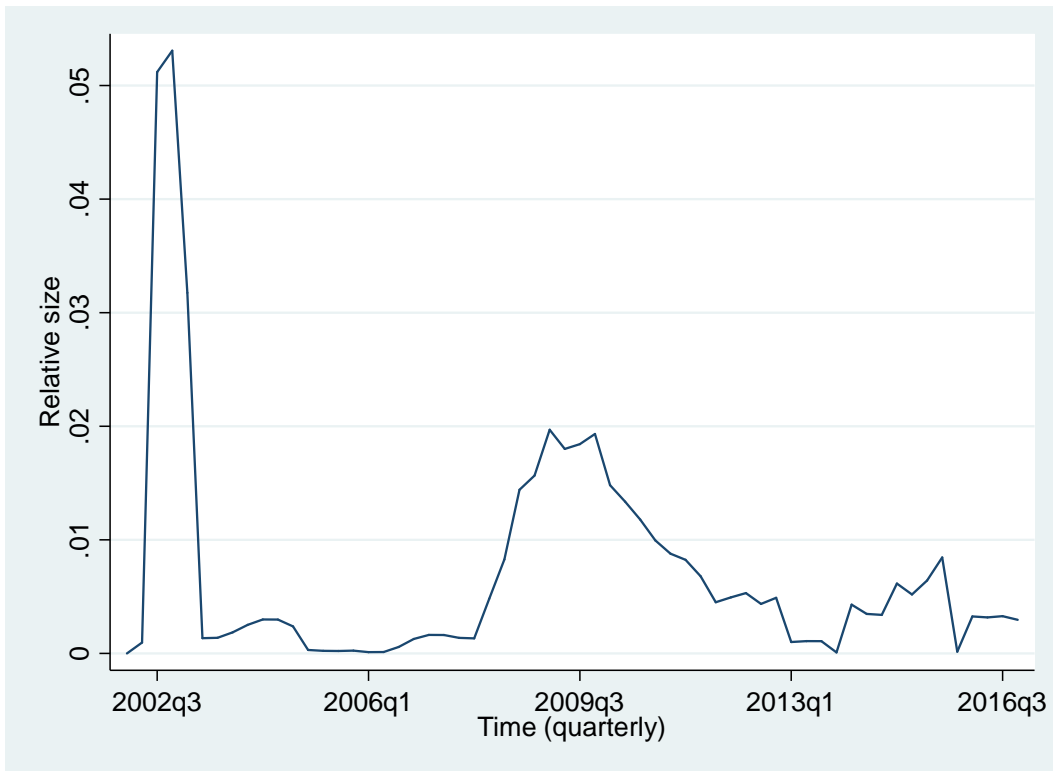


Figure 1 Time series chart of the frequency of goodwill impairments of US commercial banks between 2002 and 2016 per quarter





*Figure 2 Time series chart of the average relative size of goodwill impairments of US commercial banks between 2002 and 2016 per quarter*

## 4. Methodology

In order to test H1, multiple regression models are estimated. H2 is tested by estimating a regression using ordinary least-squares (OLS) with stock return as the dependent variable. The next paragraphs explain why these tests are used and goes into more depth about the different variables used.

### 4.1. Hypothesis 1

The financial crisis and the subsequent recession had a negative impact on the performance of US commercial banks. Previous research has shown that a decrease in financial performance leads to goodwill impairments (see section 2.3.1.). H1 examines if the financial crisis influenced goodwill impairments. To research if the financial crisis affected the frequency of goodwill impairments, a linear probit model is estimated using maximum-likelihood procedures. A linear probit model is chosen over a probit model because results are easier to interpret, and values are not expected to be smaller than 0 or bigger than 1. Model 1 is specified as follows:

$$\begin{aligned} \text{Impairment}_i = & \alpha + \beta_1 \text{Crisis years}_i + \beta_2 \text{Net income}_i + \beta_3 \text{Cash flow}_i \\ & + \beta_4 \text{Revenue}_i + \beta_5 \text{Size}_i + \varepsilon_i \end{aligned} \quad (1)$$

Where impairment is the dependent variable representing the chance of an impairment occurring for firm  $i$ ,  $\alpha$  is the constant and  $\varepsilon$  is the error term. Crisis years is a dummy variable which takes value 1 for 2007–2008, and 0 otherwise. Net income and cash flow are control variables. Net income is negatively affected by goodwill impairments and a decrease in net income and cash flow leads to impairments (see section 2.3.1.). Most observations miss data on total revenue. Consequently, the variable interest income is used as a proxy variable to capture the effect of revenue. The variable size accounts for the size of a bank through its total assets.

In order to test if the financial crisis affected the relative size of goodwill write-downs, the following regression is estimated using OLS. An OLS regression is chosen over a quantile regression because there are few outliers and the focus is on the mean. Moreover, the focus is on all impairments and not on a specific quantile. Model 2 is specified as follows:

$$\begin{aligned} \text{Relative size}_i = & \alpha + \beta_1 \text{Crisis years}_i + \beta_2 \text{Net income}_i + \beta_3 \text{Cash flow}_i \\ & + \beta_4 \text{Interest income}_i + \beta_5 \text{Size}_i + \varepsilon_i \end{aligned} \quad (2)$$

Where the dependent variable is the relative size of the goodwill impairment for firm  $i$ , calculated as the size of the impairment divided by total assets. The same control variables are used as in the linear probit model.

#### 4.2. Hypothesis 2

H2 examines the relationship between goodwill impairments and stock prices. This is tested by estimating a regression using OLS. An OLS regression is chosen because there are no outliers and the focus is on the mean. Model 3 is specified as follows:

$$\begin{aligned} \text{Stock return}_i = & \alpha + \beta_1 \text{Impairment}_i + \beta_2 \text{Relative size}_i + \beta_3 \text{Crisis years}_i \\ & + \beta_4 \text{Net income}_i + \beta_5 \text{Cash flow}_i + \beta_6 \text{Revenue}_i + \beta_7 \text{Size}_i + \varepsilon_i \end{aligned} \quad (3)$$

Where stock return is the dependent variable that shows the change in the quarterly stock price for firm  $i$ .  $\alpha$  is the constant. Impairment is a dummy variable that takes value 1 if an impairment occurred and relative size is the variable representing the relative goodwill write-down. Net income, cash flow, revenue, and size are control variables and  $\varepsilon$  is the error term. Research by Disclosure Insight (2009) shows that some banks write-down small amounts of goodwill. These small write-downs have a low effect on the financial statements and stock price. Consequently, most emphasis is put on the coefficient for relative size because the relative value of the write-down provides more information than whether an impairment occurred or not. Because of research by Darrough et al. (2014), it is expected that the relative size of an impairment has a negative effect on the stock price of an US commercial bank (see section 2.4.).

An assumption of OLS is that the variance of the error term is constant (Hayes & Cai, 2007). In order to not violate this assumption, in accordance with the existing literature, robust standard errors are used for the regressions (Lapointe-Antunes, Cormier & Magnan, 2008; Ramanna & Watts, 2012; White, 1980).

## 5. Results

I present the results from models 1 and 2 in section 5.1. Section 5.2 contains the results from model 3. I provide additional insight for the findings related to H2 by estimating a fourth model.

### *5.1. Hypothesis 1*

The first hypothesis relates to the effect of the financial crisis and the subsequent recession on the frequency and relative size of goodwill impairments. Table 2 displays the results of the estimated probit and OLS regression. Column (1) provides the predicted signs of the variables. Predictions are based on previous research discussed in section 2.3.1. Column (2) reports the results from model 1 with the dummy variable impairment as the dependent variable. Column (3) displays the results from model 2 with the variable relative size as the dependent variable.

The coefficient estimate for crisis years in column (2) shows that significantly more goodwill impairments occurred during the financial crisis (0.151, p-value < 0.01). The coefficient can be interpreted as follows: for every 1000 observations, 151 more impairments occurred during the financial crisis. Because of the potential data flaw discussed in section 3.1. and 3.3., only the sign of the coefficient can be interpreted. The sign provides enough information to conclude that significantly more impairments occurred during the financial crisis. No control variable is significant, which is contradictory to existing literature by Chalmers et al. (2011) and Churyk (2005) (see section 2.3.1.).

Next, the effect of the financial crisis on the relative size of impairments is tested by estimating a regression using OLS. Column (3) in table 2 displays the results. The same control variables are used as in the probit model. The coefficient for crisis years shows that during the financial crisis, the relative size of impairments is significantly higher (0.8%, p-value < 0.01). The coefficient for the control variable operating cash flow is again insignificant, while the coefficients for the other control variables have signs as expected.

To summarize the findings, the coefficient for the dummy variable crisis years shows that both the frequency and relative size of goodwill impairments increased significantly during the financial crisis. These findings support H1.

*Table 2 Results of the estimated probit (model 1) and OLS regression (model 2) of the relationship between the financial crisis and the frequency and relative size of goodwill impairments, respectively*

Variable	(1) Predicted sign	(2) Model 1	(3) Model 2
Crisis years	+	0.151*** (0.022)	0.008*** (0.001)
Net income	-	-0.000 (0.000)	-0.000*** (0.000)
Cash flow	-	-0.000 (0.000)	-0.000 (0.000)
Revenue	-	0.000 (0.000)	-0.000** (0.000)
Size	+	0.000 (0.000)	0.000* (0.000)
Constant		0.784*** (0.020)	0.006*** (0.001)
Observations		949	949
R-squared		0.056	0.115

The first column provides the predicted signs of the variables. Column (2) and (3) report the average coefficient estimate. The standard errors of the coefficients are presented in parentheses. Continuous variables are winsorized at 1% and 99%. All variables are described in Appendix A. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1% level, respectively.

## 5.2. Hypothesis 2

For the second hypothesis, the relationship between stock prices and goodwill impairments is analysed by estimating a regression using OLS. In order to interpret the results better, a fourth regression is estimated (see Appendix D). Table 3 provides the results of both regressions. The only difference is that model 3 includes the control variable crisis years, while model 4 does not. Both regressions use stock return as the dependent variable. Column (1) provides the predicted signs of the variables. Predictions are based on previous research discussed in

section 2.3.1. Column (2) reports the results from model 3. Column (3) displays the results from model 4.

Consistent with existing literature, the coefficient for crisis years of model 3 shows that stock prices decreased during the financial crisis (-11.3%, p-value < 0.01). An increase in net income and operating cash flow have a positive effect on the share price of an US commercial bank. The coefficients for the dummy variable impairment and the relative size of the goodwill impairment are insignificant and can therefore not be interpreted (1.37%, p-values > 0.10 and -88.494 > 0.10, respectively). This is unexpected since existing literature shows that goodwill impairments contain an often negative information component and consequently result in a decrease in the share price of a company (see section 2.4.1.).

### *5.2.1. Interpretation of the findings*

Research by Hirschey and Richardson (2002) shows that a goodwill impairment often causes stock prices to decrease. Consequently, it was expected that an increase in the relative size of an impairment would have a negative effect on the stock price of a commercial bank. The correlation matrix presented in Appendix B also shows that there is a significant negative correlation between the relative size of a goodwill impairment and the stock price of a commercial bank. The results of model 4 show that the relative size of a goodwill impairment has a significant negative effect on the stock price of an US commercial bank (-205.039, p-value < 0.05). However, when adding the control variable crisis years, the coefficient for the relative size is no longer significant. Adding the variable crisis years increases the R-squared by 0.03, meaning that model 3 explains 3% more of the variance of stock return (Recchia, 2010). In both models, the occurrence of a goodwill impairment has no effect on the share price of a commercial bank (p-value > 0.10). Once again, this contradicts prior research that shows that goodwill impairments typically result in a stock price decrease (see section 2.4.1.).

To summarize the results, the coefficient for the relative size is insignificant when the control variable crisis years is added to the model. Therefore, I find, contrary to existing literature, that there is no significant relationship between the relative size of a goodwill impairment and the stock price of US commercial banks. Although it cannot be concluded that goodwill impairments do not contain a meaningful information component, I find that this

information aspect does not have a significant impact on the stock price. Because of these findings, H2 is rejected.

*Table 3 Results of the estimated OLS regression for the relationship between stock prices and goodwill impairments*

Variable	(1) Predicted sign	(2) Model 3	(3) Model 4
Impairment	-	1.374 (2.477)	-0.367 (2.424)
Relative size	-	-88.494 (104.058)	-205.039** (103.390)
Crisis years	-	-11.326*** (2.089)	
Net income	-	0.159*** (0.027)	0.199*** (0.026)
Cash flow	+	0.032*** (0.010)	0.037*** (0.010)
Revenue	+	0.002 (0.030)	-0.047 (0.029)
Size	+	-0.000 (0.000)	0.000 (0.000)
Constant	+	-5.786** (2.243)	-8.230*** (2.180)
Observations		927	927
R-squared		0.141	0.111

The first column provides the predicted signs of the variables. Column (2) and (3) report the average coefficient estimate. The standard errors of the coefficients are presented in parentheses. Continuous variables are winsorized at 1% and 99%. All variables are described in Appendix A. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1% level, respectively.

## 6. Conclusion

The main purpose of this paper is to examine if more goodwill legislation is recommended. This is done by researching the relationship between the financial crisis and goodwill impairments of US commercial banks. In order to answer the research question *“To what extent were goodwill impairments of US commercial banks the cause and/or result of the 2007–2008 financial crisis?”*, section 6.1. summarizes the results of the tested hypotheses. Section 6.2. contains limitations and recommendations for future research.

### 6.1. Summary and main results

The first hypothesis tests the effect of the financial crisis on goodwill impairments of US commercial banks. Research by Chalmers et al. (2011) and Churyk (2005) shows that a decrease in the accounting performance or stock price of a company increases the relative size and chance of a goodwill impairment occurring. Therefore, it was expected that the financial crisis, known as a period with negative economic growth, would cause a significant increase in goodwill impairments. The results of the regressions in table 2 show that, during the financial crisis, the frequency and relative size of goodwill impairments increased.

The second hypothesis tests the effect of a goodwill impairment on the stock price of an US commercial bank. Research by Chalmers et al. (2011) and Camodeca et al. (2013) shows that goodwill impairments have a negative effect on the share price of a company. One of the main reasons for this is that impairments contain an often negative information component (Hirschey & Richardson, 2002). Therefore, it was expected that the stock price would decrease after an impairment occurred and that a higher relative size would result in a larger decrease. Model 3 in table 3 shows that this is not the case. The coefficients for both the occurrence and the relative size of an impairment are insignificant. Consequently, I conclude that there is no significant relationship between goodwill impairments and the share price of US commercial banks.

By combining the findings of the two hypotheses, I conclude that, while the financial crisis caused more goodwill impairments, these impairments did not deepen the recession through decreasing consumer confidence. Therefore, I recommend that the Dodd-Frank Act should not be changed to include goodwill and goodwill impairment legislation because



goodwill impairments of US commercial banks have no clear relationship with the financial crisis.

### *6.2. limitations and recommendations for future research*

This study is subject to the following limitations. Firstly, the Compustat North America database contains a lot of missing values. While I started with 32,005 quarterly observations, I had to drop 31,019 observations because of missing values related to goodwill impairments. It is expected that most of these missing values are related to quarters with no impairments. This is, however, most likely not true for every missing value. Consequently, it is not possible to give these missing observations a value of zero. As a result of this, the database lacks observations with no goodwill impairment. 132 observations, 13% of the total, have no impairment, which is low compared to prior research (Gu & Lev, 2011; Ramanna & Watts, 2012). Research by Disclosure Insight (2009) shows that banks tried to prevent impairments during the financial crisis. Therefore, it was expected that the banking sector would have relatively less impairments than other sectors. For future research, it is recommended to use another database. This database can also include investment banks to increase the scope of the study. Investment banks played a crucial role in the financial crisis and should be taken into account when changing legislation.

Secondly, this paper does not have an explanation for why the relative size of a goodwill impairment does not affect the stock price of an US commercial bank. The coefficient for the relative size of a goodwill impairment in model 3 is insignificant. This is unexpected and contradicts prior research (Camodeca et al., 2013; Chalmers et al., 2011). A potential explanation is that the focus of this paper is solely on commercial banks, whereas existing literature studies companies from different sectors (Camodeca et al., 2013; Chalmers et al., 2011). It could also be the result of omitted variable bias, which is the third limitation.

The estimated regression models do not contain control variables that specifically target commercial banks. Therefore, omitted variable bias could exist. This paper shows that traditional indicators for impairment, e.g., decreasing revenue and cash flow, do cause US commercial banks to impair goodwill. Bank performance is positively correlated with the interest rate, which has been historically low in the years after the financial crisis (Bikker & Vervliet, 2018). Future research could test what causes US commercial banks to impair

goodwill. For instance, a decrease in the federal interest rate. This could explain why the relative size of an impairment does not affect the stock price of a US commercial bank and could yield additional control variables that can prevent omitted variable bias.

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## 8. Appendix

### *Appendix A. Variables definitions*

<b>Variable</b>	<b>Description</b>
Goodwill	The excess cost over equity of an acquired company
Goodwill impairment	Logarithm of the sum of all goodwill impairments in a period
Impairment	1 for a period with a goodwill impairment, and 0 otherwise
Stock return	Logarithm of the quarter-over-quarter stock price change
Relative size	Relative size of the impairment, calculated as goodwill impairment / total assets
Crisis years	1 for the time period 2007 through 2008, and 0 otherwise
Size	Total assets
Net income	Fiscal period net income (loss)
Return on assets	Net income divided by lagged total assets
Cash flow	Cash flow from operating activities
Revenue	Total interest received from financial services

Appendix B. Correlation matrix

	Goodwill	Goodwill impairment	Goodwill impairment	Stock return	Relative size	Crisis years	Size	Net income	Return on size	Cash flow	Revenue
Goodwill	1										
Goodwill impairment	0.235***	1									
impairment	0.035	0.385***	1								
stock return	0.015	-0.151***	-0.071*	1							
Relative size	-0.053	0.587***	0.242***	-0.114***	1						
Crisis years	-0.069*	0.403***	0.247***	-0.266***	0.287***	1					
Size	0.995***	0.241***	0.036	0.018	-0.057	-0.069*	1				
Net income	0.205***	-0.171***	-0.038	0.102**	-0.104**	-0.162***	0.248***	1			
Return on assets	0.004	-0.081*	-0.101**	-0.113***	-0.088**	-0.085*	0.004	0.040	1		
Cash flow	0.581***	0.152***	0.019	-0.015	-0.031	-0.046	0.586***	0.284***	0.002	1	
Revenue	0.990***	0.274***	0.042	0.011	-0.060	-0.0509	0.991***	0.172***	0.002	0.595***	1

\*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1% level, respectively.



Appendix C. Methodology

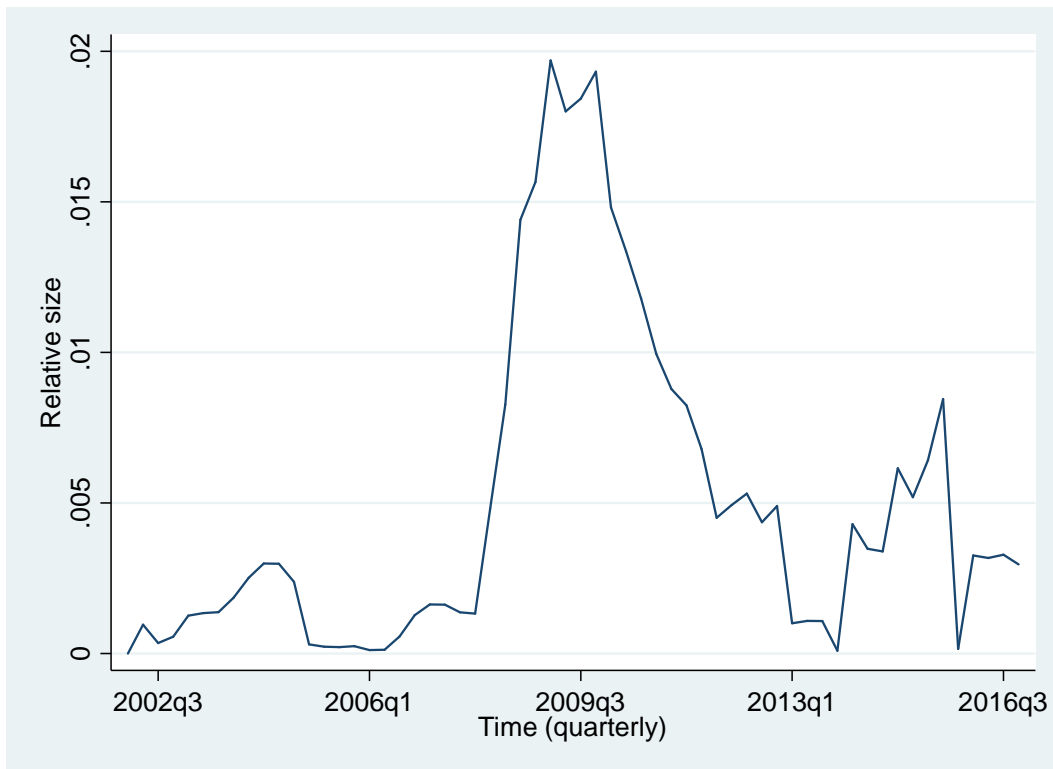


Figure 3 Time series chart of the relative size of goodwill impairments of US commercial banks between 2002 and 2016 per quarter excluding outliers

*Appendix D. Results*

$$\begin{aligned} \text{Stock return}_i = & \alpha + \beta_1 \text{Impairment}_i + \beta_2 \text{Relative size}_i + \beta_4 \text{Net income} \\ & + \beta_5 \text{Cash flow}_i + \beta_5 \text{Revenue} + \beta_5 \text{Size}_i + \varepsilon_i \end{aligned} \quad (4)$$

*Model 4. Regression model without the dummy variable crisis years*