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Lehman Brothers Bankruptcy: Reasons, Effects, and Outcome

by

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Advisor: Dr. Tim Riley

An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of Science in
Business Administration in Finance.

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Abstract

Lehman Brothers' bankruptcy was a major turning point during the 2008 Financial Crisis, and Lehman Brothers itself has become a prime example of regulatory failure since its closing. The demise of Lehman stemmed from the repeal of the Glass-Steagall Act of 1933. The deregulation of investment banking in the 1990s forged the way for new investment practices on Wall Street. The relaxation of rules allowed investment banks to be heavily invested in volatile assets. Lehman's issues were an extremely high leverage ratio, illiquid assets, and poor corporate governance. An extremely high leverage ratio left Lehman susceptible to large movements in firm valuation based on small movements in asset values. Lehman's assets were illiquid because they were unable to sell them quickly to raise the capital necessary to keep the firm in operation. Lehman's management was informed of the impending doom but chose not to act. Lehman ceased operations on September 15, 2008, creating significant market upheaval. Congress subsequently passed new regulations to mitigate the risk of Wall Street's activities on the average American. In this paper, I dissect Lehman's failure with the goal of identifying its root causes, its initial effects on the market, and how the market was able to recover.

Introduction

Investment banking has been an integral part of the United States economy since the inception of the first investment bank in the United States in the mid 1800s. The goal of investing is ultimately to make the highest return possible given a desired risk profile. An investor will always choose the investment which maximizes return for a given risk. The ethics of investing came into question as Lehman Brother's bankruptcy in 2008 increased the US economy's volatility for over 2 years. They were the largest company to file for bankruptcy in United States history, so naturally we should ask: what went wrong?

Lehman's collapse came from a multitude of factors: deregulation, overleveraged positions, illiquid assets, and failed corporate governance. The Glass Stegall Act of 1933, which limited the power of the banking industry by regulating banking practices quite heavily was repealed in 1999. At the turn of the century, banks could start to develop riskier securities. These securities came in the form of mortgage-backed securities. Many of the largest investment banks in the world heavily invested in these securities. The value of these securities was derived from mortgage payments, so an increase in mortgage defaults would leave these positions vulnerable. The United States housing market was booming during the mid 2000s. The introduction of sub-prime mortgages brought an entirely new customer base into the housing market, which would have been unable to get mortgages in the past. Uncreditworthy customers were offered these new mortgages because they couldn't receive a 'prime' mortgage. Sub-prime mortgages allowed customers to pay less money down, but interest rates were extremely high to offset the risk.

The housing market was seen as a relatively stable investment at the time. Mortgage default rates began to increase starting at the beginning of 2007, which left many investment banks holding these securities decreasing in value. Lehman had heavily leveraged their assets up to 44x their stockholder equity by incurring debt to invest in these securities. This highly leverage position left Lehman highly susceptible to large losses incurred by a decrease in their assets value. An investment bank this leveraged had not been seen as Glass-Steagall had prevented overleveraged positions.

Lehman kept packaged securities on their books, which would allow them to profit off them, but they could also be hurt by lost value. Lehman's liquidity issues became evident as they required overnight loans to fund their day-to-day operations. Their assets were not giving them capital to keep the business running, so Lehman sought outside means. They were unable to sell their assets, so other investment banks would loan Lehman cash to keep them out of bankruptcy. These liquidity issues dug a deeper hole for Lehman as they kept increasing their outstanding debt. Lehman sought outside investment or a sale of assets, but they were ultimately unable to find a buyer, which left bankruptcy evident.

Lehman's corporate governance structure allowed management to change the company's risk appetite without any oversight. Management chose to keep increasing risk appetite by taking highly leveraged positions. Lehman's management was made aware of the increasing risk they were facing by highly leveraged, illiquid positions, but they chose to keep

increasing their position. The FED and SEC began contacting Lehman pointing out realistic scenarios of solvency, but management ignored these warnings. Lehman's management failed to implement the government's suggestions at the time and led to the firm's bankruptcy.

Congress saw the need to step in and create a law, which helped reinstate some Glass-Steagall characteristics to protect the United States economy from risk undertaken by Wall Street Investors. This ultimately resulted in the Dodd-Frank Act in 2012. Regulation in the financial sector has been controversial since its inception, but fundamentally, oversight may be necessary. The financial sector is always innovating new ways to maximize profit, so proper regulation and accurate publicly shared information is very important to ensure every trader can become informed.

Lehman Brothers bankruptcy can be traced down to these three variables caused by deregulation: overleveraged positions, illiquid investments, and failed corporate governance. I will use these variables to detail Lehman's road to bankruptcy, and their direct result in Lehman applying for bankruptcy in 2008. I will also detail Lehman's failures affect on the entire US economy, and how our government chose to respond to prevent the same outcome in the future.

Deregulation

The Glass Steagall Act of 1933 was repealed in 1999, which allowed Lehman Brothers to increase their product offerings by allowing them to sell riskier financial solutions. The Glass Steagall Act was put in place to protect consumers from unethical practices undertaken by banks, so the repeal deregulated many volatile financial markets. Glass Steagall was a response to the Great Depression in the late 1920s. Under Glass Steagall, banks were not allowed to write more loans and then invest these loans into risky investments (McDonald, 2016). The banks were using depositor's money to continue lending with high leverage. Black Tuesday was driven by a mass exodus of depositors seeking to withdraw funds from their banks, but the banks didn't have the funds to sufficiently fill everyone's needs. This triggered the worst recession the United States has seen.

Repealing Glass Steagall allowed investment banks to seek risky assets by developing new derivative securities. Banks were able to begin underwriting loans to invest in high volatility assets, which allowed them to increase their leverage ratios. Lehman took this change in stride and accordingly, changed their risk appetite by offering clients new products. These new product offerings were real estate, asset management, securitization, and property trading. Increased freedom within the financials sector allowed banks to innovate these new products for consumers, but they were also able to invest themselves.

Figure 1

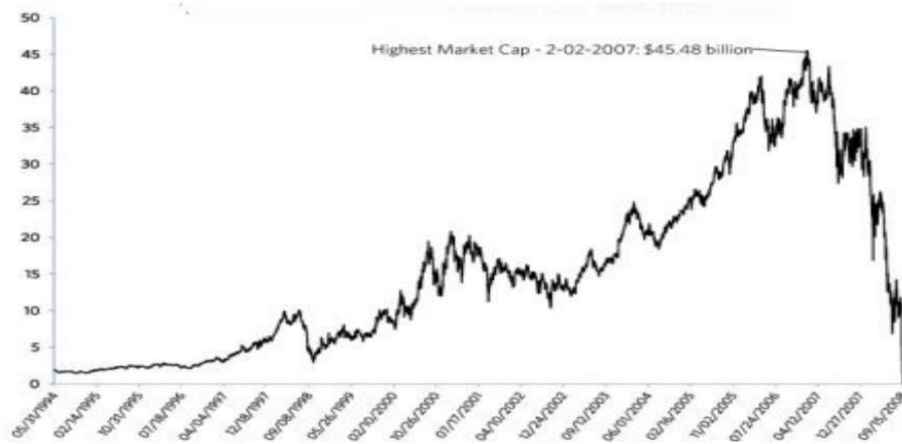


Figure 1: Lehman's market cap in billion US\$ (Wiggins et al., 2019)

Figure 1 is a graph detailing Lehman Brothers market cap from its IPO until its eventual bankruptcy in 2008. We can see the spike in value given by these new products.

Lehman's sales grew by a staggering 130% each year, which outpaced Goldman Sachs and Morgan Stanley, their two main rivals. Lehman Brothers' share price reflected this large sales growth by growth in stock price. Lehman's market cap went from \$5 billion in 2000 to \$40 billion in 2006. These new investing products clearly allowed Lehman to grow exponentially (Karim, 2021).

Lehman's Investing Strategy

The 'American Dream' in most eyes is to grow up start a family and own a house. This dream was realized by many, but some people with less income and creditworthiness were unable to take advantage of such a dream. Interest rates were extremely low during the early 2000s as Federal Reserve President, Alan Greenspan tried to boost the United States economy following the September 11 terrorist attacks. Subprime mortgages appeared in the mid-1990s to give those who failed to qualify for a mortgage the ability to acquire a mortgage (Connerty, 2010). Sub-prime mortgages were characterized as high-risk of default but provided high returns given the borrower made their payments.

Lehman acquired 5 mortgage lenders in 2003 to capitalize on the new securitization market. Most other investment banks on Wall Street were purchasing mortgages to package them in their mortgage-backed securities, but Lehman had employed a countercyclical approach in 2006. Before this, Lehman had employed a strategy of purchasing these securities and quickly selling them to clients to mitigate risk. Their new approach was to hold these assets on their books before selling them, hoping for returns to keep increasing. This was countercyclical as many market warnings showed that the housing market had hit a peak. United States housing market was seen as a mostly risk-averse investment in the early 2000s, which gave investment banks the idea to create a derivative from these subprime mortgages called mortgage-back securities.

Mortgage-Backed Securities were sold by lenders to investment banks to offset the liability risk of keeping these mortgages on the lenders books. Mortgage-backed securities pooled thousands of mortgages in pools to spread out the risk, and the quality of the loan was divided into slices called tranches. These tranches went from AAA the highest quality loan, high creditworthiness to B, extremely high risk of default. This spreading out of risk was a strategy undertaken to limit the risk of the investment, but it was built upon US households making their mortgage payments. Going back, the United States housing market was seen as stable during this period of rapid growth.

Leverage Ratio Issues

Lehman Brothers started to borrow money or take on debt, and they would lend out these loans in the forms of mortgages and mortgage-backed securities. This strategy called proprietary trading allowed Lehman to drastically increase the number of assets that they managed. A company's leverage is defined as the total assets held by the company divided by the stockholders' equity. Below is a chart of Lehman's stock price exposure to a change in the value of their assets. At the peak of Lehman's leverage at the beginning of 2008, they had achieved a leverage of 44x. This means that they held 44x the stockholders' equity in assets being managed by the firm. This fact left them with a very large risk exposure, a decrease in value of the company's assets by a mere 2.5% would throw the company into insolvency.

Table 1: Lehman's leverage ratio from 2003 to 2007 (Wiggins et al., 2019)

Year	2007	2006	2005	2004	2003
Leverage Ratio Reported*	30.7x	26.2x	24.4x	23.9x	23.7x
*Total assets divided by stockholders' equity.					

Lehman's leverage had clearly been increasing over this time frame, but it wasn't seen as a problem as consumers were paying their mortgages. In early 2006, housing prices started to fall as mortgage defaults began to increase, but the bonds value remained stable due to the sheer number of mortgages that were being held. Over the next two years, mortgage defaults were at an all-time high, which sliced the value of Lehman's holdings exponentially (Arentsen et al., 2014). The strategy undertaken by Lehman in 2006 to hold assets on their books to increase revenues backfired on Lehman as the values began to drop.

Liquidity Issues

Liquidity began to be an issue as Lehman had planned to cover their debt obligations with the revenue from these mortgage payments, but the payments were becoming an issue. If Lehman didn't cover their financial obligations, their creditworthiness would take a large reputation hit, so they chose to borrow more money in the form of commercial paper and repo agreements to cover the costs. The bank had also began using overnight wholesale funding to cover its operating costs, which sent a large sign to the other companies in the financial sector. Lehman was financing more than 50% of their assets by issuing short term debt (Zingales et al., 2008). Other institutions began to charge Lehman more securities for funding, which drove down Lehman's operating margin even further.

Clearly, Lehman was struggling with liquidity issues as they were struggling to cover day-to-day operational costs due to their large debt obligations. The below figure shows Lehman's stock price continuing to rise while their credit default swap prices are plummeting. The value of their assets was crumbling which put Lehman at a high risk of default. Large investment bank, Bear Stearns, had failed earlier that year in March of 2008, which put the entire investment banking world on notice. As you can see as well, Bear Stearns implosion had a strong impact on Lehman's stock price.

Figure 2

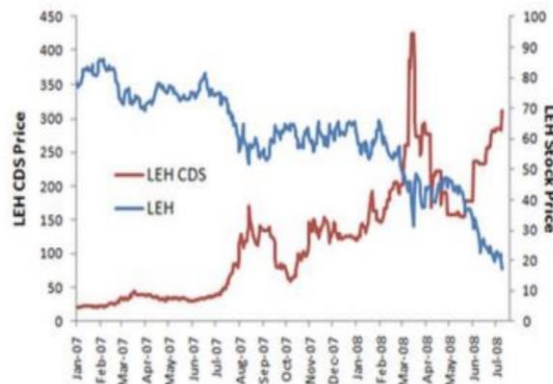


Figure 2: Lehman's stock vs. default risk (Wiggins et al., 2019, p.48)

Figure 2 shows Lehman's increasing risk of default. The blue line showcases Lehman's credit default swaps value declining, but the stock price continued to increase. This showcased increasing volatility of their financial position as leverage increased.

Corporate Governance

Lehman's corporate governance structure received criticism immediately following their bankruptcy, and it has been considered a deciding factor in their bankruptcy. Independent analysis was done by Anton Valukas on their bankruptcy to figure out what exactly happened internally. Valukas found that Lehman's corporate governance structure was high quality, but management would choose to bypass the company's pre-set standards to pursue their goals. He found that the risk management systems at Lehman were state of the art, and they accurately characterized the entire firms risk assessment profile routinely throughout the day (Walker et al., 2012). Lehman also had set risk limits with the SEC, but management had their own plans. Management would choose to bypass these company risk measures to push the risk even higher, without batting an eye. Management would set the firm's risk limit with the SEC, so they were able to manipulate the company's risk appetite.

The SEC noted Lehman's increases in risk appetite limits at the beginning of 2007, but they never questioned the firms goals with them. The SEC noted in Lehman's filings that the company's risk appetite limit "could not be exceeded under any circumstances" (Walker et al., 2012). Lehman's management also chose to bypass a company set requirement for a single transaction limit because it would cost the firm significant profit-making opportunities. Fed officials started to discuss Lehman's ability to survive as early as March 2008. The Fed urged

Lehman CEO at the time, Richard Fuld, to raise capital. They suggested finding a strategic partner for Lehman or raising capital by a stock offering (Peery, 2012). These pleadings were met by inaction from Lehman's side, but since the Fed is just a lender, they could not force Lehman into anything. The SEC would need to be brought in as a regulator for any forced change.

June 7, 2008

Lehman Brothers announced a second quarter loss of \$2.8 billion, which was the investment bank's first losing quarter in almost 20 years. This loss was incurred most likely because Lehman's portfolio of mortgage related assets and leveraged loans had been written down by \$3.7 billion in value. This quarterly loss showcased Lehman's vulnerability in their commercial real estate portfolio, so they raised \$6 billion in stockholders equity by issuing common and preferred stock on June 12. Lehman issued stock to help reduce the risk of its position in mortgage-backed securities. Lehman was also attempting to offload these sharply declining assets on their books, but most financial institutions were realizing similar instances. The price of mortgage-backed securities began to decline in 2007, but Lehman was banking on a reversal of the downward trend by employing a countercyclical strategy. As seen in Figure 3 below, there was a strong negative trend among the financial sector when Lehman announced this loss. This was the initial date that Lehman's vulnerability caused by overleveraged positions became public.

Primary dealers had the strongest negative returns that day among the subsectors studied, but they all experienced a loss around -3.3% (Johnson et al., 2012). J.P Morgan Chase delivered \$9.7 billion to Lehman between June and August to help clear some of Lehman's securities. Chase felt uncomfortable by Lehman's collateralized debt obligations, so they demanded cash as collateral for their funding. In the past, Lehman had offered additional securities to other institutions, but this offering was being refused by the other Wall Street banks. \$200 billion of Lehman's assets were being funded by secured overnight loans from 10 financial institutions. If the others chose to take JP Morgan's stance, Lehman would be in a catastrophic funding problem due to liquidity issues.

September 2, 2008

Korean Development Bank announced that it was talking with Lehman Brothers about a possible investment. The prospective of this large investment bank in Korea gave Lehman investors hope that an investment in the firm would keep Lehman afloat and allow it to offload much of its current holdings to other investors. On September 9, Korean Development Bank announced that talks to invest in Lehman had stopped, so they did not intend to invest in Lehman's future. This announcement gave investors even less hope for a quick turnaround. According to Johnson's research, this announcement caused a further decrease in value across the financial sector. One day later, Lehman announced that it expected a further write-down of \$5.6 billion dollars with an expected loss of \$3.93 billion for Q3 (Wiggins et al., 2019). Lehman had been reporting a liquidity above \$40 billion in assets that were seen as liquid according to the firm, but on September 12, Lehman had less than \$2 billion of its total assets that were

deemed liquid. This closing liquidity on Friday, September 12th didn't allow Lehman to open for business on Monday the 15th.

September 15, 2008

On September 15, 2008, Lehman Brothers officially filed for Chapter 11 Bankruptcy in the United States Bankruptcy Court for the Southern District of New York. In the filing, they declared \$639 billion in assets with \$613 billion in debt (Wiggins et al, 2019). This means that only \$26 billion of their company's assets came from stockholder investments. This bankruptcy was the largest in United States history at the time and still achieves that mark to this date. The Dow Jones Industrial Average (DJIA) declined more than 500 points or a 4.4% loss in the trading session. The Dow Jones is one of the most used market indices to gauge the market as opposed to individual companies. This announcement caused the largest financial sector downturn of the bunch according to Johnson's research as Lehman's stock price plummeted. Primary dealers portfolio values declined by 6% on that day alone.

Figure 3

		Bank portfolio	Savings and loan portfolio	Primary dealers portfolio	Brokerage portfolio
Intercept		0.003** (2.486)	0.003** (2.547)	0.002 (1.632)	0.003** (2.156)
\widetilde{Rm}_t		1.412*** (37.256)	1.057*** (34.897)	1.646*** (41.383)	1.777*** (48.211)
\widetilde{I}_t		-0.080** (-2.228)	-0.072** (-2.508)	-0.062 (-1.636)	-0.069** (-1.969)
\widetilde{Ex}_t		0.713*** (5.627)	0.713*** (7.043)	0.185 (1.395)	0.283** (2.297)
Event date	Parameter				
9 June 2008	θ_{1k}	-0.034** (-2.035)	-0.031** (-2.323)	-0.035** (-2.019)	-0.030* (-1.818)
2 September 2008	θ_{2k}	0.030* (1.804)	0.005 (0.355)	0.022 (1.272)	0.013 (0.769)
9 September 2008	θ_{3k}	-0.006 (-0.330)	-0.003 (-0.204)	-0.004 (-0.248)	-0.018 (-1.079)
10 September 2008	θ_{4k}	-0.024 (-1.448)	-0.041*** (-3.077)	-0.024*** (-1.393)	-0.044*** (-2.703)
15 September 2008	θ_{5k}	-0.029* (-1.448)	-0.002 (-0.002)	-0.060*** (-1.393)	-0.006 (-0.006)

(Johnson et al., 2012)

Figure 3 shows the returns of different subsectors within the financial sector on the given dates. These dates had key announcements releases from Lehman Brothers. Comparing the returns with the announcements, we can see the effects Lehman's announcements had on the financial sector leading up to their bankruptcy.

Lehman's filing for bankruptcy also affected the market as a whole outside of the financial sector. Lehman's bankruptcy lost the US economy hundreds of billions of dollars, which as stated previous drove the Dow Jones down 4.4% on September 15. As we can see in the below figure, the financial sector of the S&P 500 had the strongest correlation in performance to Lehman Brothers, but all the other sectors also are affected by Lehman. The chart showcases a correlation between Lehman's performance vs. overall sector performance during the financial crisis of 2007-2008. The energy sector had the highest correlation to Lehman with a positive correlation of 0.24 during Lehman's demise. Credit contagion is the term for a firm's financial risk to another firm, and many believe that Enron's failure gave way to questioning a company's financials. This theory would persist in Lehman's case as firms realized their economic risk to Lehman's situation. Firms would become more cognizant of this risk in the future (Chakrabarty et al., 2012)

Figure 4

Sectors	Before GFC (1994–2006)	During GFC (2007–15 September 2008)
FIN	0.09***	0.63***
IND	0.14***	0.08
CS	0.03**	0.1**
MAT	0.04*	0.14***
UTI	0.03	0.15***
TS	0.02	0.23***
IT	0.07***	0.15***
HC	0.05**	0.14***
ENG	0.02	0.24***
CD	0.07***	0.21***

Figure 4 showcases correlations between Lehman's returns with all sectors of the S&P 500. The first column comes from 1994-2006, which is our control group to see Lehman's performance before the financial crisis. The second column shows the volatility of the other sectors to Lehman, and all columns outside of the industrial sector increased during the financial crisis (Ranjeeni, 2014).

September 29, 2008

Lehman's bankruptcy was thought to be the largest trigger of the financial crisis from 2007-2009, by the default of \$639 billion in assets. Their bankruptcy brought about a time of increased market volatility through the end of the year. The Dow Jones was down more than 7% on September 29 as well.

Market Recovery

Wall Street Reform and Consumer Protection of 2009

Dodd Frank was signed into law to regulate the actions undertaken by Wall Street to protect the US economy from Wall Street's risks. Specifically, the Dodd-Frank Act was enacted into law on July 21, 2010. It created a more standardized derivatives market with increased regulation. Investment banks were subject to capital and margin requirements under Dodd-Frank. These requirements were to help mitigate risk in the financial sector. The investment banking standards as well the current standards put forth are to focus on lowering risk and promoting market integrity. Banks are also now subject to strict recordkeeping and reporting requirements with the SEC. This change has moved an over-the-counter business into a standardized business, and the increased regulation has also come with a larger focus from the SEC to maintain safe levels of risk in the market.

Derivative securities became standardized in size and were required to be traded on regulated exchanges or swap execution facilities. Standardization usually brings about increased competition between the players in the market, so the government desired true market prices as opposed to the prices of these securities made by the investment banks which owned the security. Lawmakers largely blamed the financial crisis on Wall Street millionaires choosing to risk our economy for profits. The Dodd-Frank Act's purpose was to limit the power of these 'too big to fail' financial institutions and give American consumers a lower financial

risk. The trades being executed in clearinghouses under the new regulations helped mitigate the risks of Wall Street for the average American consumer.

Dodd-Frank helped establish the Consumer Financial Protection Bureau. Their role was to ensure that consumers would not face high adverse risks to their financial security by Wall Street's business. Elizabeth Warren was the first person originally credited with the idea to create a freestanding financial agency to oversee the dealings of Wall Street as they pertain to the economy. The combination of an agency with a focus on consumers and Dodd-Frank the gaps within financial infrastructure that would previously pose risks to consumers have shrunk (Baily et al., 2017).

Capital requirements for investment banks increased as Dodd-Frank went into effect. Leverage ratios of these extremely large investment banks came into question because of Lehman's bankruptcy. The Federal Reserve was monitoring the ratios but was unable to act. Capital requirements had generally been between 12 and 14% during the 1990s, but leverage ratios increased across the board with the introduction of mortgage-backed securities. Increasing capital requirements forces these investment banks to protect themselves from minor economic downturns by requiring them to have larger amounts of capital on hand like a commercial bank. Dodd-Frank decreased leverage ratios back to the 1990s averages as a result.

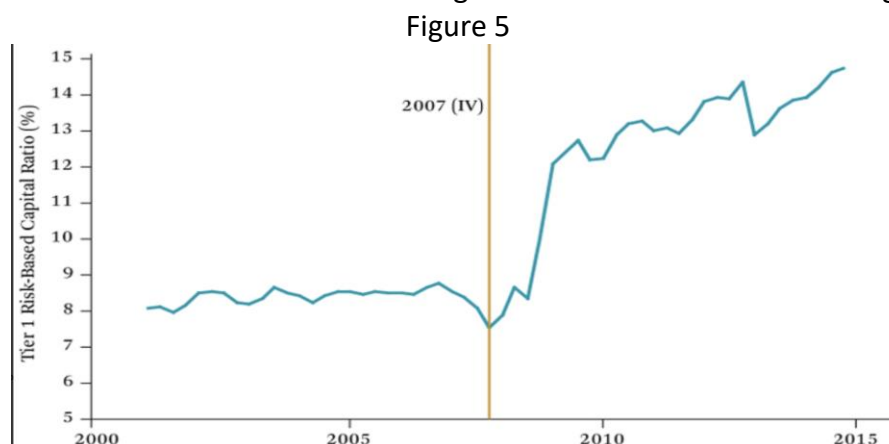


Figure 5 shows the capital ratios of six investment banks: JPMorgan, Citi, Wells Fargo, Goldman Sachs, Bank of America, and Morgan Stanley. The capital ratios were calculated as stockholder's equity divided by total assets under management (Baily, et al., 2017)

Conclusion

Lehman's bankruptcy sent shockwaves through the United States economy for a few years, and some believe that we are still experiencing effects in the financial sector today. The failure of Lehman can be contributed to a few different phenomena, but I think the key factors were lack of regulation, improper corporate governance, and extremely high-risk tolerance. These factors work together in Lehman's case as the repeal of Glass-Steagall deregulated the financials market considerably, and firms took advantage of it by investing in a new derivative security: mortgage-backed securities. These securities backed by the US housing market were thought of to be stable, but housing prices declined in 2006. This price valuation decline caused

many homeowners to default on their mortgages. A snowball effect ensued to mortgage-backed securities losing a lot of value.

Lehman's approach to increase leverage eventually led to their closing as their value was leveraged more than 30x at their bankruptcy. Some have that value up to 44x. This minor loss in value made Lehman unable to cover its day-to-day expenses internally, so they sought other banks loans to give them a boost just for a short time. Using short-term debt to cover expenses caught up with Lehman, but Lehman's management did not respond to the impending boom quickly. This snowball effect eventually concluded in Lehman's inability to open its doors coming back from the weekend on Monday, September 15, 2008.

Lehman's collapse triggered the largest financial crisis seen in the United States since the Great Depression back in the 1930s, so regulators recognized a need to increase regulation on the investment banking industry. The Dodd-Frank act established new requirements to be met by investment banks for capital requirements and proper reporting of all risk characteristics. A new agency called the Consumer Financial Protection Bureau was also started to protect consumers from Wall Street. The primary goal of all investing is to gain maximize profit with a given risk appetite, and this fact has remained constant during regulations change.

Financial regulations come under scrutiny for limiting profitability of these large investment firms, but the purpose of these requirements is to protect the firm from themselves. Firms desire profits, but financial firms can manipulate the markets for their own benefit. This fact became evident by Lehman's bankruptcy, so independent analysis of financials has become more common after Dodd-Frank. Lehman lost sight of their goal to increase shareholder wealth with their investing strategy, and ultimately, it cost them. Economic downturns provide the largest opportunity for profit growth, and in the midst of our current economic downturn, regulations on investment banking are being used to hedge the risk of Wall Street's financing practices on the US economy.

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