ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis [Economics and Business Economics]

Sector Performance During the Financial Crisis of 2008

Martijn Hoofwijk

455658

Abstract:

This thesis reviews sector performance for S&P 500 companies during the financial crisis of 2008 based on the Global Industry Classification Standard sectors using event study methodology. On the short-term, no significant cumulative abnormal returns were found. On the long-term the Consumer Discretionary and Information Technology sectors all showed significant abnormal returns based on Buy-and-Hold event study methodology. The Consumer Discretionary sector significantly outperformed 7 of the other 10 sectors. The Information Technology and Financials sectors outperformed 2 out of the 10 other sectors. Furthermore, the Industrials and Energy sectors perform significantly worse than 3 other sectors. The evaluation of sector performance might lead to a better understanding of the effects of economic crises.

Supervisor: Professor dr. T. Eisert

Second Assessor: dr. R. de Bliek

Date Final Version: July 20th 2020

Table of Contents

1. Introduction

Beltratti and Stulz (2010) examined which differences between banks caused banks to perform better, where performance is measured by stock returns. Erkens, Hung and Matos (2012) investigated whether corporate governance had influence on financial firms' performance during the financial crisis of 2008. Instead of examining which factors influence bank and firm performance, this thesis will study sector performance during the financial crisis, both short- and long-term. In order to evaluate sector performance, S&P 500 companies will be divided into sector portfolios based on the Global Industrial Classification Standard. These portfolios will then be analyzed using event study methodology for both short- and long-term effects. The event studied in this thesis is the collapse of the Lehman Brothers on September 15th, 2008. This event is considered to be a major trigger for worldwide panic (Diamond and Rajan, 2009) and also a systemic event of the financial crisis (Gorton and Metrick, 2012). This leads to the main research question of this thesis:

> *Did certain industries perform significantly better than other industries during the financial crisis of 2008?*

Based on the Buy-and-Hold Abnormal Returns event study, there are two sectors showing significant abnormal returns that are also robust to variation in the event windows. The first sector showing significant abnormal returns is the Consumer Discretionary sector. The abnormal returns are positive and significant on every event window at the 5% level. In fact, on all but one event window, the abnormal returns attain statistical significance at the 1% level. The average abnormal return over the event windows is as high as 38.8%. This allows for the conclusion that the Consumer Discretionary sector performed significantly better than expected during the financial crisis, showing positive abnormal returns up to 51.9% on the [-2;15] event window. The second sector showing long-term abnormal returns is the Information Technology sector. This sector also shows statistical significance at either a 5% or 1% level on each event window. The results found are therefore very robust to variation in event windows. The average abnormal return over the event windows is 26.4%. The Information Technology sector thus performed significantly better than expected during the financial crisis. Furthermore, both the Industrials and Health Care sectors showed signs of

respectively negative and positive abnormal returns over the event windows, but lack the significance for such a conclusion.

The short-term results observed are less interesting than the long-term results. There was not a single sector showing statistical significance on every event window, nor was there a sector showing statistical significance on the default interval. Short-term, there were no sectors performing significantly different than expected based on the normal returns.

Aside from analyzing abnormal returns, this thesis also analyzes confidence intervals to assess whether industries performed significantly better than other industries. On the long-term the Consumer Discretionary, Financials and Information Technology sectors all significantly outperform some of the other sectors. The Consumer Discretionary sector even outperforms seven out of the ten other sectors. Both the Financials and Information Technology sectors outperform two other sectors. On the other side there are obviously also sectors performing significantly worse than others, both the Energy and Industrials sector perform significantly worse than three of the other sectors. Short-term, there are no sectors showing significantly better or worse performance compared to the other sectors.

Future research evaluating sector performance during different crisis, for example the current corona pandemic, might add to this thesis by assessing whether different industries are always hit hard during economic crises.

The thesis proceeds as follows. Section 2 reviews relevant literature regarding the financial crisis. Section 3 explains the research methodology. Section 4 shows the empirical results. Section 5 discusses directions for potential future research and relevance of the thesis. Section 6 concludes.

2. Literature review

The financial crisis of 2008, also known as the credit crisis, caused a lot of stress on the economy as a whole, but especially on the banking sector. Mortgage backed securities were a major contributor to the crisis. These types of securities were packaged mortgages in order to reduce risks of default on mortgages by diversification. These securities were rated based on risk, so that the riskiest claims on the package could be sold to those willing to bear higher risks, while the AAA-rated packages could be held by institutional investors. At some point, banks were holding these types of securities on their balance sheets. Bankers seemed to think these securities were worthy investments despite their risk (Diamond and Rajan, 2009). Consistent with this view, Gorton and Metrick (2012) also argue that securitized banking ("the business of packaging and reselling loans, with repo agreements as the main source of funds") was at the nexus of the crisis. This type of banking was a major operation for investment banks (e.g. Lehman Brothers) but was also used as an addition to traditional-banking activities within commercial banks. The financial crisis can be described as a system-wide bank run that took place in the securitized banking system, which is driven by the withdrawal of repurchase (repo) agreements (Gorton and Metrick, 2012). Another important aspect of the origin of the credit crisis, was that banks were heavily reliant on short-term debt. Investors would have asked high premia for investing in banks long-term, because the complex nature of bank risk-taking. Short-term credit was easier to obtain for banks, since this allowed investors to exit or ask higher premiums when banks seemed to get into hot water (Diamond and Rajan, 2009).

Not all banks had similar performance during the financial crisis. Beltratti and Stulz (2012) investigate how banks that performed better (measured by stock returns) during the crisis differed from other banks before the crisis. They find that banks who rely more on short-term finance before the crisis perform worse during the crisis. This is consistent with Diamond and Rajan (2009) who state that banks being heavily reliant on debt was a major cause of the crisis. Beltratti and Stulz (2012) also find that large banks with less leverage in 2006 performed better during the crisis. Another interesting conclusion from their research is that banks with shareholder friendly boards (which is considered to be good governance) performed worse during the crisis. They also investigate whether these banks with better governance were less risky in 2006, but find no evidence supportive of that hypothesis. Their evidence thus poses a challenge to those people claiming that the crisis was a consequence of excessive risk taking and bad financial policies resulting from poor governance (Beltratti and Stulz, 2012).

Erkens, Hung and Matos (2012) also find that firms with more independent boards and greater institutional ownership experienced worse stock returns during the crisis. They provide two potential explanations for this finding. One explanation for the negative relation between performance and board independence is that these boards pressured managers into raising equity capital during the crisis. These equity capital raisings may have caused a wealth transfer from shareholders to debtholders. Although these capital raisings may have led to poor performance, they have also helped firms survive the crisis, since firms that raised more equity capital were less likely to be delisted during the crisis. The second potential explanation for the negative relation of board independence and performance is that managers were encouraged to increase shareholder returns through greater risk-taking prior to the crisis (Erkens, Hung and Matos, 2012). This latter explanation is consistent with the explanation of Fahlenbrach and Stulz (2009) for their finding that banks with CEOs whose incentives were better aligned with the interests of their shareholders performed worse in terms of stock returns and accounting return on equity. Fahlenbrach and Stulz provide a plausible explanation for these findings by proposing that CEOs, by focusing on the interests of their shareholders, operated in a way they believed would be profitable for the shareholders. In the build-up to the crisis these CEOs took actions that turned out to be costly to their banks and themselves (because of how the compensation for bank CEOs worked) ex post, when the results were not as expected. These poor results were also not expected by the CEOs themselves, since they did not hedge their holdings of shares in anticipation of these outcomes (Fahlenbrach and Stulz, 2009).

The findings of Beltratti and Stulz (2012), Erkens, Hung and Matos (2012) and Fahlenbrach and Stulz (2009) counteract those proposing that poor governance in terms of risk management and financial policies was what lead banks to perform worse during the crisis. In fact, they all report the opposite relation between governance and stock performance.

During the financial crisis, lending was cut dramatically. Ivashina and Scharfstein (2010) show that new loans to large borrowers fell by 47% during the fourth quarter of 2008 (after the collapse of Lehman Brothers) relative to the prior quarter and by 79% relative to the peak of the credit boom, the second quarter of 2007. Aside from a potential drop in demand causing this decline in lending, Ivashina and Scharfstein show that there could have also been a supply effect. On the one hand there was a run by short-term bank creditors after the collapse of

Lehman Brothers. On the other, firms were drawing down on their credit lines just in case access to these funds would be denied in the future. These two phenomena may have led banks to cut lending. In particular, banks cut their lending less if they were not as dependent on short-term debt. Banks reduced lending more if they were at greater risk to credit-line drawdowns (Ivashina and Scharfstein, 2010).

Diamond and Rajan (2009) also suggest a reason for banks to cut lending. They stress that it may not be the fear of being unable to fulfill creditor demands that led banks to cut lending, but perhaps the fear of being short in funds when investment opportunities present themselves in the future. "… it need not be "own" distress that prevents a bank from lending; expectations of aggregate liquidity shortages that may cause other distressed entities to sell in a future fire sale can be enough" (Diamond and Rajan, 2009).

Financial constraints played an important role in firm management during the financial crisis. Campello, Graham and Harvey (2009) show that on average, financially constraint firms in the U.S. planned significantly higher reductions in employment, technology spending and capital investment than unconstrained firms. Consistent with Ivashina and Scharfstein (2010) Campello, Graham and Harvey also find that firms draw down their credit lines just in case banks deny them credit in the future, however, they also show that 17% of constrained firms draw down their credit lines, whereas only 6% of unconstrained firms do so. An important distinction between constrained and unconstrained firms is how they handled investments during the financial crisis. Campello, Graham and Harvey report that in their survey, 86% of constrained firms said they had to bypass attractive investment opportunities due to problems in raising external capital, only 44% of unconstrained firms report the same.

Duchin, Ozbas and Sensoy (2010) find that corporate investment declined significantly post-crisis, and that this decline is greater when firms are financially constrained, are reliant on short-term debt or are dependent on external finance. This is both consistent with the findings of Campello, Graham and Harvey (2009) and with the theory of a supply effect from Ivashina and Scharfstein (2010). In order to address endogeneity concerns, Duchin, Ozbas and Sensoy test whether the same results are found during placebo crisis in the summers of 2003-2006, which is not the case. They also do not find similar results following the downward demand shock after September 11th, 2001.

Stulz (2010) argues that credit default swaps (and financial derivatives in general) had contributions to the crisis. They "enabled an unsustainable credit boom, excessive risk-taking

by financial institutions, and even market manipulation." However, Stulz also argues that these derivatives had a lot of social benefits, and were not the cause for the failure of Lehman Brothers. Interestingly, Stulz even states that instead of blaming derivative markets for contributing to the crisis, there should be regrets that the derivatives markets were not larger and more advanced during the financial crisis. Financial derivatives allowed institutions to hedge the potential fall in mortgage markets and other securities.

This thesis tries to add to the literature by evaluating sector performance during the financial crisis using event study methodology. The event study will analyze the second systemic event (Gorton and Metrick, 2012) of the financial crisis, the collapse of the Lehman Brothers.

3. Data and research methodology

The data used for this research come from the CRSP and Compustat databases for stock data. These databases were accessed through Wharton Research Data Services (WRDS). In this thesis, sector performance after the collapse of the Lehman Brothers will be analyzed. The analysis will be performed using event study methodology for both short- and long-term effects of the collapse. The main area of interest will be the long-term effects, but the short-term effects will also be briefly analyzed. The short-term effects will be analyzed using a Cumulative Abnormal Returns (CAR) event study. For the long-term effects, a Buy-and-Hold Abnormal Returns (BHAR) event study will be used. The list of S&P 500 companies will be divided into sector portfolios based on the Global Industry Classification Standard (GICS). This results in the analysis of 11 sector portfolios. The sectors are Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Communication Services, Utilities and Real Estate.

First, a list of S&P 500 constituents was accessed through the Compustat database. This list was then filtered by removing all companies that left the S&P 500 Index before June 2005. For each company on this list, monthly returns, shares outstanding and GICS sector codes were accessed through the CRSP and Compustat merged database. Based on the GICS sector codes total shares outstanding for each sector were computed. Each company's monthly return was then weighted based on shares outstanding compared to total shares outstanding of the corresponding sector. Based on these value-weighted returns, sector portfolios were built, resulting in a list of 11 portfolios. For each of these 11 portfolios a long-term event study was performed, using Buy-and-Hold abnormal returns. The market return for each portfolio is simply the return on the S&P 500 for the corresponding month. The normal returns were computed using the market model as in Brown and Warner (1980). Brown and Warner (1980) report that for monthly data "a simple methodology based on the market model performs well under a wide variety of conditions."

The control period used to estimate the α and β was 36 months. The default event window examined ran from 2 months prior to the collapse of the Lehman Brothers in September 2008 until 12 months after the collapse. To check for robustness, a variety of event windows were used ranging from 3 to 1 months prior to the event and 9 to 15 months after the event.

For the Cumulative Abnormal Returns (CAR) event study, the same list of filtered companies was used. For each company on this list, daily returns, shares outstanding and GICS sector codes were again accessed through the CRSP and Compustat merged database. The same method as used with the BHAR event study was also used here to compute the value-weighted returns. This again resulted in a list of 11 portfolios. The market returns are again the S&P 500 returns. The normal returns were also computed using the market model as in Brown and Warner (1985). Brown and Warner (1985) again suggest that for daily data, generally "methodologies based on the OLS market model and using standard parametric tests are well-specified under a variety of conditions."

The control period used to estimate the α and β was 250 trading days before the event window. The default event window used was 5 days prior to the collapse until 5 days after the collapse. A variety of windows were used to check for robustness, ranging from 10 to 0 days prior to the event and 1 to 10 days after the event.

4. Empirical results

As mentioned in the previous section, the portfolio's that were created were based on the Global Industry Classification Standard (GICS) sectors for S&P 500 companies. Each of the 11 sectors are analyzed both in the short-term and in the long-term to determine the effects of the collapse of the Lehman Brothers on the stock market. The results for the Buy-and-Hold Abnormal Returns event study will be analyzed first.

The Energy sector contains companies related to producing or supplying energy (Chen, 2020b). During the financial crisis, aggregate demand was falling. Companies therefore reduced output resulting in less energy consumption and also causing unemployment (Investopedia, 2020b). Since energy consumption decreased, it is expected that the Energy sector shows negative abnormal returns. The Energy sector, as expected, seems to have negative abnormal returns throughout all event windows, varying between -15.6% and -44.3%. The average abnormal return over all event windows is -28.5%. The Energy sector therefore did seem to perform fairly poor during the financial crisis, however as Table 1.1a shows, only for one event window the performance is statistically significant on the 5% level. On the default interval, [-2;12] an abnormal return of -36.3% was observed, being significant only on a 10% level.

The Materials sector entails businesses engaged in the discovery, development, and processing of raw materials. In this sector, companies that supply most of the materials used in construction are included (Kopp, 2020). As mentioned in the expectations for the Energy sector, companies reduced output during the financial crisis. A reduction of output means less raw materials will be bought, resulting in the expectation that the Materials sector will show negative abnormal returns. Consistent with the expectations, the abnormal returns vary between -6.9% and -13.5%, averaging -9.7% (Table 1.1a). As with the Energy sector, little significance can be observed. Only two event windows show significant abnormal returns at a 10% level and the default interval shows no significant abnormal returns.

The Industrials sector contains companies producing capital goods used in construction and manufacturing. Businesses in this sector make and sell machinery, equipment, and supplies that are used to produce other goods (Chappelow, 2018). Since banks cut lending during the financial crisis (Ivashina and Scharfstein, 2010; Diamond and Rajan, 2009), businesses that would normally use these funds to invest in new machinery, equipment or supplies could not invest (as much) during the financial crisis. Therefore, it is

expected that the Industrials sector shows negative abnormal returns. As expected, this sector shows negative abnormal returns on all event windows, ranging from -11.2% to -23.4% with an average of -17.3% over the event windows (Table 1.1a). Interestingly, most of these abnormal returns are significant at a 10% or a 1% level. Only two intervals, including the default interval, show insignificant abnormal returns. The Industrials sector therefore did seem to perform significantly worse during the financial crisis, but because of the lack of significance that conclusion cannot be drawn.

The Consumer Discretionary sector is used to classify goods and services that are desirable when income is sufficient, but these goods are not essential (Investopedia, 2020a). These goods and services are basically luxury products. Uncertainty about employment and income could cause consumers to lower their spending on luxury products. The Consumer Discretionary sector is thus expected to show negative abnormal returns. Controversially, this sector actually shows positive abnormal returns ranging from 23.4% to 51.9%. This is the first sector showing significant abnormal returns on each event window. Therefore, these results seem to be very robust. The Consumer Discretionary sector performed significantly better during the financial crisis with an average abnormal return over the event windows of 38.8% (Table 1.1a).

The Consumer Staples sector entails all companies producing products that can be considered essential, such as foods & beverage, household goods, and hygiene products. Items such as alcohol and tobacco are also included in this category. These goods are, unlike goods in the Consumer Discretionary sector, primary goods. People are unable – or unwilling – to cut these goods out of their budgets regardless of their financial situation (Chen, 2020a). Logically, the expectations for this sector are that there will be no abnormal returns. The results are as expected. The abnormal returns for this sector range from -6.4% to 2.3%, with an average over the event windows of -2.6% (Table 1.1a). There is not a single significant abnormal return present in this sector, therefore there seems to be no abnormal returns for the Consumer Staples sector.

Table 1.1a: Buy-and-Hold Abnormal Returns for GICS sectors with varying event windows

	GICS Sector				
Event Window	**Energy**	**Materials**	**Industrials**	**Consumer Discretionary**	**Consumer Staples**
[-1;9]	-15.62%	-13.29%	-22.73%	29.60%	-6.02%
	(0.1572)	(0.0750)*	(0.0708)***	(0.0798)***	(0.0516)
[-1;12]	-24.76%	-8.12%	-13.99%	42.86%	-3.35%
	(0.1774)	(0.0846)	(0.0798)*	(0.0900)***	(0.0582)
[-1;15]	-32.16%	-6.86%	-16.44%	50.64%	-1.44%
	(0.1955)	(0.0932)	(0.0880)*	(0.0992)***	(0.0641)
[-2;9]	-25.74%	-13.52%	-20.55%	30.68%	-2.84%
	(0.1642)	(0.0783)*	(0.0739)***	(0.0834)***	(0.0539)
[-2;12]	-36.28%	-8.41%	-11.23%	44.09%	0.20%
	(0.1836)*	(0.0875)	(0.0827)	(0.0932)***	(0.0603)
[-2;15]	-44.33%	-7.17%	-13.60%	51.94%	2.32%
	(0.2011)**	(0.0959)	(0.0905)	(0.1021)***	(0.0660)
[-3;9]	-17.51%	-13.47%	-23.38%	23.44%	-6.37%
	(0.1709)	(0.0815)	(0.0769)***	(0.0868)**	(0.0561)
[-3;12]	-26.40%	-8.95%	-15.74%	34.60%	-3.83%
	(0.1896)	(0.0904)	(0.0853)*	(0.0962)***	(0.0622)
[-3;15]	-33.45%	-7.91%	-18.10%	41.22%	-2.01%
	(0.2066)	(0.0985)	(0.0930)*	(0.1049)***	(0.0678)
Average	-28.47%	-9.74%	-17.31%	38.78%	-2.59%

This table shows Buy-and-Hold abnormal returns for each sector on different event windows to assess robustness. This table is divided into two parts for clarity. The combined table in a smaller font can be found in the appendix (Table 1.1). ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.

The Health Care sector entails companies that provide medical services, manufacture medical equipment or drugs, provide medical insurance, or otherwise facilitate the provision of healthcare to patients (Chappelow, 2020). Since medical care is usually a vital and sometimes urgent matter, and cannot be saved on very easily, it is expected that this sector shows neutral or positive abnormal returns. The results are consistent with the expectations. The Health Care sector shows positive abnormal returns with a minimum of 10.7% and a maximum of 22.3% over the event windows. The average over the event windows is 16.5% (Table 1.1b). Most intervals do obtain some statistical significance, mostly at the 10% level but for two event windows even at the 5% level. The Health Care sector thus seems to show some signs of positive abnormal returns during the financial crisis, but the lack of significance hinders such a conclusion.

The Financials sector contains firms and institutions that provide financial services to commercial and retail customers. In this sector, most companies generate revenue from mortgages and loans (Kenton, 2019). Since mortgage backed securities were on most banks balance sheets and these securities eventually dropped in value (Diamond and Rajan, 2009), it is expected that the Financials sector shows negative abnormal returns. This sector shows some interesting results, inconsistent with the expectations. Although the abnormal returns seem to switch between positive and negative abnormal returns a lot when the event window changes, the abnormal returns vary between -8.2% and 33.0%, averaging at 8.9% (Table 1.1b). This could be an indicator for instability in this sector, however there is only one event window that attains significance at the 5% level and one at the 10% level.

The Information Technology sector contains businesses revolving around the manufacturing of electronics, creation of software, computers or products and services relating to information technology. Most companies are dependent on innovations out of this sector for example to create their enterprise software, manage their logistics systems and protect their databases (Frankenfield, 2019). Therefore, it is expected that the Information Technology sector shows positive abnormal returns. As expected, this sector shows positive abnormal returns throughout all event windows, ranging from 23.5% to 30.2%. Every event window attains significance at the 5% or 1% level. These results seem to be very robust. The Information Technology sector performed significantly better during the financial crisis then one would expect based on normal returns, with an average abnormal return over the event windows of 26.4% (Table 1.1b).

The Communication Services sector entails companies operating in the Diversified Telecommunications Services, Wireless Telecommunications Services, Media, Entertainment or Interactive Media and Services industry. Since communication services are necessary for most companies, it is expected that there are no abnormal returns for this sector. Consistent with these expectations, the abnormal returns for this sector range from -2.1% to 9.7%, with an average over the event windows of 3.4% (Table 1.1b). Not a single event window shows any significance, therefore there seem to be no abnormal returns for the Communication Services sector.

The Utilities sector entails companies that provide basic amenities, such as water, sewage services, electricity, dams, and natural gas. Utilities are usually characterized by stable and consistent dividends, alongside less price volatility relative to the overall equity markets.

Therefore, the Utilities sector should perform well during recessionary climates (Murphy, 2020). It is therefore expected that the Utilities sector shows positive abnormal returns. Counteracting the expectations, the abnormal returns for this sector range between -14.5% and -5.0%, with an average of -9.7% over the event windows (Table 1.1b). However, this sector shows no significant abnormal returns for any event window.

Table 1.1b: Buy-and-Hold Abnormal Returns for GICS sectors with varying event windows (continued)

	GICS Sector					
Event Window	**Health Care**	**Financials**	**Information Technology**	**Communication Services**	**Utilities**	**Real Estate**
[-1;9]	10.71%	-6.81%	24.36%	5.12%	-5.00%	-9.07%
	(0.0755)	(0.1057)	(0.0812)***	(0.0660)	(0.0951)	(0.1222)
[-1;12]	12.17%	22.59%	25.71%	6.70%	-10.16%	-3.90%
	(0.0852)	(0.1193)*	(0.0916)***	(0.0745)	(0.1073)	(0.1379)
[-1;15]	17.06%	5.85%	30.20%	9.68%	-9.49%	-2.89%
	(0.0939)*	(0.1314)	(0.1009)***	(0.0821)	(0.1182)	(0.1519)
[-2;9]	15.05%	-0.09%	24.13%	2.42%	-9.00%	-9.12%
	(0.0789)*	(0.1104)	(0.0848)***	(0.0689)	(0.0993)	(0.1277)
[-2;12]	17.00%	32.97%	25.46%	3.57%	-14.49%	-4.02%
	(0.0882)*	(0.1235)**	(0.0948)**	(0.0771)	(0.1110)	(0.1427)
[-2;15]	22.29%	14.95%	29.91%	6.25%	-14.17%	-3.04%
	(0.0966)**	(0.1352)	(0.1039)***	(0.0844)	(0.1216)	(0.1563)
[-3;9]	14.99%	-8.21%	23.49%	-2.11%	-5.19%	-8.99%
	(0.0821)*	(0.1149)	(0.0883)**	(0.0718)	(0.1034)	(0.1329)
[-3;12]	16.92%	16.75%	25.06%	-1.76%	-10.09%	-4.72%
	(0.0911)*	(0.1275)	(0.0979)**	(0.0796)	(0.1147)	(0.1474)
[-3;15]	21.95%	2.28%	29.24%	0.25%	-9.50%	-3.95%
	(0.0993)**	(0.1389)	(0.1067)***	(0.0867)	(0.1250)	(0.1606)
Average	16.46%	8.92%	26.39%	3.35%	-9.68%	-5.52%

This table shows Buy-and-Hold abnormal returns for each sector on different event windows to assess robustness. This table is divided into two parts for clarity. The combined table in a smaller font can be found in the appendix (Table 1.1). ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.

The Real Estate sector entails companies active in either the Equity Real Estate Investment Trusts or the Real Estate Management and Development industry. One way to invest in real estate is to buy mortgage backed securities. During the financial crisis, these securities dropped in value as house prices started falling (Diamond and Rajan, 2009). This may have led to investors losing trust in the real estate sector. Therefore, it is expected that the real estate sector shows negative abnormal returns. Consistent with these expectations, this sector

shows abnormal returns between -9.1% and -2.9%, with an average of -5.5% over the event windows (Table 1.1b). This sector also does not attain significance in any event window, which leads to the conclusion that this sector had no abnormal returns during the financial crisis.

The expectations made for each sector based on the industry characteristics seem to be fairly accurate and consistent with the results on most instances. For example, the Energy, Materials and Industrials sectors, which should flourish when the economy is strong but diminish when the economy is weak, show negative abnormal returns on all event windows. The most controversial finding is that the Consumer Discretionary sector showed significant positive abnormal returns averaging 38.8% over the event windows. This result is completely opposite to the expectation that luxury goods and services are less important when income is low, for example during a recession. A potential explanation for this finding is that perhaps these companies could continue to perform well because the people hit the hardest by the crisis were the people that were already poor, whereas the more wealthy people would not face the choice not to buy certain goods or services from companies in this sector.

As shown in the literature review, Diamond and Rajan (2009) state that banks thought that mortgage backed securities were worthy investments and banks were therefore holding these types of securities on their balance sheets. Ivashina and Scharfstein (2010) show that both a run by short-term bank creditors after the collapse of Lehman Brothers and firms drawing down on their credit lines just in case access would be denied in the future may have led banks to cut lending. Because banks were holding mortgage backed securities – which dropped in value once house prices stopped rising and eventually started falling (Diamond and Rajan, 2009) – while also having to cut lending, investors may lose trust in the banking sector. At the same time, when house prices eventually started falling and the value of mortgage backed securities dropped, fear and uncertainty among investors may have caused loss of trust in the Real Estate sector as well. Therefore, the following hypothesis will be analyzed:

> *The Real Estate and Financials sectors both underperformed after the collapse of Lehman Brothers compared to the other sectors.*

In order to determine whether certain sectors performed significantly better than other sectors, confidence intervals for each sector's Buy-and-Hold Abnormal Return were computed

and compared. These intervals were determined for the default event window ranging from 2 months prior to the collapse of Lehman Brothers until 12 months after the collapse. Based on the confidence intervals shown in Table 1.2, it follows that the Consumer Discretionary sector performed significantly better than the Energy, Materials, Industrials, Consumer Staples and Utilities sectors based on the 99% confidence intervals. The Consumer Discretionary sector also outperformed the Communication Services and Real Estate sectors based on the 95% confidence intervals. The Health Care sector seemed to outperform the Energy sector but only when using the 90% confidence intervals. The Financials sector, which showed barely any significant abnormal returns over the event windows, did show some strong performance when compared to other sectors. Contrary to the hypothesis, the Financials sector actually outperformed a couple of sectors. The Financials sector outperformed the Energy and Industrials sectors based on the 95% confidence intervals. Based on the 90% confidence intervals the Financials sector also outperformed the Materials, Consumer Staples and Utilities sectors. The fact that the Financials sector performed significantly better than those other sectors while access to credit was so restricted (as seen in the literature) shows strength within this sector. The last sector that outperformed some of the other sectors is the Information Technology sector. This sector outperformed the Energy and Industrials sectors based on a 5% significance level and outperformed the Materials and Utilities sectors based on a 10% significance level. For the other sectors there was no significant overperformance compared to another sector observed. Logically, from the above results it also follows that the Industrials and Energy sectors performed significantly worse than the Consumer Discretionary sector at a 1% level significance level, and worse than the Financials and Information Technology sectors at a 5% significance level. The Energy sector also seemed to perform worse than the Health Care sector based on a 10% significance level.

Even though the Real Estate sector performed significantly worse than the Consumer Discretionary sector, the Real Estate sector did not underperform compared to the other sectors. The Consumer Discretionary sector just performed extremely well. The Financials sector first of all did not underperform, but in fact outperformed a couple of sectors during the financial crisis. The hypothesis that the Real Estate and Financials sectors both underperformed after the collapse of Lehman Brothers compared to the other sectors thus has to be rejected.

Table 1.2: Confidence intervals for each sector's Buy-and-Hold Abnormal Return on the default interval [-2;12]

GICS Sector	90% Confidence Interval	95% Confidence Interval	99% Confidence Interval
Energy	[-67.30%, -5.26%]	[-73.56%, 0.99%]	[-86.29%, 13.73%]
Materials	[-23.20%, 6.39%]	[-26.18%, 9.37%]	[-32.25%, 15.44%]
Industrials	[-25.19%, 2.73%]	[-28.00%, 5.55%]	[-33.73%, 11.28%]
Consumer Discretionary	[28.35%, 59.84%]	[25.18%, 63.01%]	[18.71%, 69.48%]
Consumer Staples	[-9.98%, 10.38%]	[-12.04%, 12.43%]	[-16.22%, 16.61%]
Health Care	[2.10%, 31.91%]	[-0.90%, 34.91%]	[-7.02%, 41.03%]
Financials	[12.11%, 53.83%]	[7.91%, 58.03%]	[-0.65%, 66.60%]
Information Technology	[9.44%, 41.48%]	[6.21%, 44.71%]	[-0.37%, 51.29%]
Communication Services	[-9.45%, 16.59%]	[-12.08%, 19.22%]	[-17.42%, 24.56%]
Utilities	[-33.25%, 4.27%]	[-37.03%, 8.05%]	[-44.73%, 15.76%]
Real Estate	[-28.14%, 20.09%]	[-33.00%, 24.95%]	[-42.90%, 34.85%]

This table shows 90%, 95% and 99% confidence intervals for the Buy-and-Hold Abnormal Returns on the default interval of [-2;12] months using a control period of 36 months prior to the event window, therefore 35 degrees of freedom are used.

As mentioned before, the main focus of this thesis is long-term sector performance during the financial crisis. The short-term effects were also analyzed and will be discussed in the next part, but not as thoroughly. For the short-term, most sectors are expected to show no abnormal returns, except for the Financials and Real Estate sectors. The failure of Lehman Brothers may have alarmed investors about the risks concerning mortgage backed securities and defaults on mortgages. Since a lot of other banks were holding these types of securities as well (Diamond and Rajan, 2009), the collapse of Lehman Brothers may have caused uncertainty and fear about collapses of other banks. Therefore, it is expected that both the Financials and Real Estate sectors show negative abnormal returns on the short-term.

The results for the Cumulative Abnormal Returns event study seemed to attain very little significance over the event windows. As observed in Table 2.1a and Table 2.1b, almost every sector showed insignificant results on most event windows, and not a single sector attained significance at the default interval [-5;5]. Only the Financials and Real Estate sectors showed significance on four event windows, however not all at the 5% level. The average abnormal returns over the event windows of the Financials sector were -0.1%. Interestingly, depending on the event window, the Financials sector showed significantly positive abnormal returns (13.8% on the [-10;5] interval), significantly negative abnormal returns (-12.9% on the

[-5;1] interval) or insignificant abnormal returns. These fluctuations might indicate uncertainty in the market, which is partially consistent with the expectations.

Table 2.1a: Cumulative Abnormal Returns for GICS sectors with varying event windows

	GICS Sector				
Event Window	**Energy**	**Materials**	**Industrials**	**Consumer Discretionary**	**Consumer Staples**
[-10;1]	-7.56%	-0.16%	-1.18%	7.38%	4.32%
	(0.0504)	(0.0327)	(0.0186)	(0.0309)**	(0.0196)**
[-10;5]	-1.62%	0.48%	-0.77%	3.61%	0.60%
	(0.0582)	(0.0378)	(0.0215)	(0.0357)	(0.0227)
[-10;10]	-9.33%	-5.21%	-1.57%	6.45%	2.79%
	(0.0667)	(0.0433)	(0.0247)	(0.0409)	(0.0260)
[-5;1]	-1.82%	1.43%	-1.31%	3.09%	2.42%
	(0.0385)	(0.0250)	(0.0142)	(0.0236)	(0.0150)
[-5;5]	4.13%	2.06%	-0.89%	-0.68%	-1.29%
	(0.0483)	(0.0313)	(0.0178)	(0.0296)	(0.0188)
[-5;10]	-3.59%	-3.62%	-1.69%	2.16%	0.89%
	(0.0582)	(0.0378)	(0.0215)	(0.0357)	(0.0227)
[-1;1]	1.51%	2.59%	-2.16%	1.68%	0.19%
	(0.0252)	(0.0164)	(0.0093)**	(0.0154)	(0.0098)
[-1;5]	7.45%	3.22%	-1.74%	-2.08%	-3.52%
	(0.0385)*	(0.0250)	(0.0142)	(0.0236)	(0.0150)**
[-1;10]	-0.26%	-2.46%	-2.55%	0.76%	-1.34%
	(0.0504)	(0.0327)	(0.0186)	(0.0309)	(0.0196)
[0;1]	-1.32%	0.12%	-0.64%	2.10%	0.33%
	(0.0206)	(0.0134)	(0.0076)	(0.0126)*	(0.0080)
Average	-1.24%	-0.15%	-1.45%	2.45%	0.54%

This table shows cumulative abnormal returns for each sector on different event windows to assess robustness. This table is divided into two parts for clarity. The combined table in a smaller font can be found in the appendix (Table 2.1). ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.

The Real Estate sector had an average abnormal return over the event windows of 5.8%. This sector did show positive abnormal returns on each event window, however most event windows were not significant. Depending on the event window, the abnormal returns ranged between 0.6% (on the [-1;5] interval) and 13.8% (on the [-10;10] interval), the latter being significant. This is contrary to the expectations that the Real Estate sector would show negative abnormal returns. Even though the results for the Real Estate sector seem to tend towards positive abnormal returns, the lack of significance does not allow for such a

conclusion. Contrary to the expectations, both the Financials and the Real Estate sectors showed no abnormal returns, however there were indications of uncertainty in the market concerning the Financials sector.

For the other sectors, the average abnormal returns over the event windows ranged between -3.0% and 2.5%. Even though the results for both the Financials and the Real Estate sectors are interesting, little conclusions can be drawn for the short-term because of the lack of significance as well as the lack of robustness to variation in event windows.

Table 2.1b: Cumulative Abnormal Returns for GICS sectors with varying event windows (continued)

	GICS Sector					
Event Window	**Health Care**	**Financials**	**Information Technology**	**Communi-cation Services**	**Utilities**	**Real Estate**
[-10;1]	-1.04%	-1.78%	-6.95%	-2.77%	-5.17%	9.86%
	(0.0207)	(0.0572)	(0.0279)**	(0.0301)	(0.0304)*	(0.0425)**
[-10;5]	-2.93%	13.80%	-7.51%	-3.37%	-5.83%	7.40%
	(0.0239)	(0.0661)**	(0.0322)**	(0.0348)	(0.0351)*	(0.0490)
[-10;10]	-1.79%	3.26%	-5.63%	-1.77%	-5.18%	13.83%
	(0.0274)	(0.0757)	(0.0369)	(0.0399)	(0.0402)	(0.0562)**
[-5;1]	0.00%	-12.92%	-2.05%	-3.16%	-1.04%	4.33%
	(0.0158)	(0.0437)***	(0.0213)	(0.0230)	(0.0232)	(0.0324)
[-5;5]	-1.89%	2.67%	-2.61%	-3.75%	-1.69%	1.87%
	(0.0198)	(0.0548)	(0.0267)	(0.0289)	(0.0291)	(0.0407)
[-5;10]	-0.75%	-7.87%	-0.74%	-2.15%	-1.04%	8.30%
	(0.0239)	(0.0661)	(0.0322)	(0.0348)	(0.0351)	(0.0490)*
[-1;1]	-1.11%	-5.23%	-1.34%	-2.44%	-1.29%	3.08%
	(0.0104)	(0.0286)*	(0.0139)	(0.0151)	(0.0152)	(0.0212)
[-1;5]	-3.00%	10.36%	-1.89%	-3.03%	-1.94%	0.62%
	(0.0158)*	(0.0437)**	(0.0213)	(0.0230)	(0.0232)	(0.0324)
[-1;10]	-1.86%	-0.18%	-0.02%	-1.43%	-1.30%	7.05%
	(0.0207)	(0.0572)	(0.0279)	(0.0301)	(0.0304)	(0.0425)*
[0;1]	-1.08%	-2.84%	-1.46%	-2.63%	-2.60%	1.79%
	(0.0085)	(0.0234)	(0.0114)	(0.0123)**	(0.0124)**	(0.0173)
Average	-1.55%	-0.07%	-3.02%	-2.65%	-2.71%	5.81%

This table shows cumulative abnormal returns for each sector on different event windows to assess robustness. This table is divided into two parts for clarity. The combined table in a smaller font can be found in the appendix (Table 2.1). ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.

Lastly, as with the long-term event study, confidence intervals for each sector on the default interval were computed. Table 2.2 shows the 90%, 95% and 99% confidence intervals for the abnormal returns on the default interval [-5;5] for each sector. Unlike the results from the long-term event study, no significant outperformance of a sector compared to another sector was found. This logically follows from the results in Tables 2.1a and 2.1b. Surrounding the day of the collapse of the Lehman Brothers sector performance was not significantly different from other sectors, nor were the abnormal returns statistically significant.

Table 2.2: Confidence intervals for each sector's Cumulative Abnormal Return on the default interval [-5;5]

GICS Sector	**90% Confidence Interval**	**95% Confidence Interval**	**99% Confidence Interval**
Energy	[-3.84%, 12.10%]	[-5.38%, 13.63%]	[-8.40%, 16.66%]
Materials	[-3.11%, 7.24%]	[-4.11%, 8.24%]	[-6.07%, 10.20%]
Industrials	[-3.84%, 2.05%]	[-4.41%, 2.62%]	[-5.52%, 3.74%]
Consumer Discretionary	[-5.56%, 4.20%]	[-6.51%, 5.15%]	[-8.36%, 7.00%]
Consumer Staples	[-4.40%, 1.81%]	[-4.99%, 2.41%]	[-6.17%, 3.58%]
Health Care	[-5.16%, 1.39%]	[-5.79%, 2.02%]	[-7.04%, 3.26%]
Financials	[-6.38%, 11.71%]	[-8.12%, 13.46%]	[-11.55%, 16.89%]
Information Technology	[-7.02%, 1.80%]	[-7.87%, 2.65%]	[-9.54%, 4.32%]
Communication Services	[-8.52%, 1.01%]	[-9.43%, 1.93%]	[-11.24%, 3.74%]
Utilities	[-6.49%, 3.11%]	[-7.42%, 4.04%]	[-9.24%, 5.86%]
Real Estate	[-4.85%, 8.58%]	[-6.14%, 9.88%]	[-8.69%, 12.42%]

This table shows 90%, 95% and 99% confidence intervals for the Cumulative Abnormal Returns on the default interval of [-5;5] days using a control period of 250 days prior to the event window, therefore 249 degrees of freedom are used.

5. Discussion

While writing this thesis, the world is still in the midst of an economic crisis as a result of the coronavirus. The coronavirus was characterized as a pandemic on March 11th 2020 (World Health Organization, 2020). On March 18th 2020, the S&P 500 Index took a dive, triggering a market-wide temporary trading halt before closing down 5% on that day. This was the second "circuit breaker" – which is intended to prevent extreme losses – invoked by the blue-chip index within three days, indicating extreme uncertainty and fear on the market (Yahoo Finance, 2020). These events caught my interest into the stock market, and mainly into the S&P 500 performance. However, since long-term effects cannot reasonably be observed yet, analyzing the effects of this pandemic on the economy and mainly the stock market is hard if not impossible to do. This thesis focused on evaluating sector performance during the financial crisis of 2008. The results show that sector performance differs significantly, with a few sectors showing significant abnormal returns. An interesting area of potential future research opened up with the appearance of the corona pandemic. Not only is it interesting to analyze whether the current pandemic shows similar magnitudes of fear and panic on the economy as the credit crisis, it is also interesting to reproduce the event studies performed in this thesis to assess whether the same sectors show significant abnormal returns during the corona crisis. This could add to the literature by assessing whether the industries always show similar patterns during a worldwide (economic) crisis. Perhaps certain industries are always hit hard or always perform above average during economic crises.

6. Conclusion

This thesis helped gain insight into sector performance during the financial crisis of 2008. Using event study methodology, this thesis showed that there were some significant long-term effects but no significant short-term effects. Two sectors – Consumer Discretionary and Information Technology – showed significant abnormal returns using Buy-and-Hold event study methodology. Two more sectors – Industrials and Health Care – seemed to have some abnormal returns, however these lacked the significance for this conclusion. Consistent with the expectations the Information Technology sector showed positive abnormal returns. Completely controversial with the expectations, the Consumer Discretionary sector actually showed positive abnormal returns. Looking at confidence intervals for these abnormal returns on the default interval, conclusions can be drawn regarding performance compared to other sectors. The strongest result is perhaps the fact that the Consumer Discretionary sector performed significantly better than seven of the ten other sectors, indicating a very strong performance of this sector portfolio. The Information Technology sector outperformed two other sectors, which also shows some strength in this sector. However, the fact that the Financials sector still managed to outperform two other sectors even though the access to credit was so restricted during this crisis as seen in the literature is perhaps the most interesting result. The Real Estate sector was only outperformed by the Consumer Discretionary sector which performed extremely well. These results led to the rejection of the hypothesis that the Real Estate and Financials sectors both underperformed after the collapse of Lehman Brothers compared to the other sectors. Lastly, both the Industrials and the Energy sector performed particularly poor and both got outperformed by three other sectors.

As discussed in the previous section, future research regarding sector performance during the corona pandemic could add to this thesis by comparing the effects of the pandemic to the effects observed during the financial crisis, both in terms of magnitude and in terms of sector performance.

7. References

Beltratti, A. & Stulz, R. (2012). The Credit Crisis around the Globe: Why Did Some Banks Perform Better? *Journal of Financial Economics, 105(1),* 1-17.

Browns, S. & Warner, J. (1980). Measuring Security Price Performance. *Journal of Financial Economics, 8(3),* 205-258.

Brown, S. & Warner, J. (1985). Using Daily Stock Returns: The Case of Event Studies. *Journal of Financial Economics, 14(1),* 3-31.

Campello, M., Graham, J. & Harvey, R. (2009). The Real Effects of Financial Constraints: Evidence from a Financial Crisis. *Journal of Financial Economics, 97(3),* 470-487.

Chappelow, J. (2018). Industrial Goods Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/i/industrial-goods-sector.asp

Chappelow, J. (2020). Healthcare Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/h/health_care_sector.asp

Chen, J. (2020a). Consumer Staples. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/c/consumerstaples.asp

Chen, J. (2020b). Energy Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/e/energy_sector.asp

Diamond, D. & Rajan, R. (2009). The Credit Crisis: Conjectures about Causes and Remedies. *American Economic Review, 99,* 606-610.

Duchin, R., Ozbas, O. & Sensoy, B. (2010). Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis. *Journal of Financial Economics, 97(3),* 418-435.

Erkens, D., Hung, M. & Matos, P. (2012). Corporate Governance in the 2007-2008 Financial Crisis: Evidence from Financial Institutions Worldwide. *Journal of Corporate Finance, 18(2),* 389-411.

Fahlenbrach, R. & Stulz, R. (2009). Bank CEO Incentives and the Credit Crisis. *Journal of Financial Economics, 99(1),* 11-26.

Frankenfield, J. (2019). Technology Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/t/technology_sector.asp

Gorton, G. & Metrick, A. (2012). Securitized Banking and the Run on Repo. *Journal of Financial Economics, 104(3),* 425-451.

Investopedia. (2020a). Consumer Discretionary. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/c/consumer-discretionary.asp

Investopedia. (2020b). The 2008 Financial Crisis and Its Effects on Gas and Oil. Retrieved on July 19th, 2020 from: https://www.investopedia.com/ask/answers/052715/how-did-financial-crisis-affect-oil-and-gas-sector.asp

Ivashina, V. & Scharfstein, D. (2010). Bank Lending During the Financial Crisis of 2008. *Journal of Financial Economics, 97(3),* 319-338.

Kenton, W. (2019). Financial Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/f/financial_sector.asp

Kopp, C. (2020). Basic Materials Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/b/basic_materials.asp

Murphy, C. (2020). Utilities Sector. Retrieved on July 19th, 2020 from: https://www.investopedia.com/terms/u/utilities_sector.asp

Stulz, R. (2010). Credit Default Swaps and the Credit Crisis. *Journal of Economic Perspectives, 24(1),* 73-92.

World Health Organization. (2020). Timeline of WHO's response to COVID-19. Retrieved on July 13th, 2020 from: https://www.who.int/news-room/detail/29-06-2020-covidtimeline

Yahoo Finance. (2020). Stock market news live: Dow closes at 3-year low below 20K, wiping out nearly all of Trump era's gains. Retrieved on July 13th, 2020 from: https://finance.yahoo.com/news/stock-market-news-live-updates-march-18-2020-221557940.html

Table 1.1: Buy-and-Hold Abnormal Returns for GICS sectors with varying event windows

	GICS Sector										
Event Window	**Energy**	**Materials**	**Industrials**	**Consumer Discretionary**	**Consumer Staples**	**Health Care**	**Financials**	**Information Technology**	**Communication Services**	**Utilities**	**Real Estate**
[-1;9]	-15.62%	-13.29%	-22.73%	29.60%	-6.02%	10.71%	-6.81%	24.36%	5.12%	-5.00%	-9.07%
	(0.1572)	(0.0750)*	(0.0708)***	(0.0798)***	(0.0516)	(0.0755)	(0.1057)	(0.0812)***	(0.0660)	(0.0951)	(0.1222)
[-1;12]	-24.76%	-8.12%	-13.99%	42.86%	-3.35%	12.17%	22.59%	25.71%	6.70%	-10.16%	-3.90%
	(0.1774)	(0.0846)	(0.0798)*	(0.0900)***	(0.0582)	(0.0852)	(0.1193)*	(0.0916)***	(0.0745)	(0.1073)	(0.1379)
[-1;15]	-32.16%	-6.86%	-16.44%	50.64%	-1.44%	17.06%	5.85%	30.20%	9.68%	-9.49%	-2.89%
	(0.1955)	(0.0932)	(0.0880)*	(0.0992)***	(0.0641)	(0.0939)*	(0.1314)	(0.1009)***	(0.0821)	(0.1182)	(0.1519)
[-2;9]	-25.74%	-13.52%	-20.55%	30.68%	-2.84%	15.05%	-0.09%	24.13%	2.42%	-9.00%	-9.12%
	(0.1642)	(0.0783)*	(0.0739)***	(0.0834)***	(0.0539)	(0.0789)*	(0.1104)	(0.0848)***	(0.0689)	(0.0993)	(0.1277)
[-2;12]	-36.28%	-8.41%	-11.23%	44.09%	0.20%	17.00%	32.97%	25.46%	3.57%	-14.49%	-4.02%
	(0.1836)*	(0.0875)	(0.0827)	(0.0932)***	(0.0603)	(0.0882)*	(0.1235)**	(0.0948)**	(0.0771)	(0.1110)	(0.1427)
[-2;15]	-44.33%	-7.17%	-13.60%	51.94%	2.32%	22.29%	14.95%	29.91%	6.25%	-14.17%	-3.04%
	(0.2011)**	(0.0959)	(0.0905)	(0.1021)***	(0.0660)	(0.0966)**	(0.1352)	(0.1039)***	(0.0844)	(0.1216)	(0.1563)
[-3;9]	-17.51%	-13.47%	-23.38%	23.44%	-6.37%	14.99%	-8.21%	23.49%	-2.11%	-5.19%	-8.99%
	(0.1709)	(0.0815)	(0.0769)***	(0.0868)**	(0.0561)	(0.0821)*	(0.1149)	(0.0883)**	(0.0718)	(0.1034)	(0.1329)
[-3;12]	-26.40%	-8.95%	-15.74%	34.60%	-3.83%	16.92%	16.75%	25.06%	-1.76%	-10.09%	-4.72%
	(0.1896)	(0.0904)	(0.0853)*	(0.0962)***	(0.0622)	(0.0911)*	(0.1275)	(0.0979)**	(0.0796)	(0.1147)	(0.1474)
[-3;15]	-33.45%	-7.91%	-18.10%	41.22%	-2.01%	21.95%	2.28%	29.24%	0.25%	-9.50%	-3.95%
	(0.2066)	(0.0985)	(0.0930)*	(0.1049)***	(0.0678)	(0.0993)**	(0.1389)	(0.1067)***	(0.0867)	(0.1250)	(0.1606)
Average	-28.47%	-9.74%	-17.31%	38.78%	-2.59%	16.46%	8.92%	26.39%	3.35%	-9.68%	-5.52%

This table shows Buy-and-Hold abnormal returns for each sector on different event windows to assess robustness. ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.

Table 2.1: Cumulative Abnormal Returns for GICS sectors with varying event windows

	GICS Sector										
Event Window	**Energy**	**Materials**	**Industrials**	**Consumer Discretionary**	**Consumer Staples**	**Health Care**	**Financials**	**Information Technology**	**Communication Services**	**Utilities**	**Real Estate**
[-10;1]	-7.56%	-0.16%	-1.18%	7.38%	4.32%	-1.04%	-1.78%	-6.95%	-2.77%	-5.17%	9.86%
	(0.0504)	(0.0327)	(0.0186)	(0.0309)**	(0.0196)**	(0.0207)	(0.0572)	(0.0279)**	(0.0301)	(0.0304)*	(0.0425)**
[-10;5]	-1.62%	0.48%	-0.77%	3.61%	0.60%	-2.93%	13.80%	-7.51%	-3.37%	-5.83%	7.40%
	(0.0582)	(0.0378)	(0.0215)	(0.0357)	(0.0227)	(0.0239)	(0.0661)**	(0.0322)**	(0.0348)	(0.0351)*	(0.0490)
[-10;10]	-9.33%	-5.21%	-1.57%	6.45%	2.79%	-1.79%	3.26%	-5.63%	-1.77%	-5.18%	13.83%
	(0.0667)	(0.0433)	(0.0247)	(0.0409)	(0.0260)	(0.0274)	(0.0757)	(0.0369)	(0.0399)	(0.0402)	(0.0562)**
[-5;1]	-1.82%	1.43%	-1.31%	3.09%	2.42%	0.00%	-12.92%	-2.05%	-3.16%	-1.04%	4.33%
	(0.0385)	(0.0250)	(0.0142)	(0.0236)	(0.0150)	(0.0158)	(0.0437)***	(0.0213)	(0.0230)	(0.0232)	(0.0324)
[-5;5]	4.13%	2.06%	-0.89%	-0.68%	-1.29%	-1.89%	2.67%	-2.61%	-3.75%	-1.69%	1.87%
	(0.0483)	(0.0313)	(0.0178)	(0.0296)	(0.0188)	(0.0198)	(0.0548)	(0.0267)	(0.0289)	(0.0291)	(0.0407)
[-5;10]	-3.59%	-3.62%	-1.69%	2.16%	0.89%	-0.75%	-7.87%	-0.74%	-2.15%	-1.04%	8.30%
	(0.0582)	(0.0378)	(0.0215)	(0.0357)	(0.0227)	(0.0239)	(0.0661)	(0.0322)	(0.0348)	(0.0351)	(0.0490)*
[-1;1]	1.51%	2.59%	-2.16%	1.68%	0.19%	-1.11%	-5.23%	-1.34%	-2.44%	-1.29%	3.08%
	(0.0252)	(0.0164)	(0.0093)**	(0.0154)	(0.0098)	(0.0104)	(0.0286)*	(0.0139)	(0.0151)	(0.0152)	(0.0212)
[-1;5]	7.45%	3.22%	-1.74%	-2.08%	-3.52%	-3.00%	10.36%	-1.89%	-3.03%	-1.94%	0.62%
	(0.0385)*	(0.0250)	(0.0142)	(0.0236)	(0.0150)**	(0.0158)*	(0.0437)**	(0.0213)	(0.0230)	(0.0232)	(0.0324)
[-1;10]	-0.26%	-2.46%	-2.55%	0.76%	-1.34%	-1.86%	-0.18%	-0.02%	-1.43%	-1.30%	7.05%
	(0.0504)	(0.0327)	(0.0186)	(0.0309)	(0.0196)	(0.0207)	(0.0572)	(0.0279)	(0.0301)	(0.0304)	(0.0425)*
[0;1]	-1.32%	0.12%	-0.64%	2.10%	0.33%	-1.08%	-2.84%	-1.46%	-2.63%	-2.60%	1.79%
	(0.0206)	(0.0134)	(0.0076)	(0.0126)*	(0.0080)	(0.0085)	(0.0234)	(0.0114)	(0.0123)**	(0.0124)**	(0.0173)
Average	-1.24%	-0.15%	-1.45%	2.45%	0.54%	-1.55%	-0.07%	-3.02%	-2.65%	-2.71%	5.81%

This table shows cumulative abnormal returns for each sector on different event windows to assess robustness. ***, **, * indicate 1%, 5% and 10% statistical significance, respectively.