Volume 3 • Number 1
Fall 2013

JURF
Journal of Undergraduate
Research in Finance

Stock Market Reactions to the "Fiscal Cliff": How Political Uncertainty Affected Market-Wide and Idiosyncratic Volatility

Alexis G. Read[1]
James Madison University

C58, G01, G18

Both market-wide volatility and idiosyncratic volatility consistently have positive relationships with events that cause uncertainty in the markets. With a variety of federal tax codes scheduled to expire on December 31, 2012, there were fears of the United States economy being sent off a "fiscal cliff." Leading up to the expirations, it was unknown whether or not policy changes would take effect, resulting in slight rise in aggregate market volatility during that time. Meanwhile, aggregate firm-specific volatility remained unaffected. This gives rise to the question of whether or not the fiscal cliff was as significant of an event as the news coverage made it out to be. We explore the trend in aggregate idiosyncratic volatility over the period leading up to the possible fiscal cliff and find that firm-specific risk was not positively affected. On the contrary, average idiosyncratic volatility by industry had a variety of reactions. We find that the industry responses were correlated to the level of government funding to those industries.

Keywords: market-wide volatility, firm-specific volatility, idiosyncratic risk, national budget deficit, political uncertainty, quantitative policy modeling, financial econometrics, regression analysis

---

[1] I would like to give special thanks to my professor, Jason Fink, for providing guidance and support while conducting research for this paper. Also, I would like to thank James Madison University and the Department of Finance and Business Law for giving me the opportunities and resources to do conduct my research.

I. Introduction

With the ever increasing $16 trillion United States national debt, there has been extensive political debate on how to correct the large budget deficit. With a variety of federal income tax codes scheduled to expire on December 31, 2012[2], politicians debated on what new tax and spending policies would be the most effective in solving the problem without threatening economic health. Politicians agreed that a simultaneous increase in taxes and a decrease in government spending would cut the deficit roughly in half in 2013, but there were fears of it sending the economy off a "fiscal cliff," a term first coined by Ben Bernake in February 2012. It became an intense political debate and pivotal point in the markets following the Official FOMC Press release on September 13, 2012[3]. According to projections by the Congressional Budget Office, the economy would have likely initially fallen into a recession due to a projected drop in GDP of .5% in 2013 and an increase in unemployment rate to 9.1% if these laws were enacted[4]. This uncertainty in the political realm naturally led to insecurity in the markets and pushed the S&P500 Index volatility up 28.6% from the September 13, 2012 announcement to the peak on December 28, 2012. Following the decision to eliminate the fiscal cliff through the enactment of the American Taxpayer Relief Act of 2012 on January 2, 2013, market-wide volatility sharply declined as the uncertainty was put to rest. Interestingly, aggregate S&P500 idiosyncratic volatility did not follow the same pattern. This implies that the event was regarded as a market-wide event, affecting most firms in a similar way.

Idiosyncratic volatility, or unsystematic risk, is an important consideration in portfolio management. Although it can be theoretically eliminated through diversification, most investors have large holdings of individual stocks, causing idiosyncratic volatility to have an effect on most portfolios. Trends in idiosyncratic volatility were first modeled by Campbell, Lettau, Malkiel and Xu (2001), henceforth CLMX. They summarize historical movements in market, industry, and idiosyncratic volatility and find that from 1962-1997 there was a "noticeable increase in firm-level volatility relative to market volatility." They also explain that pricing errors are higher when idiosyncratic volatility is high, so arbitrageurs seeking to trade mispriced securities are concerned about idiosyncratic volatility rather than market-wide volatility. Additionally, idiosyncratic risk affects event-related returns on individual stocks. Xu and Malkiel (2001) agree that volatilities of individual stocks have increased over time. Bekaert, Hodrick, and Zhang (2010) expand on the CLMX findings by continuing the study of time-series behavior of aggregate idiosyncratic volatility as well as looking at international data. When the CLMX sample is extended to 2008 in their studies, they find no support that there are significant trends

---

[2] This included the expiration of the 2001 and 2003 George W. Bush Tax Cuts, increasing estate taxes, raising the Alternative Minimum Tax exemption level, allowing the payroll-tax holiday to expire, increasing business expensing, making provisions to Obamacare, and enacting the Budget Control Act of 2011. See the Tax Foundation Article "The Fiscal Cliff: A Primer" for details.

[3] Press release was published by the Federal Reserve Board of Governors

[4] See CBO article "Economic Effects of Policies Contributing to Fiscal Tightening in 2013," published November 8, 2012.

in idiosyncratic volatility over time using U.S. data. Brandt, Brav, Graham and Kumar (2010) agree that there is no significant trend in idiosyncratic volatility during this time.

We explore the patterns in market-wide volatility and aggregate idiosyncratic risk during the fiscal cliff debate. We also see how industry-specific risk was affected by the event and compare the trends in idiosyncratic volatility to similar periods of uncertainty in the markets. By comparing the idiosyncratic volatility reaction during the time leading up to the potential fiscal cliff to that of other significant economic periods of high idiosyncratic volatility (including the Great Depression, the Oil Crisis of the 1970s, the 1987 recession, the internet boom, and the sub-prime mortgage crisis of 2008), we can see the relative significance of the fiscal cliff. We hypothesize that the extensive media coverage on the subject in late 2012 caused an overreaction due to what Tversky and Kahneman (1974) call representativeness heuristic where viewers of the event believe something is more likely to have a bigger impact than it actually does just because it is seen over and over again in the news. Further, we believe that the uncertainty associated with the event will have more of an effect on market-wide volatility rather than firm-specific volatility.

The paper is organized as follows. Section II describes the method of volatility estimation and data collected. Section III analyzes time-series behavior of market-wide volatility. Section IV explores the effect of the fiscal cliff on aggregate idiosyncratic volatility. Section V concentrates on average idiosyncratic volatility by industry. Section VI is the conclusion. Lastly, Section VII includes the references.

II. Estimation and Data

A. Model Specification

There are numerous models for computing idiosyncratic volatility. A common and simplistic method of calculation is to measure deviations in residuals, a.k.a. nondiversifiable risk factors, from the capital asset pricing model (CAPM) or similar models. Moreover, CLMX (2001) created a model that averaged the deviations of individual firms in an industry's returns from market returns and then averaged the results for each industry. Instead, we use an exponential general autoregressive conditional heteroskedastic model (hencefore, EGARCH(1,1) model) to calculate idiosyncratic volatility from January 3, 2012 to January 31, 2013. The model was first introduced by Nelson (1991) as an extension of the GARCH(1,1) model[5]. Many studies, beginning with Black (1976), have found an inverse relationship between stock returns and volatility. The GARCH(1,1) model, however, assumes symmetry in the negative correlations of stock returns to changes in returns volatility – i.e. it assumes volatility rises when there is "bad news" in the markets just as much as it falls when markets have "good news". As explained by

---

[5] For a better understanding of the GARCH(1,1) model, refer to the 1986 Journal of Econometrics article "Generalized Autoregressive Conditional Heteroskedasticity" by Tim Bollerslev. GARCH(1,1) is a generalized expansion of the ARCH model introduced by Engle (1982).

Nelson (1991), there is actually a stronger rise in volatility in response to negativity in the market than there is a fall in response to positive market news, resulting in an asymmetric negative relationship. Bekaert and Wu (2000) found that the reasons for this asymmetry were due to “leverage effects” – when an increase in financial leverage of a firm causes negative return, making the stock more volatile – and “volatility feedback” – when return shocks are caused by conditional volatility. Pantelidis and Pittis (2009) also found that the forecasting performance of the GARCH(1,1) is less accurate relative to other models. The EGARCH(1,1) model is more accurate and captures the volatility-to-returns asymmetry. It is presented by Nelson (1991) as follows:

$$\log {\sigma_t}^2 = \omega_t + \sum_{k=1}^{\infty} \beta_k \, g(Z_{t-k}),$$

where σ_t is the volatility at time *t*, ω_t, β_k are deterministic coefficients and

$$g(Z_t) = \theta Z_t + \Upsilon(|Z_t| - E|Z_t|)$$
$$E[g(Z_t)] = 0$$

B. Data

The Standard & Poor’s 500 (S&P500) Index represents a large portion of the total market capitalization, so we use the 500 stocks in the index as a proxy to compute both market-wide volatility and aggregate idiosyncratic volatility. Specifically for the idiosyncratic volatility calculations, we define the market as the 500 stocks that comprise the S&P500 as of January 3, 2012 (the beginning of our sample period). Our sample period ranges from January 3, 2012 to January 31, 2013. The logic behind this date range selection is that it begins where the 2012 Center for Research in Securities Prices (CRSP) data is unavailable and encompasses the entirety of the fiscal cliff debate. Since CRSP data is only available up until December 31, 2011 during the time of our research, we use Bloomberg to gather the remaining data.

To calculate idiosyncratic volatility using the EGARCH(1,1) model, we need the following factors: firm-level returns, market capitalization for value-weighting the aggregate idiosyncratic volatility, high-minus-low (HML) ratio, small-minus-big (SMB) ratio, excess market return, and the risk-free rate. We obtain daily firm-level holding period return adjusted for dividends and market capitalization from Bloomberg for all firms in the S&P500 Index from January 3, 2012 to January 31, 2013. Additionally from Bloomberg, we get volatility data from the creation of the S&P500 index on March 4, 1957 until the end of our sample period. All other return and market capitalization data prior to December 31, 2011 was obtained from CRSP using the same 500 S&P500 stocks that comprised the index on January 3, 2012. The risk-free rate, the market risk premium, the small-minus-big (SMB) ratio, and the high-minus-low (HML) ratio are pulled from the Kenneth R. French Data Library. The risk-free rate is measured as the daily 1-month T-Bill rate and the excess market return is calculated as the daily market return minus the risk-free rate.

For the analysis of the effect of the fiscal cliff on idiosyncratic volatility for each industry, we assign each of the 500 firms in the index to one of the 48 Industry Portfolios defined by Fama and French (1997) based on their 4-digit SIC codes. The SIC Code data was taken from the CRSP database and the 48 industry definitions were acquired from the Kenneth R. French Database.

III. The Effect of the Fiscal Cliff on Market-Wide Volatility

This section explores trends in aggregate market-wide volatility (using the S&P500 Index as a proxy for the market) during the fiscal cliff debate. For comparison of the changes in volatility during this period to other times of economic uncertainty, we also look at the historical levels of volatility for the S&P500 since its creation on March 4, 1957. Section (III.A) models time-series behavior of aggregate market-wide risk and Section (III.B) formally tests for evidence of influence on market-wide volatility due to the fiscal cliff.

A. Time-Series Behavior of Aggregate Market-Wide Risk

Not only were short-term effects of the fiscal cliff ambiguous, but the projected long-term outcomes on the economy were also up for debate. Ben Bernake felt that "if the fiscal cliff was allowed to occur, and certainly if it were sustained for any period, it could have a very negative affect on hiring, jobs, wages, economic activity [and] investment."[6] As the debates surged, the S&P500 volatility increased from .1385 on September 13, 2012 to a peak of .1783 on December 28, 2012. Following this peak, the volatility decreased sharply to .145 on January 2, 2013 when the American Taxpayer Relief Act of 2012 was enacted on that day, which at least temporarily relieved the possibility of the fiscal cliff. This time-series behavior over the "fiscal cliff period"[7] can be seen in Graph A of Figure 1.

There is an obvious reaction in market-wide volatility to fiscal cliff events when looking at the local fiscal cliff sub-period. When the time period is extended further, however, the relative impact is lessened. Graph B of Figure 1 shows that other spikes during the full period dwarf the local reaction to the fiscal cliff uncertainty. For example, from early May 2012 to early June 2012, there was a much larger spike in market volatility with a simultaneous drop in market prices. This reaction was due to concerns about the European financial situation, which caused negative investor sentiment. The S&P500 Index dropped to its lowest levels of the period on June 1, 2012. On June 2, 2012, the markets experienced gains and decreased volatility when the European Union reached a deal that promised to "stabilize the region's troubled banks and the lingering debt woes of the region."[8] Graph C further extends the period to the beginning of the S&P500 index existence, depicting that past volatility spikes due to recessionary environments

---

[6] See CNN Money news article titled "Bernake warns of fiscal cliff as Fed lowers forecasts" by Annalyn Kurtz, published December 12, 2012

[7] We define the "fiscal cliff period" as the time starting from the Official Press Release on September 13, 2013 to the enactment of the American Taxpayer Relief Act of 2012 on January 2, 2013

[8] See article "Stock Market News for July 2, 2012" presented by ADVFN

render the market-wide volatility spike during the fiscal cliff as trivial. Noticeable spikes occurred during the oil crisis of 1987, the internet boom of the late 1990s, the 2008 subprime mortgage crisis, and the August 2011 stock market fall due to fears associated with the European debt crisis. Based purely on the appearance of the graphs, the reaction in volatility surrounding the fiscal cliff debate is hardly sizeable compared to these other historical events. We formally test the impact in Section (III.B).

B. Formal Time-Series Test for Influence of the Fiscal Cliff on Volatility

To formally test for evidence of influence on market-wide volatility over the sample period due to the fiscal cliff debate, a linear trend regression was conducted. The ANOVA model was applied to the full sample period and the fiscal cliff sub-period. The model takes on the following functional form:

$$[1] \qquad VOL_t = \alpha_{1t} + D\alpha_{2t} + \varepsilon_t,$$

where VOL_t is the average daily volatility of the S&P500 Index and D is a binary variable assigned to the dates ranging from December 21, 2012 to December 31, 2013 – i.e. D=1 on these days and 0 otherwise.

These dates represent the six days approaching the January 1, 2013 deadline for a political decision to be made. We can assume that these days represent the time of the highest political uncertainty regarding the fiscal cliff because the deadline was quickly approaching and the projected outcome of the debate was ambiguous. Hence, these days should give a good representation of how the fiscal cliff influenced the change in idiosyncratic volatility over the period. When the test is conducted for the entire sample period, it turns out that there is no statistically significant evidence of the fiscal cliff debate positively influencing market-wide volatility over the period. When the same model is applied to the sub-period, there is strong evidence that there was a positive influence on volatility during the days leading up to the New Year. It can be interpreted that the days leading up to the fiscal cliff decision increased the September 13, 2012 to December 31, 2012 average volatility by .01642, or from .15173 to .16815. The regression results can be seen in Table 1.

IV. The Effect of the Fiscal Cliff on Aggregate Idiosyncratic Volatility

In this section, we study the patterns in aggregate idiosyncratic volatility over the entire history of the market and over the two periods surrounding the fiscal cliff. After the idiosyncratic volatility calculations, we conduct formal regression analysis to test for any evidence of influence of the fiscal cliff on idiosyncratic risk. Section (IV.A) discusses the historical time-series behavior of aggregate idiosyncratic risk and Section (IV.B) focuses on patterns in aggregate firm-specific surrounding the fiscal cliff.

A. Formal Time-Series Test for Influence of the Fiscal Cliff on Volatility

Before examining the patterns in idiosyncratic volatility surrounding the fiscal cliff, it is important to understand historical movements in aggregate idiosyncratic volatility through time. Our study focuses on daily analysis, but for historical comparison we could only obtain monthly data back to July 31, 1926 due to CRSP limitations. CLMX (2001) was the first to model historical movements in aggregate volatility, and there have been numerous studies analyzing event-related reactions to idiosyncratic volatility as well. Brockman and Yan (2008) examine the daily time trend of idiosyncratic risk from 1926 to 1962 and specifically look at the events during that time period, such as the Great Depression (1929-1933) and World War II (1939-1945). They assign dummy variables to each of these events, finding a positive and statistically significant Depression dummy variable (the WWII dummy variable was found to be statistically insignificant, however). Xu and Malkiel (2001) found the spikes in idiosyncratic volatility during the oil shock in 1975 and stock market crash of 1987 to influence the positive trend in historical idiosyncratic volatility initially outlined by CLMX (2001). Fink, Fink, Grullon and Weston (2010) explored the jump in idiosyncratic volatility during the internet boom and found that it was caused by a market-wide decline in firm maturity during that time. The most recent spike was seen in the December 2007 to June 2009 credit crisis as explained by Schneider (2011). They found a positive and statistically significant coefficient on the bivariate variable for the subprime mortgage crisis. Figure 2 shows the time-series behavior of both the daily value-weighted aggregate idiosyncratic volatility back to July 2, 1962 and the monthly value-weighted aggregate idiosyncratic volatility back until July 31, 1926. The effect of these market events on idiosyncratic risk can be seen in the graphs.[9]

B. Time-Series Behavior of Aggregate Idiosyncratic Volatility Surrounding the Fiscal Cliff

This section looks at the time-series results of the idiosyncratic volatility calculations over the sample period from January 3, 2012 to January 31, 2013 and conducts formal regression analysis to test for any positive influence of the fiscal cliff on average idiosyncratic volatility over the full sample period and the fiscal cliff sub-period. Section (IV.B.i) maps the time-series behavior for both value-weighted and equal weighted idiosyncratic volatility and Section (IV.B.ii) shows the results of the formal bivariate regression tests.

i. Time-Series Behavior of Aggregate Idiosyncratic Volatility Surrounding the Fiscal Cliff

Using the EGARCH(1,1) model to estimate the daily aggregate idiosyncratic risk of the 500 firms in the S&P500 index, we find that the time-series patterns of this type of volatility differ from that of market-wide volatility for both value-weighted and equal-weighted volatilities surrounding the fiscal cliff debate. According to Bekaert, Hodrick, and Zhang (2010), macro-economic uncertainty drives up both systematic and idiosyncratic risk. Therefore, this result is not consistent with the usual positive correlation between the two volatilities. Figure 3 shows the value-weighted and equal-weighted idiosyncratic volatilities over the sample period from January 3, 2012 to January 31, 2013. Additionally, Graph C compares market-wide volatility from Graph B in Figure 1 to both equal- and value-weighted aggregate idiosyncratic volatility.

A few patterns can be noticed from the data comparison. First, idiosyncratic volatility is more stable than market-wide volatility over the period. Second, both equal-weighted

---

[9] It should be noted that due to limitations in data before July 2, 1962, monthly idiosyncratic volatility is much less accurate before this time and appears to be more volatile.

idiosyncratic volatility and value-weighted idiosyncratic volatility tend to move together, with the equal-weighted portfolio consistently having higher volatility. Third, there isn't any appearance of idiosyncratic volatility reaction to fiscal cliff events as there was with market-wide volatility. These observations will be formally tested in section (IV.B.ii) using bivariate regression models.

ii. Bivariate Regression Analysis

We use daily series of idiosyncratic volatility for the sample full period and the fiscal cliff sub-period for both aggregate and industry-specific idiosyncratic volatility to formally test for any influence of the fiscal cliff on idiosyncratic risk. The regression model applied to the two periods is estimated as follows:

$$[2] \qquad IVt = \alpha_{1t} + D\alpha_{2t} + \varepsilon_t,$$

where IVt is the daily idiosyncratic volatility at time *t* and D once again represents a dummy variable for the same "crunch-time" dates as used in Equation [1].

The results of this regression can be seen in Table 2. When comparing the regression results in Table 1 and 2, there are obvious differences in the market-wide and idiosyncratic volatility trends. The coefficients on the dummy variables are statistically significant and negative for the aggregate idiosyncratic volatility for both periods as well as for both value-weighted and equal weighted returns. Therefore, it can be interpreted that the fiscal cliff caused risk to shift from firm-specific to market-wide risk. In contrast, the coefficient on the bivariate variable for the market-wide volatility during the fiscal cliff sub-period is statistically significant and positive (although there is no statistically significant impact on volatility for the full sample period). Given that past uncertainty in the markets has led to increases in both idiosyncratic volatility and market volatility, these prove to be interesting results. It can be interpreted that, although the fiscal cliff debate dominated news coverage during the time, aggregate firm-specific risk was not positively affected by it. Therefore, the event was not as significant of a source of insecurity at the firm-level as it was made out to be by the media. The next section explores the effects of the fiscal cliff on idiosyncratic risk by industry.

V. Time-Series Behavior of Idiosyncratic Risk by Industry

This section analyzes the time-series patterns of average idiosyncratic volatility by industry. It can be seen, unsurprisingly, that certain industries were more affected by the fiscal cliff than others due to differences in government funding to the firms. The fiscal cliff would have reduced government funding toward many agencies and firms. Certain industries receive a large portion of their funding from the government, so it is a logical assumption that those industries had the largest increases in idiosyncratic volatility during the fiscal cliff period. Therefore, we hypothesize that the firms that rely heavily on government aid would have been affected the most by spending cuts. This section explores the reactions of average firm-specific risk for 48 industries defined by Fama and French (1997) using the same 500 stocks that comprise the S&P500. Section (V.A) describes industry definitions, and Section (V.B) formally tests for influence of political uncertainty associated with the fiscal cliff on average idiosyncratic volatility by industry. Further, Section (V.C) outlines time-series behavior of average value-weighted firm-specific risk for industries with positively impacted volatility due to the fiscal cliff.

A. Industry Definitions

The Standard Industrial Classification (SIC) code system was first developed in 1937 when the Central Statistical Board created the Interdepartmental Committee on Industrial Classification to develop a standard system for classifying industries[10]. Today, it is still a standard system for numerically identifying industries for many agencies and databases. Fama and French (1997) divided the SIC Codes in 48 separate industries, which we follow in our industry definitions. These definitions are outlined in Figure 4.

B. Bivariate Regression Testing for Influence on Idiosyncratic Risk by Industry

We use daily series of idiosyncratic volatility for the sample full period and the fiscal cliff sub-period for both aggregate and industry-specific idiosyncratic volatility to formally test for any time-series trends in idiosyncratic risk. The regression model applied to the two periods is estimated as follows:

$$IVi,t = \alpha_{1,i,t} + D\alpha_{2,i,t} + \varepsilon_{i,t}, \qquad [3]$$

where IVi,t is the idiosyncratic volatility for industry *i* at time *t* and D once again represents a dummy variable for the same "crunch-time" dates.

Table 3 shows the regression output. Specifically, we are focusing on the industries with a positive and statistically significant coefficient at the 5% or better level. The regression renders surprising results, considering only 3 out of the 48 industries had a positive and statistically significant coefficient on the fiscal cliff dummy variable for both periods. This means that the period leading up to a decision only increased average idiosyncratic volatility for three industries – defense, steel works and automobiles. This holds true for both the full and fiscal cliff sub-periods. For the full period, the fiscal cliff lead to a 4.58% increase in idiosyncratic volatility within the defense industry, a 1.04% increase in the steel works industry, and a 4.1% increase in the automobile industry. For the local sub-period (with dates ranging from September 13, 2012 to December 31, 2012), the fiscal cliff lead to a 2.5% increase in idiosyncratic volatility within the defense industry, a .98% increase in the steel works industry, and a 4.3% increase in the

---

[10] For more information on the history of the SIC Code development, refer to the United States Office of Statistical Standards article "History of the Standard Industrial Classification" published on July 10, 1957 by Esther Pearce

automobile industry. Figure 5 shows the time-series behavior of average idiosyncratic volatility for each of these three industries over the full period.

The remainder of the regression results that were statistically significant had negative coefficients, showing that the fiscal cliff had a negative impact on the idiosyncratic volatility within the industry. These results are perplexing, considering events like the fiscal cliff typically have positive influence on industries-specific and aggregate firm-specific risk.

In the next section, we will look at the time-series behavior of the industries where the fiscal cliff had a positive and statistically significant impact on idiosyncratic risk during the period.

C. Industries with Positively Affected Idiosyncratic Volatility due to the Fiscal Cliff

Through the bivariate regression tests, we discovered that defense, steel works, and automobiles were the three industries where unsystematic risk was positively affected by the fiscal cliff period. Figure 5 shows the time-series pattern in idiosyncratic volatility for each of these three industries.

The positive coefficients on these three industries can be due to a variety of reasons associated with the fiscal cliff. First, the Budget Reduction Act of 2011 would have caused significant reductions in funding to the department of defense. The enactment of this act was delayed two months by the American Taxpayer Relief Act of 2012 (ATRA), however. By looking at the graph of the defense idiosyncratic volatility, the largest spike in unsystematic risk occurred after the December 31 deadline. Since the ATRA postponed any reductions, this late spike might have been a reaction to future reductions. At the end of 2012, there was a drop in military spending of 22.1%. Then, in the first quarter or 2013, there was an 11.5% drop in military spending on top of that. According to the same article, “the pattern of military cuts is expected to continue in the coming months.”[11] As for the steel works industry, steel imports were down 8.4% in January 2013 compared to January 2012 according to David Phelps, President of the American Institute of International Steel. This reaction reflected the lower level of demand for steel due to concerns regarding fiscal cliff[12]. Lastly, the automobile industry typically suffers severely when the economy crashes. Therefore, the fears of the economy falling off the “fiscal cliff,” caused even greater worries of the automobile industry crashing even harder.[13]

VI. Conclusion

While market-wide volatility reacted positively to the fiscal cliff debate in the September 13, 2012 to January 4, 2013 sub-period, the reaction was insignificant when the time period is extended back to the full sample period (beginning January 3, 2012) as well as when extended to

---

[11] See article "Defense cuts pose an economic quandary for liberals" published in The Washington Post on April 28, 2013

[12] See article "January U.S. Steel Imports Up Month-On-Month but Down Year-on-Year" published in Steel News on March 1, 2013

[13] Refer to NBC Business News article “Fiscal Cliff Resolution Good News for Auto Industry”

the full period of the S&P500 existence (beginning March 4, 1957). When looking at the full sample period, however, there was a larger spike in market-wide volatility from May 1 to June 1 due to concerns about Europe's financial health. Historical economic events since the S&P500 index creation (including the oil crisis of 1987, the internet boom of the late 1990s, the 2008 subprime mortgage crisis, and the August 2011 stock market fall) all had much larger spikes in volatility as compared to the time of the fiscal cliff debate.

Aggregate idiosyncratic volatility was not positively affected by the possibility of a fiscal cliff in either of the periods tested. In fact, the time leading up to the tax code expirations and the need for a political decision had a negative impact on idiosyncratic volatility in the full sample period as well as the fiscal cliff sub-period. This implies that the fiscal cliff caused risk to shift from firm-specific to market-wide risk. During other times of economic uncertainty, idiosyncratic volatility increased much more dramatically. Events such as the Great Depression, the oil crisis of 1987, the internet boom of the late 1990's and the 2008 subprime mortgage crisis had a much larger and positive impact on aggregate idiosyncratic volatility levels.

Certain industries did experience an increase in idiosyncratic volatility, likely due to the uncertainty of future government funding if the fiscal cliff was enacted, while others had a negative or insignificant effect due to the fiscal cliff. The industries that were positively affected include defense, steel works, and automobiles. Overall, there was little reaction to the fiscal cliff in the markets relative to other periods of uncertainty.

VII. References

[1] ADVFN. "Stock Market News for July 2, 2012." *ADVFN*. N.p., 2 July 2012. Web. <http://www.advfn.com/news_Stock-Market-News-for-June-1-2012-Market-News_52638025.html>.

[2] Bekaert, Geert, and Guojun Wu. "Asymmetric Volatility and Risk in Equity Markets." *The Review of Financial Studies* 13.1 (2000): 1-42. Web.

[3] Bekaert, Geert, Hodrick, Robert J. and Zhang, Xiaoyan, Aggregate Idiosyncratic Volatility (July 30, 2010). AFA 2009 San Francisco Meetings Paper; EFA 2009 Bergen Meetings Paper.

[4] Black, Fischer. "The Pricing of Commodity Contracts." Journal of Financial Economics 3.1-2 (1976): 167-79. Print.

[5] Bollerslev, Tim. "Generalized Autoregressive Conditional Heteroskedasticity." *Journal of Econometrics* 31 (1986): 307-27. Web. <http://public.econ.duke.edu/~boller/Published_Papers/joe_86.pdf>.

[6] Brandt, Michael W., Alon Brav, John R. Graham, and Alok Kumar. "The Idiosyncratic Volatility Puzzle: Time Trend or Speculative Episodes?" *By Michael Brandt, Alon Brav, John Graham, Alok Kumar*. N.p., n.d. Web. Mar. 2013.

[7] Brockman, Paul and Yan, Xuemin Sterling, The Time-Series Behavior and Pricing of Idiosyncratic Volatility: Evidence from 1926 to 1962 (March 1, 2008). Available at SSRN: http://ssrn.com/abstract=1117284 or http://dx.doi.org/10.2139/ssrn.1117284

[8] Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu. "Have Individual Stocks Become More Volatile?" *The Journal of Finance* LVI.1 (2001): 1-44. Web.

[9] Eisenstein, Paul A. "Fiscal Cliff Resolution Good News for Auto Industry." *NBC Business News*. N.p., n.d. Web. <http://www.nbcnews.com/business/fiscal-cliff-resolution-good-news-auto-industry-1C7776740#/business/fiscal-cliff-resolution-good-news-auto-industry-1C7776740>.

[10] Engle, Robert F. "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50.4 (1982): 987-1007. Web.

[11] Fink, Jason, Kristin Fink, Gustavo Grullon, and James Weston. "What Drove the Increase in Idiosyncratic Volatility during the Internet Boom?" *Journal of Financial and Quantitative Analysis* 45 (2010): n. pag. Print.

[12] French, Kenneth, and Fama. *Kenneth B. French Data Library*. N.p., n.d. Web. <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html>.

[13] Goldfarb, Zachary. "Defense Cuts Pose an Economic Quandary for Liberals." *The Washington Post: Business*. N.p., 28 Apr. 2013. Web. <http://www.washingtonpost.com/business/economy/defense-cuts-pose-an-economic-quandary-for-liberals/2013/04/28/6cc78b72-b01b-11e2-9a98-4be1688d7d84_story.html>.

[14] "January U.S. Steel Imports Up Month-on-Month but Down Year-on-Year." *Steel News*. Association for Iron and Steel Technology, 1 March 2013. Web. Apr. 2013. <http://www.steelnews.com/tabid/36/Doc/12057/Default.aspx>.

[15] Kurtz, Annalyn. "Bernanke Warns of Fiscal Cliff as Fed Lowers Forecasts." *CNN Money*. N.p., 12 Dec. 2012. Web. <http://money.cnn.com/2012/12/12/news/economy/bernanke-fiscal-cliff/index.html>.

[16] Nelson, Daniel B. "Conditional Heteroskedasticity in Asset Returns: A New Approach." *Econometrica* 59 (1991): 347-70. Web.

[17] Pantelidis, T. and N. Pittis (2009), "Estimation and Forecasting in First-order Vector Autoregressions with Near to Unit Roots and Conditional Heteroskedasticity", *Journal of Forecasting*, 28 (Issue 7), 612-630.

[18] Schneider, Thomas. "Idiosyncratic Volatility, Firm Fundamentals, and the Credit Crisis." *Journal of Undergraduate Research in Finance* 1.1 (2011): 1-11. Web.

[19] TF Staff. "The Fiscal Cliff: A Primer." *Tax Foundation*. N.p., 13 Nov. 2012. Web. <http://taxfoundation.org/article/fiscal-cliff-primer>.

[20] *The Center for Research in Security Prices*. Wharton Research Data Services, n.d. Web.

[21] Tversky, Amos, and Daniel Kahneman. "Judgment under Uncertainty: Heuristics and Biases [Paperback]." *Science* 185.4157 (1974): n. pag. Web. <http://www.hss.caltech.edu/~camerer/Ec101/JudgementUncertainty.pdf>.

[22] United States. Bureau of the Budget. Office of Statistical Standards. *History of the Standard Industrial Classification*. By Esther Pearce. Washington, D.C.: n.p., 1957. Print.

[23] United States. Congress. Congressional Budget Office. *Economic Effects of Policies Contributing to Fiscal Tightening in 2013*. N.p., 08 Nov. 2012. Web. <http://www.cbo.gov/publication/43694>.

[24] United States. Department of Defense. *American Forces Press Service*. By Jim Garamone. N.p., 20 Dec. 2012. Web. <http://www.defense.gov/news/newsarticle.aspx?id=118853>.

[25] United States. Federal Reserve System. Board of Governors. N.p., 13 Sept. 2012. Web. <http://www.federalreserve.gov/newsevents/press/monetary/20120913a.htm>.

[26] Wang, Lu. "Dow Drops Most in 2012 as Europe Concern Resurfaces." *Bloomberg Businessweek*. N.p., 12 May 2012. Web. <http://www.businessweek.com/news/2012-05-11/dow-drops-most-in-2012-as-europe-concern-resurfaces>.

[27] Weisman, Jonathan. "Obama's New Offer on Fiscal Crisis Could Lead to Deal." *The New York Times* [New York] 17 Dec. 2012: n. pag. Print.

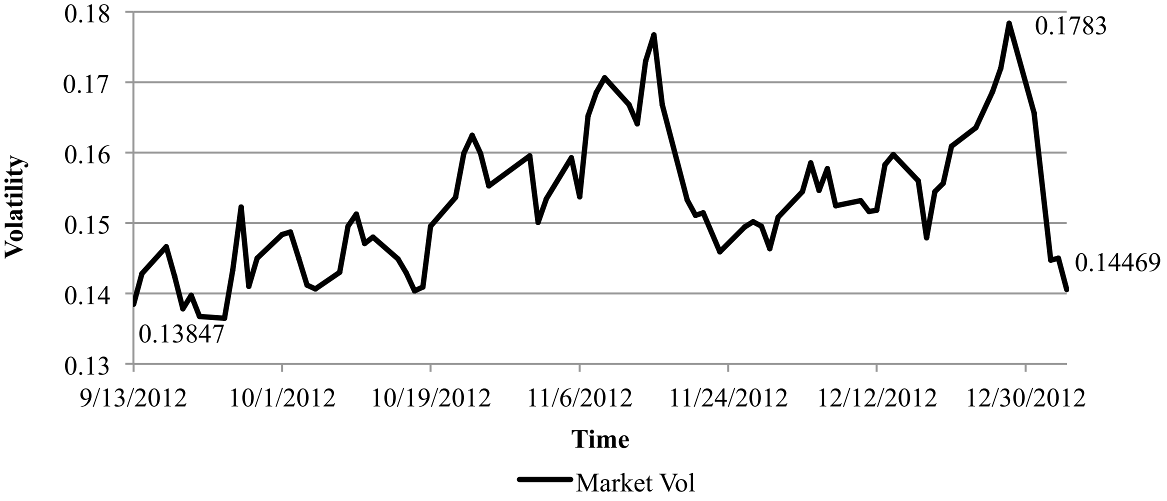
[28] Xu, Yexiao and Malkiel, Burton G. G., Idiosyncratic Risk and Security Returns (May 2004). AFA 2001 New Orleans Meetings. Available at SSRN: http://ssrn.com/abstract=255303

[29] Zacks Equity Research. "Stock Market News for June 1, 2012 - Market News." *Zacks*. N.p., 1 July 2012. Web. <Zacks Equity Research. "Stock Market News for July 2, 2012." Zacks. N.p., 2 July 2012. Web.>

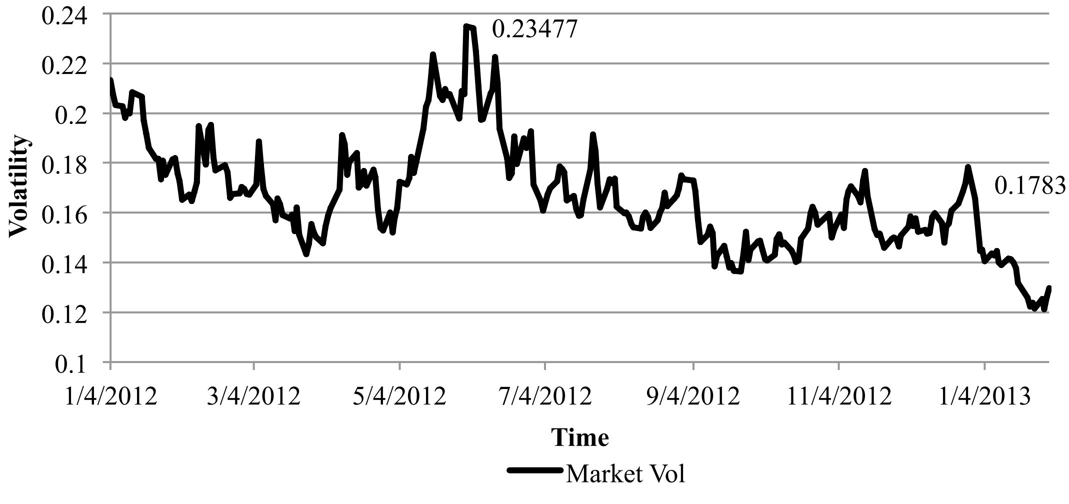
FIGURE 1
S&P500 Index Volatility

Figure 1 shows the time-series behavior of daily market-wide volatility, measured as the volatility of the S&P500 index. Graph A shows the volatility from the FOMC Press Release on September 13, 2012 to January 4, 2013, which was 2 days after the decision to extend tax cuts through the enactment of the American Taxpayer Relief Act of 2012. Graph B shows the full sample period, indicating that the local impact on market-wide volatility as seen in Graph A is much greater than the full sample period impact. Graph C shows the volatility since the creation of the S&P500 on March 4, 1957.

Graph A. Aggregate Market-Wide Volatility: September 13, 2012 to January 4, 2013 (Fiscal Cliff Period)



Graph B. Aggregate Market-Wide Volatility: January 4, 2012 to January 31, 2013 (Full Sample Period)



Graph C. Aggregate Market-Wide Volatility: March 4, 1957 to January 31, 2013 (Since Creation)

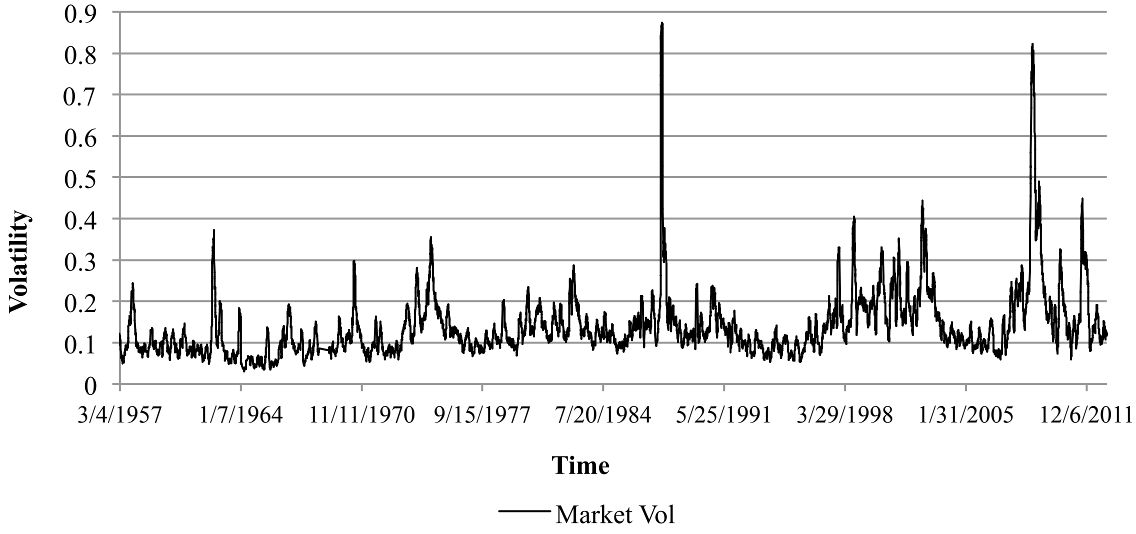
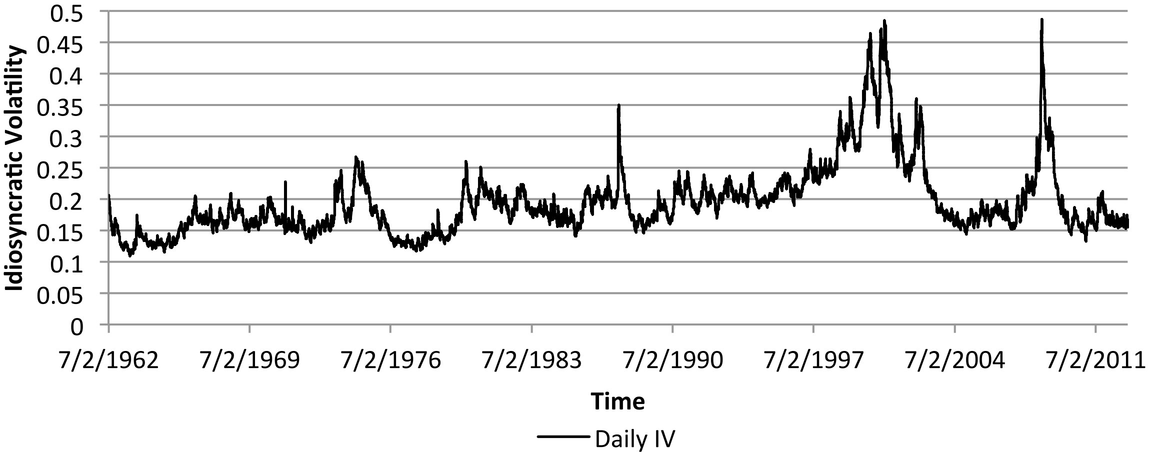


FIGURE 2
Historical Aggregate Idiosyncratic Risk in the S&P500

Figure 2 displays the time-series behavior of both daily and monthly value-weighted aggregate idiosyncratic risk from July 2, 1962 to December 31, 2011. This time period signifies the available data in the CRSP database at the time of research.

Graph A. Daily Value-Weighted Idiosyncratic Volatility: July 2, 1962-December 31, 2011



Graph B. Monthly Value-Weighted Idiosyncratic Volatility: July 2, 1926-December 31, 2011

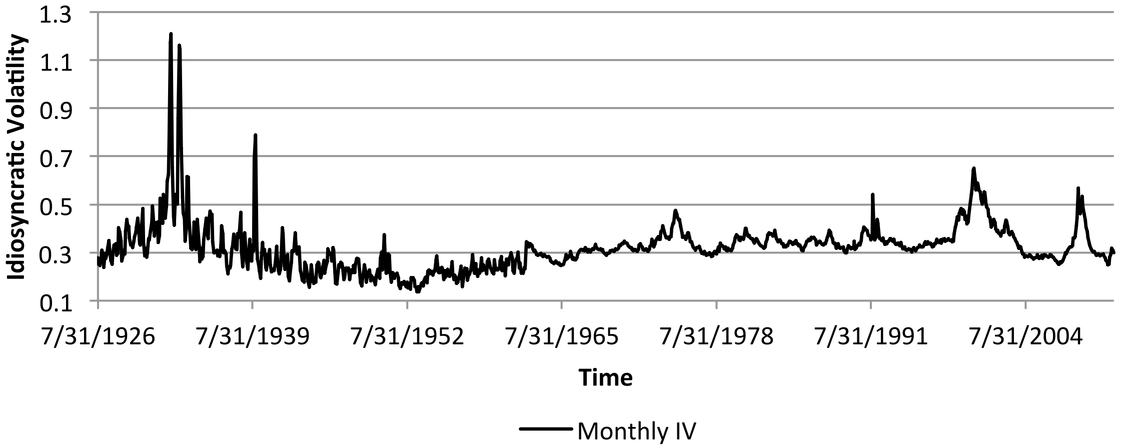
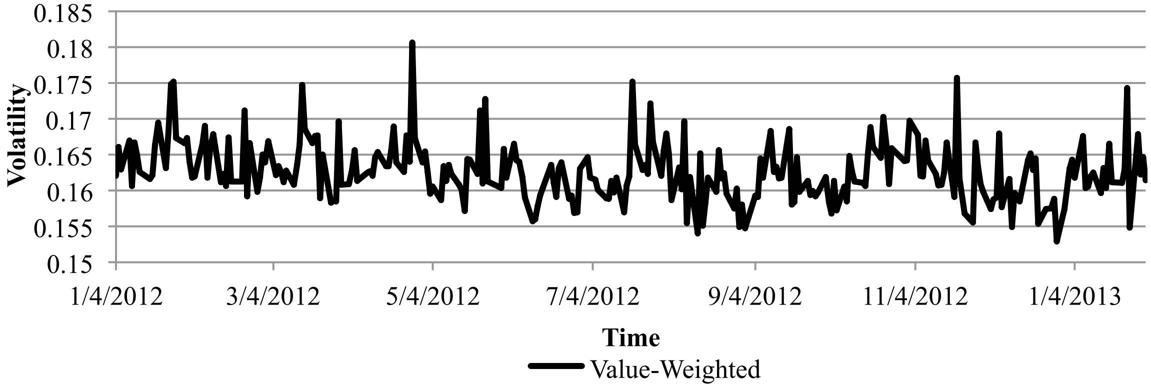


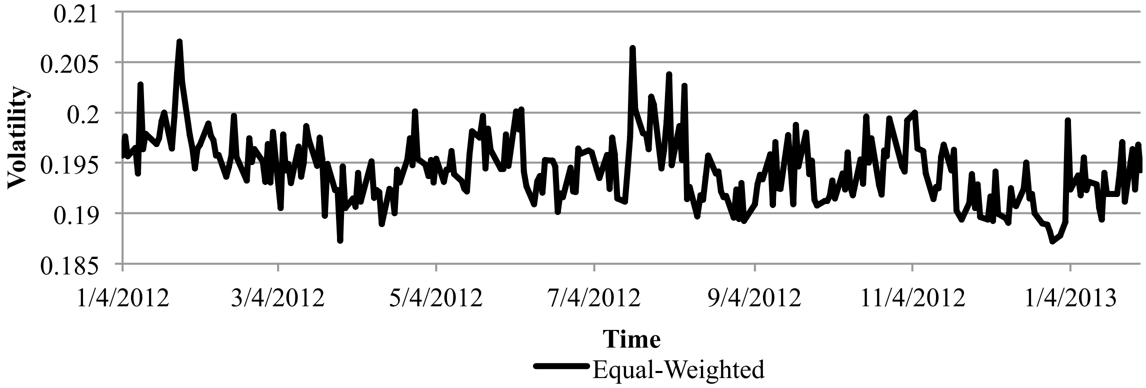
FIGURE 3
Aggregate Idiosyncratic Risk in the S&P500 Surrounding the Fiscal Cliff Debate

Figure 3 displays the time-series behavior of daily idiosyncratic risk over the full sample period for both value-weighted (Graph A) and equal-weighted portfolios (Graph B). For easy comparison, the market-wide volatility is displayed alongside value-weighted and equal-weighted idiosyncratic volatility in Graph C.

Graph A. Value-Weighted Idiosyncratic Volatility



Graph B. Equal-Weighted Idiosyncratic Volatility



Graph C. Market-Wide Volatility Comparison to Value-Weighted and Equal-Weight Idiosyncratic Risk

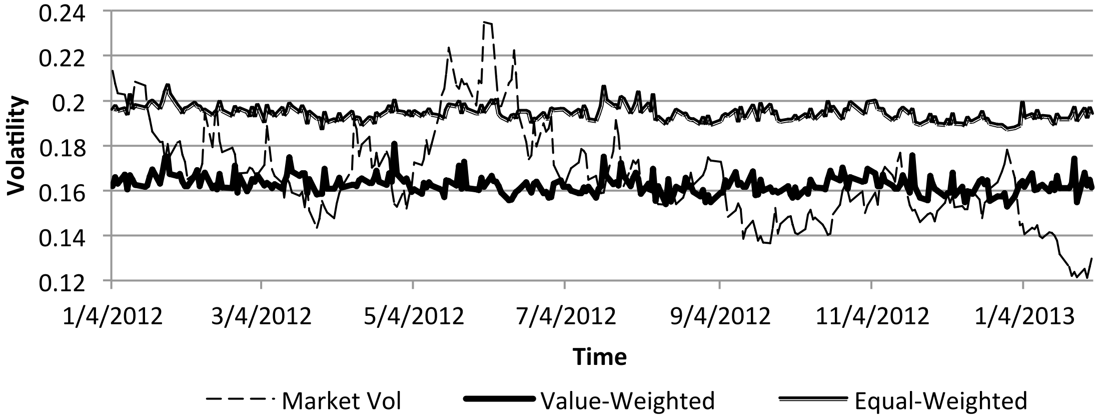


FIGURE 4
Fama-French 48 Industry Portfolio Definitions

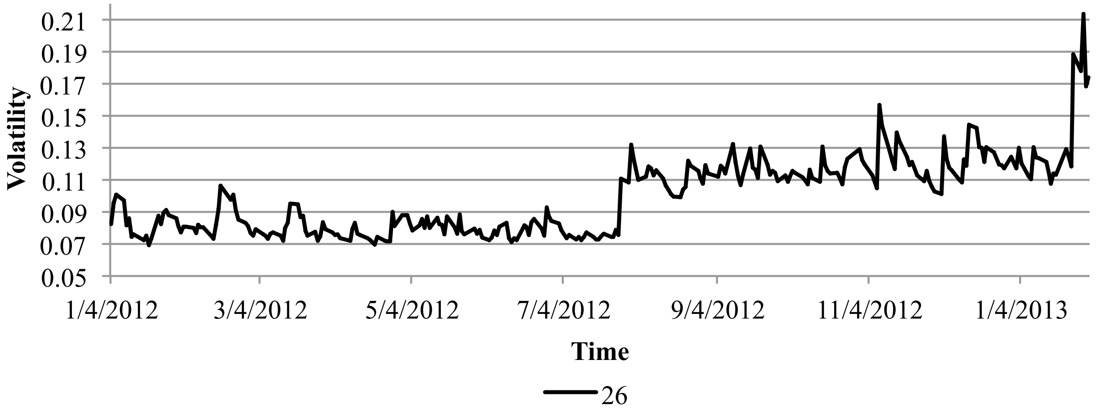
Figure 4 shows the code that corresponds to each industry as defined by Fama and French (1997). These definitions were taken from the Kenneth B. French Database. For our analysis, we do not have data on Textiles (16), Fabricated Products (20), or Precious Metals (27).

1	Agriculture	13	Pharmaceuticals	25	Shipbuilding	37	Lab Equipment
2	Food	14	Chemicals	26	Defense	38	Business Supplies
3	Soda	15	Rubber and Plastics	27	Precious Metals	39	Shipping Containers
4	Beer	16	Textiles	28	Mining	40	Transportation
5	Tobacco Products	17	Construction Materials	29	Coal	41	Wholesale
6	Recreation	18	Construction	30	Oil	42	Retail
7	Entertainment	19	Steel Works	31	Utilities	43	Restaurants, Hotels
8	Printing and Publishing	20	Fabricated Products	32	Communication	44	Banking
9	Consumer Goods	21	Machinery	33	Personal Services	45	Insurance
10	Apparel	22	Electrical Equipment	34	Business Services	46	Real Estate
11	Healthcare	23	Automobiles	35	Computers	47	Trading
12	Medical Equipment	24	Aircraft	36	Electronic Equipment	48	Other

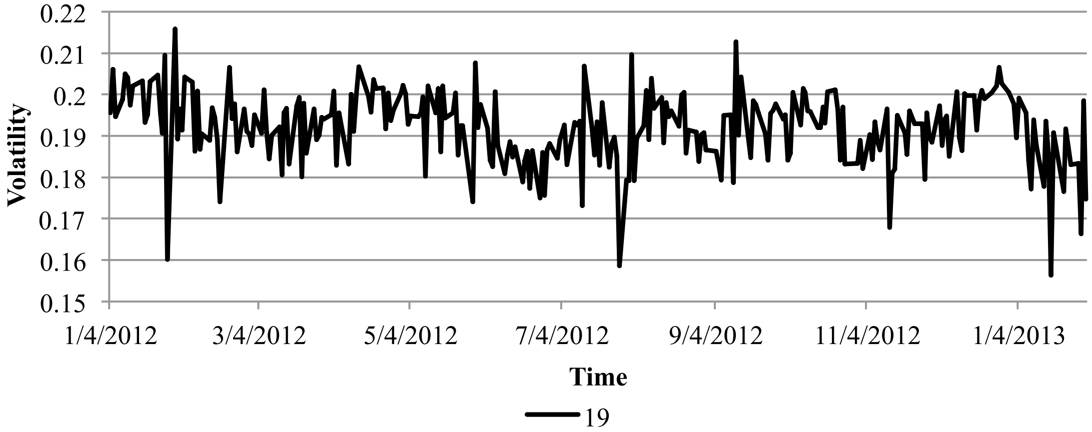
FIGURE 5
Time-Series Behavior of Average Idiosyncratic Volatility by Industry: January 3, 2012 – January 31, 2013

Figure 5 shows the three industries – defense, steel and automobile – that had a positive and statistically significant coefficient on the fiscal cliff dummy variable on the average idiosyncratic volatility by industry.

Graph A. Average Idiosyncratic Volatility for the Defense Industry



Graph B. Average Idiosyncratic Volatility for the Steel Works Industry



Graph C. Average Idiosyncratic Volatility for the Automobile Industry

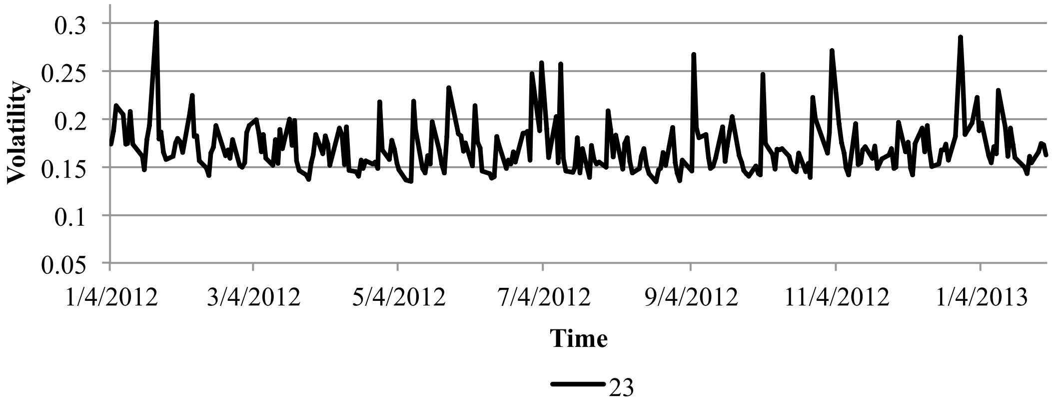


TABLE 1
Evidence of Trends in Market-Wide Volatility Using S&P500 Index

Table 1 shows the results of the linear bivariate regressions which test for time trends in daily market-wide volatility during the fiscal cliff debate. Ordinary Least Squares regressions were used for the estimates, and are presented in the following form:

$$VOL_t = \alpha_{1t} + D\alpha_{2t} + \varepsilon_t$$

T-values are reported under the coefficient estimates. Statistically significant at **5% ***1% level.

Variable	Full Sample	Fiscal Cliff Period
Constant ($\hat{a}_1$)	.16689 [125.66]	.15173 [141.7]
Fiscal Cliff ($\hat{a}_2$)	.00126 [.14]	.01642*** [4.37]
R^2	**0.01%**	**20.94%**

TABLE 2
Regression Results Testing for Influence on Idiosyncratic Volatility

Table 2 shows the regression output using a day dummy variable to test for any influence of the fiscal cliff on idiosyncratic volatility over the full period and fiscal cliff period. Table A displays the results for the value-weighted portfolio while Table B displays those for the equal-weighted portfolio. The fiscal cliff sub-period studies the trend from September 13, 2012 to December 31, 2012. The model uses the following specification:

$$IV_t = \alpha_{1t} + D\alpha_{2t} + \varepsilon_t$$

T-values are reported under the coefficients. Statistically significant at **5% ***1% level.

Table A. Value-Weighted Trends in Idiosyncratic Volatility over the Full Period and Fiscal Cliff Sub-Period

Variable	Full Sample	Fiscal Cliff Period
Constant ($\hat{\alpha}_1$)	.16241 [583.33]	.16338 [341.90]
Fiscal Cliff ($\hat{\alpha}_2$)	-.00377** [.-2.02]	-.00474*** [-2.83]
R^2	**1.50%**	**9.99%**

Table B. Equal-Weighted Trends in Idiosyncratic Volatility over the full period and fiscal cliff sub-period

Variable	Full Sample	Fiscal Cliff Period
Constant ($\hat{\alpha}$)	.1947 [980.77]	.19384 [566.69]
Trend ($\hat{\gamma}$)	-.00615*** [.-4.62]	-.00529*** [-4.40]
R^2	**7.37%**	**21.22%**

TABLE 3

Regression Results Testing for Influence on Average Firm Idiosyncratic Volatility

Table 3 shows the regression output for the dummy variable to test for any influence of the fiscal cliff on industry-level volatility for the industries with a statistically over the full period and fiscal cliff period. Table A displays the results for the value-weighted portfolio over the full-period while Table B displays those for the value-weighted portfolio over the sub-period. The fiscal cliff sub-period studies the trend from September 13, 2012 to December 31, 2012. The model uses the following specification:

$$IV_{i,t} = \alpha_{1,i,t} + D\alpha_{2,i,t} + \varepsilon_{i,t}$$

Where $IV_{i,t}$ is the value-weighted idiosyncratic volatility for industry i at time t.

Statistically significant at **5% ***1% level. The highlighted rows indicate the industries that experienced a change positive industry-specific volatility due to the fiscal cliff.

Table A. Industry-Specific Volatility Trends over the Full Period

Industry	Intercept ($\hat{\alpha}_1$)	Dummy ($\hat{\alpha}_2$)	T-Value ($\hat{\alpha}_2$)	P-Value ($\hat{\alpha}_2$)
Recreation (6)	0.21	-0.02814	-2.43667	0.01547**
Steel Works (19)	**0.193**	**0.0104**	**2.80281**	**0.00544*** **
Electrical Equipment (22)	0.141	-0.00925	-2.24174	0.0258**
Automobiles (23)	**0.169**	**0.04111**	**4.0296**	**0.00007*** **
Defense (26)	**0.098**	**0.04578**	**4.01394**	**0.00008*** **
Trading (47)	0.139	-0.00826	-2.3239	0.02088**

Table B. Industry-Specific Volatility Trends over the Fiscal Cliff Sub-Period

Industry	Intercept ($\hat{\alpha}_1$)	Dummy ($\hat{\alpha}_2$)	T-Value ($\hat{\alpha}_2$)	P-Value ($\hat{\alpha}_2$)
Beer (4)	0.172	-0.02078	-2.10141	0.03911**
Recreation (6)	0.209	-0.02669	-2.16641	0.03359**
Construction (18)	0.274	-0.03683	-2.40277	0.01885**
Steel Works (19)	**0.193**	**0.00984**	**3.39767**	**0.00111*** **
Electrical Equipment 22	0.14	-0.00869	-2.68169	0.00908***
Automobiles (23)	**0.167**	**0.04331**	**4.01635**	**0.00014*** **
Defense (26)	**0.119**	**0.02493**	**4.3564**	**0.00004*** **
Trading (47)	0.137	-0.00555	-2.325	0.02289**