

The Impact of Sectoral Performance on the Stock Market: Does Volatility Equal Explanatory Power?

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Abstract:

This paper investigates the real impact of sector performance on the overall stock market and the possibility that the primary culprit of negative or positive performance isn't necessarily the one that significantly drives overall market performance. The study compares average gain or loss by sector with regression analysis to determine if the largest gainer or loser is also reflected in regression analysis after beta calculation. The results show that there is very limited correlation between the two measures suggesting that major volatility in one sector doesn't necessarily have the greatest impact on total market movement.

JEL Classification: [E44](#), [G11](#), [G14](#)

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1.0 Introduction

Individual sector performance on the overall stock market has not really been analyzed. One could argue that this is because logically, the market reacts to news, news which affects any individual sector, so the relationship should seem quite simple. It is this relationship that I believe requires further attention. Is logical thought really accurate in this situation? Does Volatility have Explanatory Power? This is the question that will be addressed.

This study aims to enhance the understanding of the intricate relationship between sector volatility and actual explanatory power in overall market performance. From a policy perspective, this analysis is important because if the results show that there is a disconnect in the two measures, then it could have implications for the accuracy of corrective measures in the market and even monetary policy. The relevance of this study is that it impacts the investing strategies of countless investors, as well as the impact the results could have on policy makers. If there is no disconnect between volatility and explanatory power, then logical thought is correct and we haven't really learned much new information. On the other hand, if that disconnect does in fact exist, then this information immediately becomes valuable.

This paper was guided by two research objectives that differ from other studies: First it investigates the possibility of a disconnect between sector volatility and explanatory power on overall market performance. Second, it looks at which sectors tend to have, on average, the highest levels of volatility and explanatory power as calculated through regression analysis. There tends to be an absence of research on this specific topic. This paper successfully fills that void. The rest of the paper is organized as follows: Section 2 analyzes stock market trends over the last eight years. Section 3 provides a brief literature review on other research papers written on related subjects. Section 4 outlines the empirical model, data and estimation methodology.

Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

2.0 Stock Market Trends

While the scope of this paper covers a time period of the last eight years, volatility in the stock market has been a characteristic since the establishment of stock exchanges. Since the year 2000, however, we have seen plenty of volatility both in well defined crises and in less aggressive price swings. The bursting of the tech bubble, along with the current financial crisis are two of the major occurrences in sell-pressure volatility. The bulls took over at the beginning of 2003, resulting in constant price appreciation until the recent credit crisis began in August of 2007. Below are three charts displaying the trends in performance since 2000.

Figure 1:



Source: Yahoo! Finance

Figure 2:



Source: Yahoo! Finance

Figure 3:

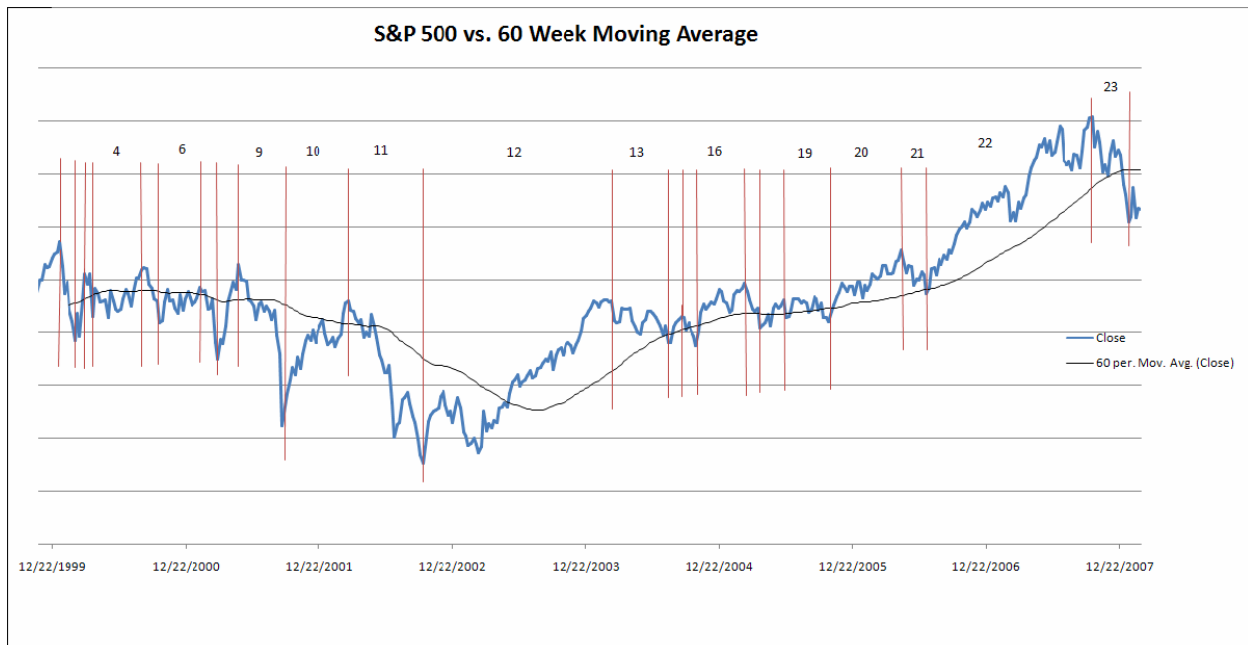


Source: Yahoo! Finance

Based on what the above charts show, it becomes very obvious that this eight year time range is comprised ultimately of one phase of buy volume sandwiched between two phases of sell volume. While it is not important in the scope of this paper whether there is buy or sell volume, it is important that there is volatility and movement in the market, which is established here. It generally seems to be widely accepted without much of a question as to what determines this volatility. When the tech stocks tanked, we assumed the market was down because of the

technology sector. Now, in the midst of a financial crisis, we are assuming that the market is down because of the sell pressure on financial stocks. But is that really the truth? That question is ultimately what we are looking to answer in this research paper. When the market has a significant price swing, what is actually the cause? An eight year performance chart of the S&P 500 (SPY) has been broken down into twenty-three “significant price swings” or as they will be referred to moving forward, “ranges.” Embedded in the chart as a black line is a sixty week moving average which helps determine these ranges. Each time the moving average intersects the performance line, the high and low point on either side is noted to determine a range. These ranges are marked out in the chart below with vertical red lines.

Figure 4:



Source: Author Compilation with data from Yahoo! Finance

The ranges determined statistically significant after regression analysis are numbered in the above graph. These are the ranges that will receive additional analytical attention in the remainder of this research paper. Included as Appendix B is a table outlining the exact dates of

each data range. Outlined in Table 1 is the breakdown of statistically significant and insignificant ranges:

Table 1: Corresponding time range breakdown to Figure 4.

Statistically:	Range:												
Significant	4	6	9	10	11	12	13	16	19	20	21	22	23
Insignificant	1	2	3	5	7	8	14	15	17	18			

3.0 Literature Review

Stock market volatility is a widely researched concept, with many different attack angles. According to *Is There a Positive Relationship between Stock Market Volatility and the Equity Premium?* (Kim, Morley & Nelson, 2004), volatility feedback is the idea that an exogenous change in the level of market volatility initially generates additional volatility as stock prices adjust in response to this new information about future discounted expected returns. Ultimately this means that premature concerns about weak earnings reports results in high sell volume and downward pressure on stock prices.

Another offered possibility in *Daily Stock Market Volatility: 1928-1989* (Turner & Weigel, 1992) suggests that most volatility is attributable to trading in the derivative markets. This makes sense presently, as there has been high volume trading in the options markets, as well as short selling of financial stocks. This explanation fits the bill as the financial sector has been the most volatile in recent months.

One could also argue that volatility is due to movement in international stock markets, with the idea that markets need to “decouple.” However, in *Volatility and Links between National Stock Markets* (King, Sentana & Wadhvani, 1994) it is found that international markets are not quite integrated and have low correlation. While that paper is a bit outdated especially

given recent developments in the concept of decoupling, their findings hold significance in the idea of volatility.

Unfortunately, there is a lack of literature regarding stock market sector performance, but that is the benefit of this paper, as we will analyze sectoral performance on the stock market.

4.0 Data and Empirical Methodology

4.1 Definition of Variables

$$SPY_r = \beta_0 + \beta_1 XLF_r + \beta_2 XLK_r + \beta_3 XLI_r + \beta_4 XLV_r + \beta_5 XLY_r + \beta_6 XLP_r + \beta_7 XLE_r + \beta_8 XLU_r + \beta_9 XLB_r + \varepsilon$$

SPY_r represents the Standard & Poor's 500 index for time period, or range "r." This is the dependent variable, and is the benchmark used in this study to approximate overall stock market performance. All of the independent variables are representative of each sector of the stock market over different ranges, or "r." XLF is the benchmark for the financial sector, XLK = Technology sector, XLI = Industrials, XLV = Healthcare, XLY = Consumer Discretionary, XLP = Consumer Staples, XLE = Energy, XLU = Utilities, and XLB = Materials. To sum it up, Table 2 displays each variable and what it represents.

Table 2

Variable	Description
SPY	S&P 500
XLF	Financial Sector
XLK	Technology Sector
XLI	Industrial Sector
XLV	Healthcare Sector
XLY	Consumer Discretionary Sector
XLP	Consumer Staples Sector
XLE	Energy Sector
XLB	Materials Sector
XLU	Utilities Sector

These benchmarks are all designed to track performance of each individual sector, and are actual Exchange Traded Funds (ETFs) available for trading on the stock market. The acronyms used as variables are actually ticker symbols for each ETF and can be reviewed on any financial website or the website of their creator, www.sectorspdr.com. They are constructed with approximately 50 companies that are considered major players in their respective sectors.

4.2 Data

The study uses weekly closing price data from January 10th, 2000 through January 14th, 2008. Data were obtained from the Yahoo! Finance website. This weekly data for the SPY was then plotted and graphed, and a 60 week moving average was plotted along the line. Ranges of time were identified by looking for time periods where the moving average crossed the SPY line. These time ranges are considered significant price swings in the SPY, and thus qualifying these ranges for analysis. A 60 week moving average was used for two reasons; first, because betas for individual stocks are typically calculated on a 60 month basis, but since 60 months in this case represents over half of the total time range, it was reduced to 60 weeks. Second, a 60 week moving average eliminates most of the smaller and less important price swings in the SPY.

Ultimately, twenty-three ranges were identified (see Appendix B for exact breakdowns), and the weekly closing prices downloaded from Yahoo! Finance were divided into those ranges for the SPY as well as all of the independent variables. Week over week percentage price changes were calculated and these numbers were used as inputs for the X and Y variables in the regression equation. A regression was run for each individual time range, totaling twenty-three regression outputs. The regressions without enough observations or statistically insignificant were discounted and removed from analysis, leaving thirteen of the original twenty-three outputs.

Once the Regression analysis was completed, the average gain or loss for each sector (X variables) in each range was calculated. This is necessary because we are comparing the largest gaining or losing sector with the highest correlation coefficient in each range to determine if there is consistency between the two measures. Gain or Loss is our measure of volatility, while correlation coefficients are the measure of explanatory power. Remembering that the key question we are trying to answer here is if volatility equals explanatory power. If it does, then we should see the most volatile sector in each range also have the highest correlation coefficient for that range.

5.0 Empirical Results

The results of the data analysis are astounding. Of the thirteen data ranges, only two showed consistency in variables from % Gain or Loss (Volatility) to Highest Correlation Coefficient (Explanatory Power). This suggests that sector volatility in this sample has very little to do with explaining overall market performance, and thus, completely negating what I would have expected. The major concern and implication of this in monitoring and aiding financial markets is that we may be implementing the wrong solutions, simply because we have not correctly identified the problem. This is particularly troublesome in range twenty-three. This range covers October 8th, 2007 through January 14th, 2008, the primary period of losses due to subprime writedowns and the credit crunch.

While the XLF shows the greatest loss (volatility) of any sector during that period, regression analysis suggests otherwise. Regression shows the XLY, or consumer discretionary stocks, as the most explanatory in accounting for market performance over the aforementioned time period. This does make sense, as economists had been speaking of recessionary fears during that time, scaring consumers from spending, ultimately causing those companies to suffer the most. However, my concern here is that the initial problem was thought to have been clearly

identified as financial companies experiencing turmoil. That turmoil, being felt immediately, should logically be most explanatory for market performance, but instead, the *expected* troubles in the future earnings reports for consumer discretionary companies is what best explains market performance during this time. What could this tell us? Perhaps brokers, hedge funds, mutual funds, and institutional investors are more afraid of what could happen in the future than they are of what's happening right now. Or maybe they recognize that there's more than just one leak in the pipeline. Either way, it's concerning that there isn't more consistency from Volatility to Explanatory power. Table 3 outlines the results:

Table 3

Column 1	Column 2		Column 3		Column 4
	Volatility		Explanatory Power		
Range	Variable with Greatest % Gain or Loss	% Gain or Loss	Variable with Highest Correlation Coefficient	Correlation Coefficient	Sector Consistency?
Four	Financials	0.84%	Technology	0.399	No
Six	Cons. Discretionary	1.89%	Cons. Staples	0.452	No
Nine	Technology	-1.88%	Financials	0.263	No
Ten	Cons. Discretionary	1.54%	Financials	0.229	No
Eleven	Technology	-2.11%	Cons. Staples	0.227	No
Twelve	Technology	0.77%	Technology	0.184	Yes
Thirteen	Technology	-0.49%	Financials	0.313	No
Sixteen	Energy	1.07%	Industrials	0.303	No
Nineteen	Cons. Discretionary	-0.29%	Financials	0.258	No
Twenty	Materials	0.89%	Financials	0.28	No
Twenty-One	Technology	-1.19%	Materials	1.509	No
Twenty-Two	Technology	0.52%	Technology	0.203	Yes
Twenty-Three	Financials	-2.17%	Cons. Discretionary	0.794	No

Column 1 identifies each data range, as these were the ranges resulting in statistical significance. Column 2 is our Volatility column, identifying which sector was the most volatile during the given time range. Volatility is measured in % Gain or Loss for the given range.

Column 3 is the measure of Explanatory Power, identifying the sector with the most explanatory power as found through regression analysis. Explanatory Power is assigned by the correlation coefficient of the sector with the market, and is listed in the corresponding column. Column 4 simply determines if there is consistency in our measures across sectors. In other words, “Yes” means the most volatile sector is also the one with the most explanatory power, and “No” is vice versa. The two highlighted rows are the only data ranges with sector consistency.

Based on the results, we can also compare a volatility index with an explanatory index to show the relationship between the two and find if there is any consistency in variables and their overall contribution to either measure. Table 4 outlines which sectors (variables) were most frequently calculated as the leader in volatility in Column 2 of Table 3. Table 5 outlines which sectors (variables) most frequently produced the highest correlation coefficients in Column 3 of Table 3, and thus, have the most explanatory power. Tables 4 and 5 are below:

Table 4

Volatility Breakdown		
Volatility Ranking	Variable	Volatility Leader %
1	Tech	46.15%
2	C.D.	23.08%
3	Fin’ls	15.38%
4	Energy	7.69%
4	Mat’ls	7.69%

Table 5

Explanatory Breakdown		
Explanatory Ranking	Variable	Explanatory Leader %
1	Fin’ls	38.46%
2	Tech	23.08%
3	C.S.	15.38%
4	Ind’ls	7.69%
4	Mat’ls	7.69%
4	C.D.	7.69%

The “Leader %” columns show the frequency with which any one variable appears as the most volatile or as having the most explanatory power. This shows that in this sampling, Technology and Financial stocks are major market movers while Consumer Discretionary stocks are secondary. This information is important in that day traders and investors using technical analysis, option investors, and short sellers can expect to make the most money, and have the

most opportunities to profit by focusing on tech and financial stocks. This is because all of these types of investors thrive on volatility and movement. When the market moves sideways with no vertical movement, these investors lose money.

One perfect example of the policy implications that have been discovered by this study is illustrated in Range 23. This time period is the bulk of the credit crunch that began in the summer of 2007 through the beginning of 2008. Our volatility leader was found to be financials, which logically makes sense. On the other hand, the sector found to have the most explanatory power is actually consumer discretionary. This, also makes sense, but the problem is that there is no sector consistency here. Consumer Discretionary stocks are generally hit the hardest during recessionary times, which explains why they had the most explanatory power in this recent time range. The issue is that these companies are affected most by consumer sentiment, and there were no preventive or corrective measures taken to ease and comfort consumers. Instead, we saw rate cut after rate cut to bail out banks and financial institutions. This study proves that that course of action was an error in judgment. The Fed believed that financial companies were driving the market, when in reality, consumer discretionary companies such as Best Buy or Home Depot were the actual root of the market movement. Instead of rate cuts, we should have taken measures to control inflation, and maintain a favorable exchange rate. Instead, we saw the complete opposite.

6.0 Conclusion

Ultimately, we have determined that just because one sector moves the most in a given time range, chances are that it does not actually have the greatest impact or explanatory power on overall market performance. My expectations were proven to be inaccurate; however, this information can certainly create profit opportunities or avoid losses for investors with the

perspective to realize these opportunities. By knowing and understanding that volatility is only the surface of the movement and that it does not identify which sector is the root of the market movement, we become investors with a deeper and more skeptical vision of investing.

These results also imply that taking corrective measures in periods of market turmoil may not address the actual rooted problem. Therefore, taking drastic action without sufficient information and analytics could further deteriorate markets, or delay recovery. If we look specifically at the most recent data range, which covers the credit crisis of the last few months, we can see that consumer discretionary stocks are actually the most impactful on the market. So in terms of policy implications, one must consider the possibility that rate cuts to bail out financial firms may not have been the most prudent decision. If consumer spending is what really drove the market, then the Fed should have focused more on inflation and the value of the dollar. Hindsight is 20/20, however, and perhaps this new information could be of some assistance in future policy decisions. While this paper doesn't offer a step-by-step solution to what the real determinants of market movement are, it does prove that there is more analysis required to create and implement an accurate and efficient solution. We have found that volatility does *not* equal explanatory power, and thus, finding the most volatile sector and attempting to ease this volatility is not the needed solution.

Appendix A: Variable Description and Data Source

Acronym	Description	Source
SPY	S&P 500 ETF, tracking the performance of the S&P 500	Yahoo! Finance
XLF	ETF designed to accurately track the Financial Sector	Yahoo! Finance
XLK	ETF designed to accurately track the Technology Sector	Yahoo! Finance
XLI	ETF designed to accurately track the Industrial Sector	Yahoo! Finance
XLV	ETF designed to accurately track the Healthcare Sector	Yahoo! Finance
XLY	ETF designed to accurately track the Consumer Discretionary Sector	Yahoo! Finance
XLP	ETF designed to accurately track the Consumer Staples Sector	Yahoo! Finance
XLE	ETF designed to accurately track the Energy Sector	Yahoo! Finance
XLU	ETF designed to accurately track the Utilities Sector	Yahoo! Finance
XLB	ETF designed to accurately track the Materials Sector	Yahoo! Finance

Appendix B – Range Breakdowns

Range #	From	To
1	1/10/2000	2/22/2000
2	2/22/2000	3/20/2000
3	3/20/2000	4/10/2000
4	4/10/2000	8/28/2000
5	8/28/2000	10/9/2000
6	10/9/2000	1/29/2001
7	1/29/2001	3/19/2001
8	3/19/2001	5/14/2001
9	5/14/2001	9/24/2001
10	9/24/2001	3/11/2002
11	3/11/2002	9/30/2002
12	9/30/2002	3/1/2004
13	3/1/2004	8/2/2004
14	8/2/2004	9/13/2004
15	9/13/2004	10/11/2004
16	10/11/2004	2/28/2005
17	2/28/2005	4/11/2005
18	4/11/2005	6/13/2005
19	6/13/2005	10/17/2005
20	10/17/2005	5/1/2006
21	5/1/2006	7/10/2006
22	7/10/2006	10/8/2007
23	10/8/2007	1/14/2008

Green dictates the ranges with valid regression outputs

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