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Abstract

This study will perform a sector-wise analysis of the reaction of stock markets to anticipated and unanticipated monetary policy changes. The analysis will be conducted by observing the reactions of the financial, energy, utilities, materials, industrials, consumer discretionary, consumer staples, information technology, and telecommunications sectors to changes in monetary policy. Since there is a more direct connection between Fed policy and the financial sector of the economy, this allows a hypothesis stating that the financial sector's stock prices will be the most responsive to changes in monetary policy. The results of this analysis and the conclusions derived from these results are reported in the final sections of this paper.

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I. Introduction

December 23, 1913 saw the creation of an organization that changed the future of economics in the United States. The "Federal Reserve Act", created the Federal Reserve Bank, which has considerable clout in the functioning of the economy today via the implementation of monetary policy. The success of the Federal Reserve's (Fed's) monetary policy is usually measured by looking at economic variables such as output, inflation and unemployment. These aggregate variables, however, are at best indirectly affected by the Federal Reserve's actions.

Ben Bernanke, the chairman of the Federal Reserve said, "The most direct and immediate effects of monetary policy actions, such as changes in the Federal funds rate, are on the financial markets" (Bernanke, 2005). Stock markets are financial representatives of the strength of the USA's economy. The New York Stock Exchange is the largest exchange in the world, with $2.674 billion in securities and a market capitalization of $25 trillion. Stock trading is the main way that America's companies finance their operations. The average dollar amount traded daily in the NASDAQ and Dow Jones is in the billions. As stated by The Enquirer, "More people invest in the stock markets in the USA than own pets or have college degrees" [The Enquirer, 2002]. One must keep in mind, that these people mentioned may not be individual investors, but also people who invest through their pension plans and through similar financial instruments like mutual funds. Even though they are not individual investors, they contribute to the stock market pool significantly.

The Federal Reserve's monetary policy is something that is scrutinized daily by investors in stock markets. Changes in monetary policy could affect the stock markets either adversely or favorably, depending on the direction of the change. The change in policy may be contractionary, such as a reduction in the money supply and a consequent rising of interest rates, or expansionary, such as an increase in the money supply and a consequent decrease in interest rates. These changes may be unanticipated or anticipated. Theories such as the present value of future cash flows about stock price valuation suggest that contractionary monetary policy will lower stock prices and vice versa, and that unanticipated policy changes affect the stock market more than anticipated ones due to the market's "forward looking" nature. The Fed funds futures rate helps determine whether policy was expected or unexpected and also allows us to see if the market is truly "forward looking" (when markets incorporate future changes in monetary policy into their stock valuation).

This study will perform a sector-wise analysis of the reaction of stock markets to anticipated and unanticipated monetary policy changes. The analysis will be conducted by observing the reactions of the financial, energy, utilities, materials, industrials, consumer discretionary, consumer staples, information technology, and telecommunications sectors to changes in monetary policy. Since there is a

more direct connection between Fed policy and the financial sector of the economy, this allows a hypothesis stating that the financial sector's stock prices will be the most responsive to changes in monetary policy. The results of this analysis and the conclusions derived from these results are reported in the final sections of this paper.

Section II presents the theoretical aspect of stock price valuation that forms the base for the analysis. Section III presents some similar literature on this topic that has been reviewed and has influenced this research. Section IV presents the data that I will be using to conduct the analysis; section V displays the empirical model that I will be using to test my hypothesis; section VI presents the results of my testing and lastly, section VII presents the conclusions that I can draw from this analysis, future policy implications and suggestions for research.

II. Theoretical Model

The most widely used theory for stock price valuation in modern financial literature is that of the present value of future cash flows. This theory is best explained by Crowder (2006), in his article "The interaction of monetary policy and stock returns".

Crowder provides us with the following equation for stock valuation:

Monetary policy changes affect this equation in two significant ways. First, policy can alter expected future cash flows (D_{t+j}) of the firm, therefore altering the return and pricing of the firm's stock. A monetary easing, a decrease in the federal funds rate, will increase the level of activity in the economy as a whole, which in turn raises the earnings of the firm, causing stock prices to rise. Monetary tightening will have the opposite effect.

$$P_{t+1} = E_t[\sum_{j=1}^{K}(1/(1+R_t))^{j} D_{t+j}] + E_t\left[(1/(1+R))^{K} P_{t+K}\right]$$

Where: P_{t+1} = Stock price; D_{t+j}= future expected cash flows;

E_t = expectations operator based on information;

R_t = rate of return; and

K = investor's time horizon or holding period.

The second way in which monetary policy affects this equation is through the discount rate used by the market participants. This idea is a more direct way of influencing the equation, as discount rates used by equity market participants are generally tied to market interest rates. A tighter monetary policy will increase the Federal funds rate, which causes stock prices to decline.

The only concept that is not considered in this model is the equity premium, which is defined as the excess return that an individual stock or the overall stock market provides over a risk-free rate. This excess return compensates investors for taking on the relatively higher risk of the equity market. The size of the premium will vary as the risk in a particular stock, or in the stock market as a whole, changes (i.e. high-risk investments are compensated with a higher premium.)

This problem, however, is resolved by Bernanke (2005) who states that the equity risk premium or equity premium will be incorporated in the R_t variable of the equation, as it is a general variable that accounts for almost all types of market risk. Some economists also argue that the presence of this equity premium in relation to monetary policy indicates that "(equity) risk premia might be overstated because all of the assets employed have exposures of the same sign to monetary policy" (Thorbecke, 1997). This argument suggests that excluding the equity premium from the analysis or accepting Bernanke's incorporation of it into the R_t variable of the equation would be the appropriate approach to take. However, this could present problems of an omitted variable bias. This potential problem must be kept in mind when interpreting the results.

III. Literature Review

The main conclusions of past literature that are most pertinent to my research are presented

in this section of the paper. A discussion of how these findings were incorporated into this analysis is also presented. There are a few problems and observations associated with the research question this project addresses. Theses problems are also dealt with in this section of the paper, by observing what other authors did to correct for them.

The most significant article for this paper was by Bernanke and Kuttner (2005). These economists perform an extensive analysis of the impact of monetary policy changes on equity prices. They claimed, as stated above, that the most direct impact of monetary policy changes was on financial markets, which led to the hypothesis for this paper. They were pioneers in using the Federal Funds Futures rate as an indicator for expected and unexpected policy changes, which is used for the same purpose in this research and is further analyzed to see whether stock markets are truly forward looking and incorporate changes in this rate.

Bernanke and Kuttner conduct the analysis using OLS regressions, and find that an unexpected 25 basis point cut in the Federal funds rate target is associated with a 1% increase in broad stock indexes. This result is set as a baseline estimate of how well the model presented in this paper accounts for the effects of monetary policy. They provide a sector-wise analysis as well, using portfolios developed by a previous study by Fama and French (1988). They conclude, contrary to intuition, that the high tech and telecommunications sectors are the most responsive to changes in monetary policy. The result is contrary to intuition because we assume a more direct connection between Federal Funds rate changes and the financial sector, not the technology sectors.

The second most significant study in this project is that of Ehrmann and Fratzscher (2004). They provide a comprehensive and sector-wise analysis of the effects of monetary policy changes on stock prices using a VAR methodology. They find that industries characterized by their relatively higher degree of cyclicality are the ones that react the most significantly to changes in monetary policy; this is because they are more sensitive to interest rates than non-cyclical industries. The conclusions drawn are that technology, communication and cyclical consumer goods industries are the most responsive to monetary policy changes. Average responses are observed in the financial, industrial and basic material sectors. The least responsive industries are food, agriculture and beverages. This study and Bernake (2005) are the only literature that directly relate to the analysis in this paper. This point is also noted by Ehrmann and Fratzscher (2004) themselves.

Deodola and Lippi (2005), Ganley and Salmon (1997) and Hayo and Uhlenbrock (2000) are three other studies that contributed significantly to this study. All these studies analyzed the effects of monetary policy changes on sector output. They developed specific measures for each industry's relative health and estimated a Vector Autoregression to incorporate monetary policy shocks to this health variable. While all six of these economists used similar techniques in their studies, their analyses differed greatly. Deodola and Lippi (2005) analyzed cross-sectoral effects of monetary policy in five OECD countries, including the USA; Hayo and Uhlenbrock (2000) estimated these effects in Germany only; and Ganley and Salmon (1997) presented their analysis for the UK economy.

These three studies are significant for the paper in that they provide real output effects of monetary policy changes, which directly relate to stock price changes, since stock prices are an excellent indicator of the well being of a firm, economy or sector. Including GDP in my study was considered, but this would pose some serious collinearity problems. This could bias the coefficient estimates and create instability in the results. Therefore, it was removed and another indicator of well being in the economy, namely unemployment, was added. An interesting fact to note here was that Deodola and Lippi (2005) find that the effects of monetary policy changes on similar industries across countries do not differ significantly. This means that the effects of a

monetary policy change on a particular industry in the German economy will be similar for the same industry of any other OECD country, such as the USA. Therefore, the findings from all three papers can be used in this analysis.

It should also be noted that considerable heterogeneity in the effects of monetary policy changes across industries within countries was observed in the three studies. This result allows the assumption that some sectors of the economy are more affected by monetary policy changes than others, which is the analytical base of the hypothesis for this research.

An issue that is encountered in this type of analysis is that of the causality of the relationship between monetary policy and stock prices. Flood (2006) finds that stock prices do not systematically predict output growth regardless of the monetary regime in effect, implying that the Federal Reserve does not react to stock market movements. He also illustrates the causality issue through the use of a Granger causality test, which proves that stock market movements do not cause changes in monetary policy, and that it is indeed the opposite (changes in monetary policy cause movements in the stock markets) that is true. This causality is therefore assumed to be true for this analysis.

A technical issue with this research question is the asymmetry of the effects of changes in monetary policy. Asymmetry is defined as "the possibility that equity price response to monetary policy depends on the direction of the action; or on the context in which it occurred" (Bernanke, 2005). Asymmetry in reactions of stock markets to monetary policy changes has been observed by various articles (Bernanke, 2005; Peersman, 2005; Jensen, 2002; Ehrmann, 2004) surveyed while researching this paper. An extensive analysis of this concept is done by Jensen and Mercer (2002). Although these authors do not explicitly state the concept of asymmetry, their results showcase it and they analyze reasons for its occurrence using an OLS regression analysis, involving market and company ß values. They find that during expansionary monetary policy periods, ß values have a positive and significant relation to stock returns, and during restrictive monetary policy, ß has a negative value. This finding means that different industry equities in the economy reacted differently to positive versus negative changes in the Federal funds rate, which is what asymmetry is. Asymmetry will be included in this analysis by the use of a dummy variable. This is explained in detail in Section V.

The other issue that is noted is the distinction between expected and unexpected monetary policy changes. This is done in the analysis by Bernanke and Kuttner (2005) where they used the Federal funds futures rates. They set a range of 25 basis points (the usual incremental change) and decided that if the effective Federal funds rate was within that range, the change would be considered an expected change. If not, the change would be classified as unexpected. I plan to follow their footsteps and use this classification technique in this paper's analysis.

Other studies that are worth mentioning are Bomfin (2003) and Patra (2006), which aided in confirming that this analysis had the right control variables and Campbell (2004) which aided in understanding the significance of inflation in this analysis.

This study adds to the existing literature by being one of the few to break down the effect of monetary policy changes into the economic sectors and analyze sector-wise elasticites of response. The study is also unprecedented in that it tries to provide reasons for the disparity in reactions by the different sectors via the monetary policy transmission mechanism.

IV. Data

The variables being used for this analysis include sector-wise stock indices, the Fed funds futures rate, the effective Federal funds rate, CPI (as a measure for inflation) and the unemployment rate. The data will be daily, so that it is relatively disaggregated. Deodola and Lippi (2000), indicate that the use of this relatively disaggregated data serves an important purpose, stating "disaggregated

data (is) more helpful in the understanding of monetary policy transmission mechanism than their aggregate counterpart." Therefore, the use of daily data will provide more accurate results due to the high level of disaggregation.

Unemployment and CPI-U are available on a monthly basis only, so daily values are estimated by carrying the monthly value through the days of the month. This is an appropriate approximation of the values because investors can only access this monthly data and are unlikely to observe and react to daily changes in these variables.

The daily sector-wise stock price data are obtained from the Dow Jones website (http://www.djindexes.com/mdsidx/index.cfm?event=showTotalMarketIndex
Data), which provides sector-wise stock indexes that are used in this study.

The Federal funds futures daily data is obtained from the Price-Data website, ([http://www.grainmarketresearch.com/eod_futures.cfm) in the form of a CD-ROM.

The effective Federal funds rate data is obtained from the Federal Reserve website [http://www.federalreserve.gov/Releases/h15/data.htm]. Since the rate is deemed effective, it is available daily and is not limited to days when the Federal Reserve changed monetary policy. Data that is restricted to days when the Federal Reserve changes policy can also be obtained from the same website. If that data is used, then the analysis conducted will be an event study, opposed to a continuous analysis. This paper will attempt to conduct both an event study analysis and a continuous analysis since data are so readily available.

The rest of the data variables are all used as controls in the analysis. Inflation is the first such variable, which is measured by the Consumer Price Index. The data for this variable is obtained from the U.S Bureau of Labor Statistics (http://www.bls.gov/cpi/). Two kinds of CPI statistics exist: CPI for urban wage earners and clerical workers (CPI-W), and the chained CPI for all urban consumers (CPI-U). Of the two types of CPI, the CPI-U is a better representation of the general public, because it accounts for about 87% of the population. Therefore, the CPI-U is used for this analysis.

The other control variable that is used in this analysis is the unemployment rate. This data is also obtained from the BLS website. This variable is used because it serves as a gauge of the overall performance of the economy and thereby acts as a control variable.

The graphical charts for all the data variables are presented in Appendix A of this paper, so as to provide a visual example of the analysis I will be conducting.

The data begins on January 31, 2001, and ends on October 22, 2007. There are two reasons why there is no data presented before 2001. The first is that the Dow Jones website only provides sectoral index data from 2001. Since this is the main variable in this analysis, the rest of the data is also restricted from 2001:1-2007:10. Another reason is a change in Federal Reserve Policy regarding the disclosure of monetary policy changes. On February 4, 1994, the Federal Reserve changed its disclosure policy and decided to immediately disclose monetary policy changes to the public once they were decided. Therefore, if the data originated before 1994, the analysis would have been severely impacted.

The other problem with this specific date range is the events of September 11, 2001 that sent the economy through turmoil. This event causes high levels of heteroscedasticity in my data and I will attempt to correct for it by using an appropriate statistical method or by removing the year 2001 from my dataset.

Literature reviewed for this project (Deodola and Lippi; Gulley and Bomfin) used other measures of monetary policy, including non-borrowed reserves and monetary aggregates (M1, M2). This analysis used the Federal funds rate because, by using its interaction with Fed Funds Futures data, it is easy to distinguish between anticipated and unanticipated policy shocks.

V. Empirical Model

OLS regressions are used to test the hypothesis proposed in this analysis. The elasticities of response for each of the relevant variables, i.e., the Federal funds rate and the Federal funds futures rate will be determined by taking a double log transformation. I will conduct separate regressions for each sector of the economy, which will allow us to focus on the responsiveness of each sector. The regression equation for each sector will resemble the one presented below:

The equation presented above is the generalized regression that will be run for each sector analyzed in this project. Since it is in the log-log form, the ß of each variable represent the variable's elasticity of response. This interpretation means that the ß value will be the most critical part of my project, since my hypothesis suggests that the financial sector of the market will be the most responsive, and therefore have the largest ß.

The ($sector_i$) variable represents the sector's stock index. The financial, energy, utilities, materials, industrials, consumer discretionary, consumer staples, health care, information technology and telecommunications sectors will be analyzed in this study. The first analysis will use continuous (daily) data. The second analysis will use an event study approach, which will involve the same regression equation but have restricted data that singles out individual days of policy change. Therefore, there will be 20 regressions in total; one for each sector (there are a total of 9 sectors being analyzed) and one set of sectoral analysis each for continuous data and event study data.

$$\ln sector_i = \alpha + \beta_{1,i} \ln FFR + \beta_{2,i} \ln FFF + \beta_{3,i} \ln CPIU + \beta_{4,i} UNEMP + \beta_{5,i} A + \beta_{6,i} E$$

The different variables included in the above equation are explained as follows and their hypothesized sign is also presented.

- FFR (-): This is the Federal funds rate that is observed. For the continuous analysis, the effective Federal funds rate will be used, which is the average of the interest rate used by brokerage traders. For the event study analysis, only the values released by the Fed on days of monetary policy changes will be used. The predicted sign of the response to this variable is negative because, by the formula for the present value of future cash flows, the interest rate is negatively related to price. So an increase in the Federal Funds rate is expected to reduce stock prices.
- FFF (+/-): This is the Daily Federal funds futures rate. It is the settlement price of futures contracts to the Federal funds rate, which is traded in the Chicago Exchange. It is an excellent predictor of the Federal funds rate for the economy. The variable has been included to see if the market is indeed forward looking. The reaction of the stock index is positive (and opposite to the Federal funds rate expected sign) since the futures themselves are prices. However, since these Futures are indeed prices of contracts that are estimators of the Federal funds rate, the expected response of stock prices may also be negative. In other words, this variable's effect on stock prices could go either way. If the response is significant it means that the market is forward looking since it incorporates changes in the Fed Funds Futures rate. If the response is not significant, the market is not forward looking since it does not incorporate changes in the futures rates.
- CPIU (+): An index of prices used to measure the change in the cost of basic goods and services in comparison with a fixed base period. This is the urban consumer related index, which represents the CPI for 87% of the population and serves as a popular measure for inflation. This is a control variable that accounts for nominal changes in the stock price. The data is available monthly and the value for the month is applied to all the days in the month.
- UNEMP (-): This is the unemployment rate for the US economy, and it serves as an indicator to its well being. A better economy usually is complemented by low unemployment. Since economic well being is also reflected by stock prices, they should be negatively related to

unemployment. The data is available monthly and the value for the month is applied to all the days in the month.

• A (+/-): This is the dummy variable for indicating Asymmetry. It takes the value of 1 if the policy change is positive and 0 if the policy change is negative. The expected sign could be positive or negative, depending on the industry.

• E (+/ 0): This is the dummy variable for the expectations of monetary policy. It takes the value of 1 if the policy change is expected and takes the value of 0 if the policy change is unexpected. The expected sign is theoretically positive, but may also be so small that it would be 0. This is because if the policy change is expected, we could assume that the change is already incorporated into the stock market price.

Now that a base has been set to conduct this analysis, regressions will be run following the equation presented above. The next section includes the results of the regressions that will be run.

VI. Results

The results tables for both analyses (continuous and event-study) are presented in Appendix B of this paper. Tables 1 and 2 report results that show a good level of significance for most variables and most of the signs of the variables are also as expected. However, those results have a high degree of autocorrelation. The average Durbin-Watson statistic for the regressions run in table 1 is 0.05 and those for table 2 are 0.78. This statistical disease usually is prevalent with time series data and results in biased t-statistics. This means the results will show things that are truly insignificant as significant. Since this autocorrelation was present, a solution getting rid of it had to be devised.

The autocorrelation problem can be corrected. A procedure called Cochrane Orcutt can be used to correct for autocorrelation. This is the procedure that I use to correct for autocorrelation.

The corrected Cochrane Orcutt results are presented in tables 3 and 4. As can clearly be seen, the results lose their significances and their R-square values. However, it is observed that CPI has a consistently high level of significance. This is possibly because inflation is increasing consistently from 2001 to 2007 and so are the stock prices. Therefore, the CPI variable is only explaining a trend. This prompted me to remove it from the analysis.

The final tables, 5 and 6, presented the final results of the OLS regressions. These were Cochrane Orcutt regressions that were run without the inclusion of CPI. Of the tables provided, the results of 3-6 are eligible for discussion.

The results seen do not agree with the hypothesis presented in the paper. It is seen that the utilities industry is the most responsive to changes in the Federal funds rate. This may be due to the high level of regulation in the utilities industry, and I assume that the regulatory authorities react to changes in the Federal funds rate when they set their prices. The Federal funds futures rates are also mostly insignificant, implying that the market is not forward looking. It is also seen that asymmetry and the anticipation levels of policy changes do not play a significant role in the stock price changes.

The results seem to be inconsistent with the theories provided by the authors reviewed in the literature review. I feel that the correction for autocorrelation significantly affected the results so as to alter the t-statistics until they were mostly insignificant. The solution to this problem may lie in using a different statistical model, which is specifically geared towards time-series analysis, such as a GARCH, ARCH or VAR model. These models were frequently used by authors that I reviewed for the literature review of this paper and since they came up with good results, I hope to do so too in the future.

VII. Conclusion

In conclusion, it is seen that OLS regression is not an appropriate technique to conduct such an analysis. The autocorrelation in the dataset

biases the estimates and once it is corrected for, the t-statistics lose their significance. The results, although weak still suggest that the utilities sector of the economy is somewhat sensitive to interest rate fluctuations.

For future research, I plan to use a VAR/GARCH/ARCH technique that will allow me to conduct this analysis more appropriately since these models are specifically geared towards financial time series data.

One policy implication may lie in the fact that the utilities sector stock index reacted to the Fed funds rate. The implication suggests that the Federal Reserve should set its interest rate with the utilities prices in mind. They should observe (according to the results) that a change in the Fed Funds rate by 0.2% will result in a 1% change in the sectoral index.

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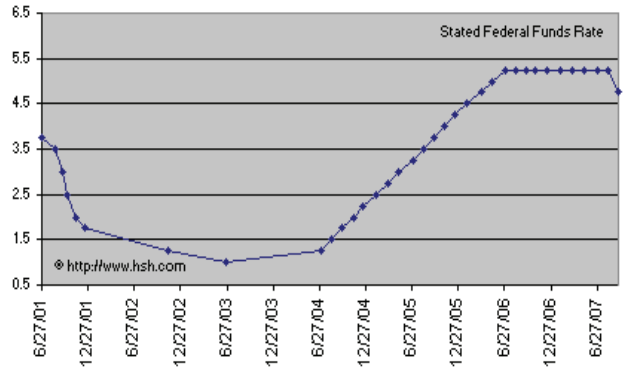
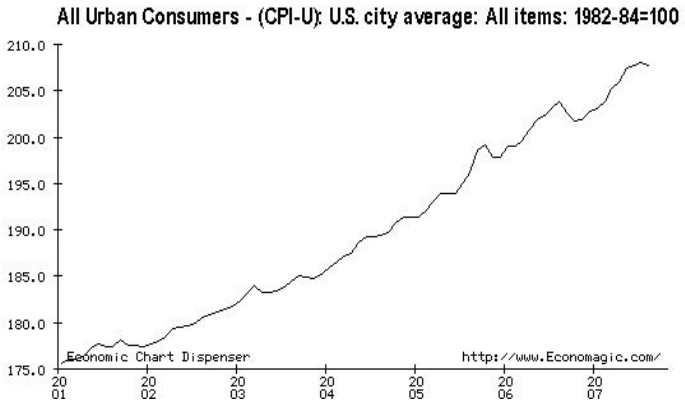
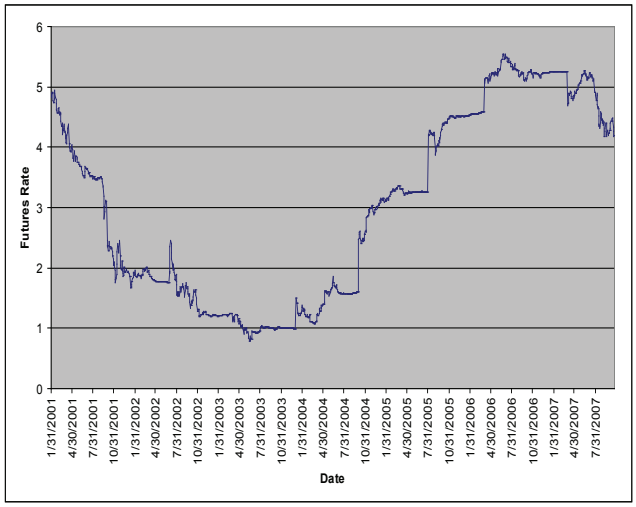
Appendix A: Federal Funds Rate



Appendix A: CPI



Appendix A: Federal Funds Futures



Appendix A: Unemployment Rate

Appendix B: Results Tables

Table 1

Continuous study using daily data (Autocorrelation present)

Sector	Federal Funds Rate	Fed Funds Futures	CPI	Unemployment	AsyPositive	Expected	R-square
Basic Materials	-0.535***	0.551***	0.773***	-0.221***	-0.006	-0.075***	0.864
	(-8.175)	(7.747)	(67.996)	(-8.220)	(.691)	(-5.102)	
Consumer Goods	-0.812***	0.743***	0.820***	-0.220***	-0.006	-0.032**	0.854
	(-11.984)	(10.086)	(69.647)	(-7.900)	(-0.672)	(-2.089)	
Consumer Services	-0.609***	0.423***	0.384***	-0.709***	0.006	-0.007	0.661
	(-5.901)	(3.767)	(21.426)	(-16.685)	(0.425)	(-0.281)	
Financials	-0.550***	0.338***	0.719***	-0.504***	0.001	0.001	0.842
	(-7.799)	(4.409)	(58.682)	(-17.376)	(0.102)	(0.049)	
Industrials	-0.456***	0.448***	0.471***	-0.560***	0.005	0.007	0.820
	(-6.602)	(5.483)	(36.067)	(-18.104)	(0.500)	(0.424)	
Oil and Gas	0.036	0.259***	0.687***	-0.113***	0.005	0.008	0.961
	(1.021)	(6.797)	(112.867)	(-7.872)	(1.082)	(0.999)	
Technology	-0.394***	0.011	0.024	-1.082***	0.010	0.052**	0.557
	(-3.346)	(0.084)	(1.175)	(-22.303)	(0.613)	(1.962)	
Telecom	-0.333***	0.589***	-0.413***	-0.727***	0.035**	-0.100***	0.671
	(-3.274)	(5.321)	(-23.400)	(-17.373)	(2.485)	(-4.331)	
Utilities	-0.034	0.382***	0.199***	-0.468***	0.012	0.001	0.865
	(-0.523)	(5.403)	(17.633)	(-17.475)	(1.383)	(0.058)	

Open values are the elasticities of response, Values in parentheses are t-statistics
* = significant to the .1 level, ** = significant to the .05 level and *** = significant to the .01 level

Table 2

Case study using only days when FOMC meets (Autocorrelation Present)

Sector	Federal Funds Rate	Fed Funds Futures	CPI	Unemployment	Asymmetry	Expected	R-square
Basic Materials	-0.077	0.067	3.355***	-0.515*	-0.025	0.008	0.863
	(-0.388)	(0.329)	(11.867)	(-1.669)	(-0.824)	(0.183)	
Consumer Goods	-0.205*	0.175	2.437***	-0.362*	-0.012	0.009	0.867
	(-1.556)	(1.300)	(13.000)	(-1.768)	(-0.609)	(0.330)	
Consumer Services	-0.194	0.136	1.137***	-0.963***	-0.013	-0.001	0.647
	(-1.057)	(0.726)	(4.359)	(-3.381)	(-0.462)	(-0.030)	
Financials	-0.180	0.112	2.334***	-0.817***	-0.008	0.007	0.853
	(-1.181)	(0.719)	(10.759)	(-3.447)	(-0.331)	(0.209)	
Industrials	-0.132	0.109	1.899***	-1.088***	-0.010	0.016	0.796
	(-0.658)	(0.530)	(6.627)	(-3.477)	(-0.307)	(0.389)	
Oil and Gas	0.112	0.053	4.770***	-0.423	-0.004	0.028	0.960
	(0.674)	(0.311)	(20.126)	(-1.637)	(-0.153)	(0.802)	
Technology	-0.166	0.029	0.139	-2.057***	-0.029	0.015	0.530
	(-0.518)	(.088)	(0.305)	(-4.131)	(-0.589)	(0.222)	
Telecom	-0.354	0.501*	-1.225**	-1.211**	-0.157***	-0.019	0.718
	(-1.235)	(1.713)	(-3.003)	(-2.721)	(-3.543)	(-0.327)	
Utilities	-0.036	0.178	1.042***	-0.867**	-0.049*	0.026	0.863
	(-0.192)	(0.927)	(3.886)	(-2.962)	(-1.671)	(0.660)	

Open values are the elasticities of response, Values in parentheses are t-statistics
* = significant to the .1 level, ** = significant to the .05 level and *** = significant to the .01 level

Table 3

Continuous study using daily data (Cochrane Orcutt)

Sector	Federal Funds Rate	Fed Funds Futures	CPI	Unemployment	Asymmetry	Expected	R-square
Basic Materials	0.002	0.005	0.604*	0.018	0.0002	0.001	.002
	(0.197)	(0.405)	(1.734)	(0.280)	(0.053)	(0.512)	
Consumer Goods	0.001	0.012*	0.439**	-0.019	0.000	0.000	0.005
	(0.195)	(1.562)	(2.102)	(-0.499)	(-0.481)	(-0.123)	
Consumer Services	0.008	0.006	0.210	-0.060	0.000	0.000	0.002
	(1.055)	(0.480)	(0.716)	(-1.068)	(0.683)	(-0.160)	
Financials	0.004	0.017*	0.397	0.026	0.000	0.001	0.003
	(0.522)	(1.506)	(1.337)	(0.466)	(0.311)	(0.736)	
Industrials	0.003	0.004	0.525*	-0.017	0.000	0.001	0.002
	(0.370)	(0.355)	(1.705)	(-0.292)	(-0.236)	(0.424)	
Oil and Gas	0.003	0.009	0.943**	0.151**	0.000	0.001	0.008
	(0.315)	(0.666)	(2.519)	(2.228)	(-0.524)	(0.655)	
Technology	-0.005	0.001	1.291**	0.046	0.000	0.002	0.006
	(-0.396)	(0.028)	(3.038)	(0.516)	(-0.419)	(1.051)	
Telecom	-0.006	0.025*	0.719**	0.018	0.000	-0.001	0.005
	(-0.596)	(1.782)	(2.000)	(0.259)	(-0.045)	(-0.801)	
Utilities	0.014**	-0.004	0.939***	0.042	0.000	0.000	0.009
	(1.842)	(-0.319)	(3.188)	(0.768)	(-0.255)	(0.086)	

Open values are the elasticities of response, Values in parentheses are t-statistics

* = significant to the .1 level, ** = significant to the .05 level and *** = significant to the .01 level

Table 4

Case study using only days when FOMC meets (Cochrane Orcutt)

Sector	Federal Funds Rate	Fed Funds Futures	CPI	Unemployment	AsyPositive	Expected	R-square
Basic Materials	0.132	-0.077	3.111***	-0.077	0.007	-0.002	0.531
	(0.891)	(-0.563)	(4.385)	(-0.200)	(0.173)	(-0.069)	
Consumer Goods	0.002	0.028	2.020***	0.023	-0.007	0.004	0.383
	(0.026)	(0.347)	(3.496)	(0.094)	(-0.262)	(0.247)	
Consumer Services	-0.103	0.112	1.244*	-0.333	-0.007	-0.021	0.242
	(-0.751)	(0.891)	(1.848)	(-0.935)	(-0.164)	(-0.900)	
Financials	-0.018	0.054	2.089***	-0.146	0.001	-0.011	0.488
	(-0.141)	(0.445)	(3.960)	(-0.446)	(0.016)	(-0.491)	
Industrials	0.005	0.030	2.134**	-0.461	0.012	-0.005	0.464
	(0.035)	(0.212)	(3.092)	(-1.164)	(0.284)	(-0.171)	
Oil and Gas	0.216*	-0.0007	5.012***	0.045	-0.005	0.007	0.867
	(1.511)	(-0.001)	(9.474)	(0.127)	(-0.135)	(0.271)	
Technology	-0.158	0.106	1.640*	-0.668	-0.038	-0.007	0.170
	(-0.644)	(0.462)	(1.664)	(-1.078)	(-0.560)	(-0.162)	
Telecom	-0.300*	0.216*	2.149	-0.149	-0.027	-0.024	0.099
	(-1.660)	(1.380)	(1.357)	(-0.314)	(-0.453)	(-0.858)	
Utilities	0.123	0.077	2.081**	0.245	-0.013	0.004	0.335
	(0.996)	(0.718)	(1.997)	(0.758)	(-0.313)	(0.225)	

Open values are the elasticities of response, Values in parentheses are t-statistics

* = significant to the .1 level, ** = significant to the .05 level and *** = significant to the .01 level

Table 6

Continuous study using daily data(Cochrane Orcutt)

Sector	Federal Funds Rate	Fed Funds Futures	Unemployment	Asymmetry	Expected	R-square
Basic Materials	0.002	0.004	0.023	0.000	0.001~	0.003
	(0.186)	(0.303)	(0.366)	(0.138)	(0.528)	
Consumer Goods	0.001	0.012*~	-0.017	0.000	0.000	0.002
	(0.217)	(1.485)	(-0.436)	(-0.363)	(-0.113)	
Consumer Services	0.008~	0.005	-0.058	0.000	0.000	0.002
	(1.065)	(0.454)	(-1.047)	(0.725)	(-0.157)	
Financials	0.004	0.017*~	0.027	0.000	0.001	0.002
	(0.544)	(1.465)	(0.497)	(0.390)	(0.740)	
Industrials	0.003~	0.003	-0.014	-0.0006	0.001	0.003
	(0.391)	(0.295)	(-0.250)	(-0.141)	(0.431)	
Oil and Gas	0.004	0.009	0.152***~	0.000	0.001	0.004
	(0.388)	(0.639)	2.241	(-0.359)	(0.656)	
Technology	-0.003	0.001	0.043	0.000	0.002~	0.001
	(-0.265)	(0.068)	(0.482)	(-0.226)	(1.040)	
Telecom	-0.005	0.025**~	0.016	0.0005	-0.001	0.002
	(-0.507)	(1.804)	(0.229)	(0.096)	(-0.806)	
Utilities	0.014***~	-0.004	0.044	-0.0003	0.000	0.003
	(1.904)	(-0.391)	(0.813)	(-0.062)	(0.094)	

Open values are the elasticities of response, Values in parentheses are t-statistics, ~ indicates most significant
* = significant to the .15 level, ** = significant to the .1 level and *** = significant to the .05 level

Table 7

Case study with only FOMC meeting days (Cochrane Orcutt)

Sector	Federal Funds Rate	Fed Funds Futures	Unemployment	AsyPositive	Expected	R-square
Basic Materials	0.138~	-0.088	-0.086	0.021	0.006	0.034
	(0.949)	(-0.699)	(-0.231)	(0.427)	(0.280)	
Consumer Goods	-0.015	0.019	-0.005	-0.011	0.009~	0.034
	(-0.180)	(0.274)	(-0.024)	(-0.394)	(0.709)	
Consumer Services	-0.057	0.115	-0.353~	-0.008	-0.020	0.104
	(-0.423)	(0.930)	(-0.979)	(-0.183)	(-0.888)	
Financials	0.012	0.037	0.021	-0.046	-0.008~	0.010
	(0.094)	(0.347)	(0.065)	(-0.310)	(-0.389)	
Industrials	0.080	0.032	-0.515~	0.017	-0.003	0.171
	(0.515)	(0.229)	(-1.239)	(0.335)	(-0.112)	
Oil and Gas	0.184~	-0.032	0.107	-0.003	0.018	0.056
	(1.180)	(-0.243)	(0.273)	(-0.063)	(0.755)	
Technology	-0.081	0.103	-0.883*~	-0.024	-0.006	0.174
	(-0.328)	(0.430)	(-1.442)	(-0.383)	(-0.128)	
Telecom	-0.211	0.248*~	-0.293	-0.046	-0.023	0.075
	(-1.192)	(1.552)	(-0.620)	(-0.733)	(-0.777)	
Utilities	0.200**~	0.103	0.062	-0.025	0.006	0.367
	(1.623)	(0.361)	(0.187)	(-0.610)	(0.300)	

Open values are the elasticities of response, Values in parentheses are t-statistics, ~ indicates most significant
* = significant to the .15 level, ** = significant to the .1 level and *** = significant to the .05 level