

Federal Reserve Policy and the Intraday Impact of Economic Releases on US Equity Markets: 2000-2015

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Executive Summary

Financial analysts, economists, and policy makers often hypothesize about economic indicators and expect the release of economic indicators to influence financial-market volatility, volume, prices, and rates of return. Among the more important economic indicators investors anxiously await are economic releases on US jobs, the consumer price index (CPI), and gross domestic product (GDP). It is assumed that investors adjust their security valuations according to the data released relative to market expectations. Market movements may occur when organizations release indicators that are significantly above or substantially below market expectations. These movements may be greater immediately after the announcement then regress toward pre-announcement prices. For example, if a released indicator points to improved profit growth for corporations above that expected, one might anticipate that equity prices would spike initially then fall gradually but remain higher than before the announcement.

While past research has examined macroeconomic announcement effects, the present study examines intraday announcement effects, especially in light of recent unprecedented Federal Reserve actions stemming from the US economic downturn beginning in 2008. These actions include a funds rate between 0 and 0.25 percent; and the first, second, and third rounds of quantitative easing (QE1, QE2, and QE3), which ballooned the Fed's balance sheet of bonds from \$900 billion to almost \$4.5 trillion by the time the programs ended in 2014. This study investigates the intraday effects of a realized "expectation differential" on equities, as proxied by the S&P 500, and compares these to interday effects. Additionally, the present study examines whether the Fed's policy stance and trend change those relationships.

Finding a relationship between the expectation differential and trends in the financial markets would provide useful information about how macroeconomic indicators affect securities pricing. Furthermore, knowledge of an expectation-differential effect could lead to superior returns for investors who project a different indicator value than the market consensus. Also, understanding how intraday and interday effects differ could allow investors to time the market after a macroeconomic indicator is released. With a more accurate indicator estimate, an investor could anticipate market movements resulting from the indicator's release, potentially taking advantage of price movements after the release. On the other hand, concluding that financial markets do not move when an economic indicator's actual value differs significantly from the expected value could provide further evidence for the efficient market hypothesis (EMH), which states that market prices incorporate all relevant market information in advance of any announcement. According to the EMH, no significant market movements should occur as a result of a data release since the market has already incorporated any deviations from expected values.

Introduction

Previous research has concluded that government monetary policy influences macroeconomic announcement effects on financial markets. Additional research has shown that markets only react to surprise portions of announcements. However, these studies were completed prior to 2000 and the aggressive and unprecedented actions by the Federal Reserve (Fed) stemming from the 2008-09 economic downturn. The hypothesized macroeconomic announcement effects on bond and equity markets follow a simple pattern: if the economy, as measured by the data in the release, is better than anticipated by the market consensus, equity prices are likely to trend upward for the day and bond prices are likely to head lower for the day. However, such simplistic reactions may not actually hold and likely differs according to the interest rate policy stance of the Fed. Further, the initial effect may be significantly different than the measured effect at market

close. As such, this paper examines and quantifies how the Fed's unprecedented policy actions since 2000 had on macroeconomic announcement effects. This study concludes that macroeconomic announcement effects on equity markets were most significant in the first ninety minutes after the announcement.

The remainder of this study will examine S&P market data and Federal Reserve interest rate policy to determine whether the impacts of economic announcements differ over the course of the announcement date. In that regard, Table 1 lists the description of the terms used in the remainder of this paper.

In Table 2, the total period 2000-2015 is broken down into Fed policy intervals based on definitions contained in Table 1. As presented, the shortest time interval was 106 days between September 1, 2008 and December 16, 2008 when the Fed maintained a policy stance of monetary accommodation with declining funds rate. The longest time interval was between December 16, 2008 and

Table 1: Terminology

Term	Definition
Period of accommodative Fed funds rate	The actual federal funds rate was less than the average from 2000 to Aug. 2016 of 1.83%
Period of restrictive Fed funds rate	The actual federal funds rate was greater than the average from 2000 to Aug. 2016 of 1.83%
Direction of Fed funds rate is lower	The most recent change to the intended Fed funds rate, and the change immediately preceding the most recent change, were both rate decreases
Direction of Fed funds rate is higher	The most recent change to the intended Fed funds rate, and the change immediately preceding the most recent change, were both rate increases
Direction of Fed funds rate is stable	The most recent change to the intended federal funds rate was a rate increase, or the change immediately preceding the most recent change was a rate increase, but not both.
Positive announcement surprise	The data contained in the macroeconomic indicator release beat the market consensus (bullish news)
Negative announcement surprise	The data contained in the macroeconomic indicator release did not meet the market consensus (bearish news)

Table 2: Time periods of Federal Reserve policy

Period Start	Period End	# of days	Policy Trend	Policy Stance
1/1/2000	5/16/2000	136	Rising	Restrictive
5/16/2000	1/3/2001	232	Stable	Restrictive
1/3/2001	12/1/2001	332	Declining	Restrictive
12/1/2001	6/25/2003	571	Declining	Accommodative
6/25/2003	6/30/2004	371	Stable	Accommodative
6/30/2004	11/1/2004	124	Rising	Accommodative
11/1/2004	6/29/2006	605	Rising	Restrictive
6/29/2006	9/18/2007	446	Stable	Restrictive
9/18/2007	9/1/2008	349	Declining	Restrictive
9/1/2008	12/16/2008	106	Declining	Accommodative
12/16/2008	12/17/2015	2,557	Stable	Accommodative
12/17/2015	Present	319	Rising	Accommodative

Figure 1: S&P 500 Index closing price by monetary policy period, Jan. 3, 2000-Sept. 1, 2016



December 17, 2015, or 2,557 days, when the Fed maintained a policy stance of accommodative, but with stable rates.

Table 3 lists annualized rates of return for S&P 500 and the yield on the 10-Year U.S. Treasury bond. In terms of policy direction, investors achieved the highest yields for stocks during a period of stable funds rate. Perhaps contrary to expectations, the

investors earned the lowest or negative returns during a period of declining rates. Of course, this is due to the likelihood that the Fed is lowering the funds rate due to withering economic prospects including corporate profitability.

Bond investors, as expected, earned the greatest returns during periods of the lowest returns to stocks, or declining funds rate.

However, contrary to expectations, bond holders earned their lowest returns during periods of stable funds rates. One would expect returns to be the lowest in periods marked by rising funds rate when the Fed is attempting to prevent higher inflation rates.

For policy direction and policy type, the highest-yielding Fed stance for stocks was accommodative-stable and for bonds was accommodative-declining. The worst period for stock returns was accommodative-declining and for bonds was accommodative-stable.

Table 3: Rates of return from January 1, 2000 to May 26, 2016

Fed policy stance	Annualized rate of return (median yield)
	S&P 500
Declining funds rate	-16.6%
Rising funds rate	3.7%
Stable funds rates	13.1%
Accommodative	1.4%
Restrictive	-5.2%
Accommodative-stable	13.1%
Accommodative-declining	-38.5%
Accommodative-rising	1.4%
Restrictive-stable	1.6%
Restrictive-declining	-16.6%
Restrictive-rising	4.7%
Total full period	3.22%
Source: Yahoo, http://finance.yahoo.com	
Note: Returns do not consider transactions costs	

(Results) Equity Values, Fed Policy and Announcement Impacts

In general, intraday macroeconomic announcement effects on equity markets did not follow the expected pattern from 2000-2015. Equity markets had an unexpected intraday reaction to macroeconomic

announcements 58 percent of the time, compared to an unexpected interday reaction 64 percent of the time. Unexpected macroeconomic announcement effects were more likely when the indicator fell short of the market consensus. An unexpected market reaction was most likely to occur during a period of declining intended federal funds rates, and least likely to occur during periods of stable rates. An unexpected market reaction was equally likely to occur in response to an unemployment rate or CPI release, and less likely to occur in response to a GDP release. Unexpected reactions were more likely to occur while the Fed had an accommodative monetary policy stance.

In order to determine whether equity market reactions to macroeconomic indicator releases differ at different times of day after the Federal Reserve's most recent expansionary policies, data were collected from GDP, CPI, and unemployment rate releases. Additionally, Standard & Poor's 500 Index data were collected for the release dates, and five trading days prior to and after the release dates from 2000 through September 2016.

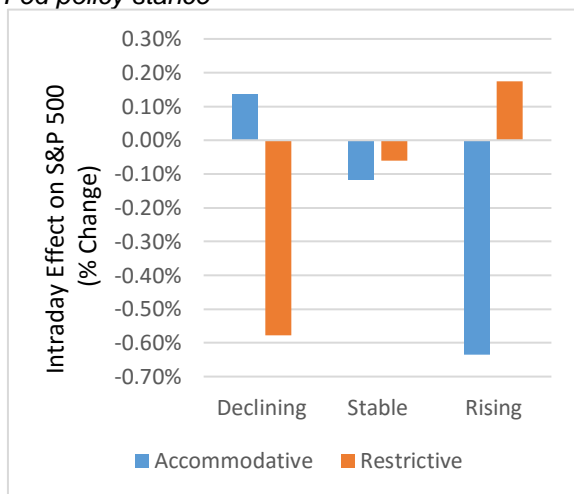
Individual releases were categorized by whether indicators were worse than, equal to, or better than the market consensus. The intraday change was calculated as the difference between the release date's opening price and the price at 11:00 am ET. The market trend was calculated as the average intraday change of the five trading days before and after the release to find reactions not consistent with the expected pattern. The macroeconomic announcement effect was calculated as the difference of intraday change and the market trend. The average announcement effect for each category of Fed policy stance and trend was observed to determine whether expected intraday

macroeconomic announcement impacts occurred, as defined in the introduction. Further, interday announcement impacts were also observed and compared to intraday impacts, to determine whether the intraday impact increased, stabilized, or dissipated after the initial market shock.

Effects of Differences in the State of the Economy

Boyd, Jagannathan, and Hu (2001) found that a positive surprise in the unemployment rate decreases stock prices during recessions but increases stock prices during expansions. This study examined positive surprises in unemployment rate during each type of Federal Reserve monetary policy, as shown in Figure 2. A positive surprise in the unemployment rate only caused equity markets to trend higher during periods of declining and accommodative or rising and restrictive Fed funds rates. Thus, one could conjecture that a positive surprise has a positive impact when it reinforces Fed policy objectives. Further, a positive surprise in the unemployment rate usually decreases intraday stock prices regardless of the state of

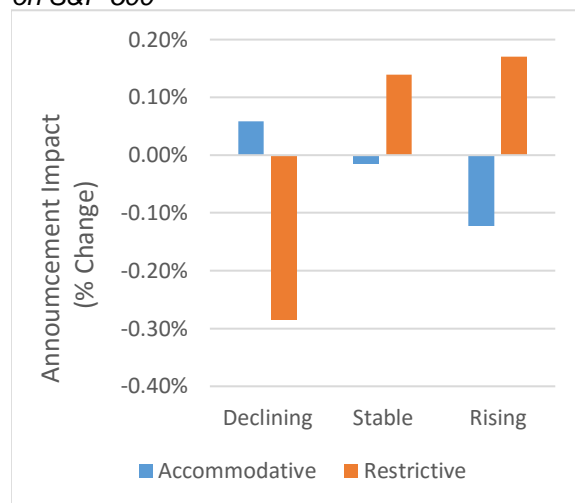
Figure 2: Intraday impact of positive unemployment rate surprises on the S&P 500 by Fed policy stance



the economy, contradicting the conclusion of Boyd, Jagannathan, and Hu.

Christiansen and Rinaldo (2007) found that the effects of macroeconomic announcements were much greater during recessions for both bond and equity markets. However, Poitras's (2004) research indicates that even though announcements do have an effect on the S&P 500, the effects do not differ in alternate states of the economy. As shown in Figure 3, his study found that the average effect on equity markets was greatest during periods of declining, restrictive rates, followed by rising, restrictive rates. Negative announcement impacts were most likely to occur during

Figure 3: Surprise announcement intraday effect on S&P 500



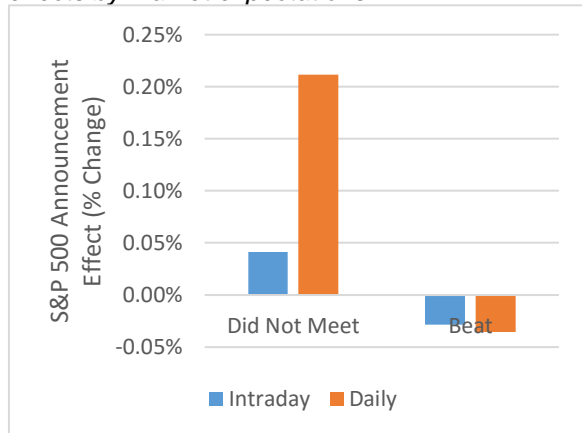
periods of accommodative rates.

Effects of Bad News vs. Good News

Andersen et al. (2003) found a "sign effect" that bad announcement surprises have a greater impact than good announcement surprises, an asymmetrical market reaction. This is consistent with the economic theory of loss aversion which states that people prefer avoiding large losses to realizing large gains. From 2000 to 2015, intraday and interday negative surprise announcement effects (bad

news) were both greater than positive surprise effects, by almost 1.5 and over 5 times greater, respectively. These observed effects support their conclusion that a sign effect occurs.

Figure 4: Intraday and daily announcement effects by market expectations

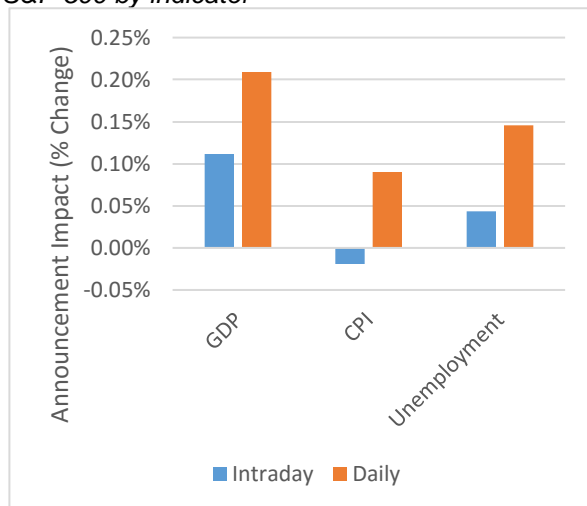


Additionally, this shows that announcement impacts continue to become more significant throughout the day.

Effect of Announcements on Equity Returns

Kim, McKenzie, and Faff also found that few announcements significantly affected the equities markets. However, surprises in CPI correlated very strongly and positively with

Figure 5: Surprise announcement effects on the S&P 500 by indicator



stock market returns. For both intraday and daily announcement impacts, for all three announcements observed in this study, GDP announcements had the greatest average intraday effect on equities markets, followed by unemployment rate releases. The average effect of an CPI surprise was the least, contradicting Kim, McKenzie, and Faff's conclusions. Again, announcement effects followed the pattern of becoming more significant as the day went on.

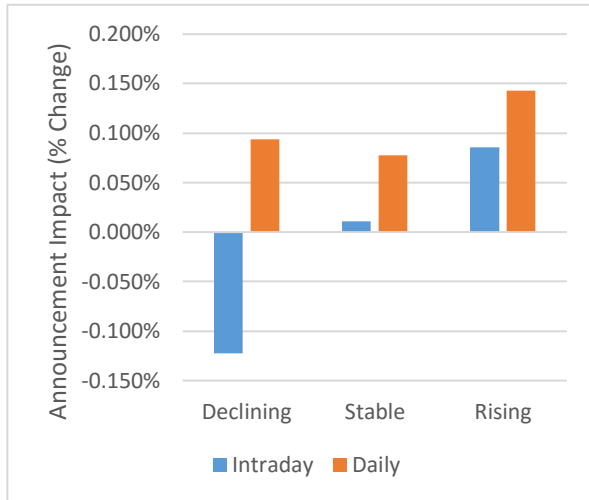
Bernanke and Kuttner (2005) discovered that a 0.25 percent cut in the Federal Funds rate target tended to lead to a 1 percent increase in broad stock indices. Bernanke and Kuttner believe that their findings suggest that monetary policy surprises affect the equity markets through its effects on expected future excess returns or on expected future dividends. The average intraday and interday effects of surprise announcements on equity markets from 2000 to 2015 were greatest during periods when rates were rising.

The intraday effect was least when rates were declining, while the interday effect was least when rates were stable. The intraday announcement effect when rates were declining was negative, while all others were positive. If Bernanke and Kuttner are correct, these findings show that equity markets expect greater future excess returns and dividends during periods of rising intended federal funds rates, not just on the day of a decrease. Further, when rates were declining the intraday effect, -0.122 percent, reversed and increased to 0.094 percent by market close, breaking from the pattern.

Poitras' study found that announcement releases from government surveys could not explain even 2 percent of the daily change in the S&P 500, but that the change in the discount rate alone could explain more than 9

percent of the S&P 500. Poitras believes this indicates that market participants give greater value to changes in public policy than they do to surveys giving historical information.

Figure 6: Average surprise announcement effect of S&P 500



Intraday vs. Daily Announcement Effect

Figure 7 shows intraday and daily announcement effects, classified into twelve

groups by the Fed’s policy stance and trend on the release date, as well as whether or not the macroeconomic release did not meet or beat the market’s expectations. The most significant average interday announcement impact, trending up by 1.170 percent, occurred during periods of declining and accommodative rates when the indicator fell short of expectations. The most significant average intraday announcement impact was a downward trend of -0.437 percent, when the indicator did not meet expectations during periods of restrictive and declining rates. Notably, both the interday and intraday effects were more significant if the indicator released did not meet the market’s consensus.

Of the twelve groups shown in Figure 8, the interday effect was more significant than, and had the same sign as, the intraday effect in seven groups. For example, during periods of accommodative and declining rates

A sign change occurred in two of the twelve groups, and the interday effect was more significant than the intraday effect in both

Figure 7: Intraday and daily announcement effects by Fed policy, policy trend, and market expectations

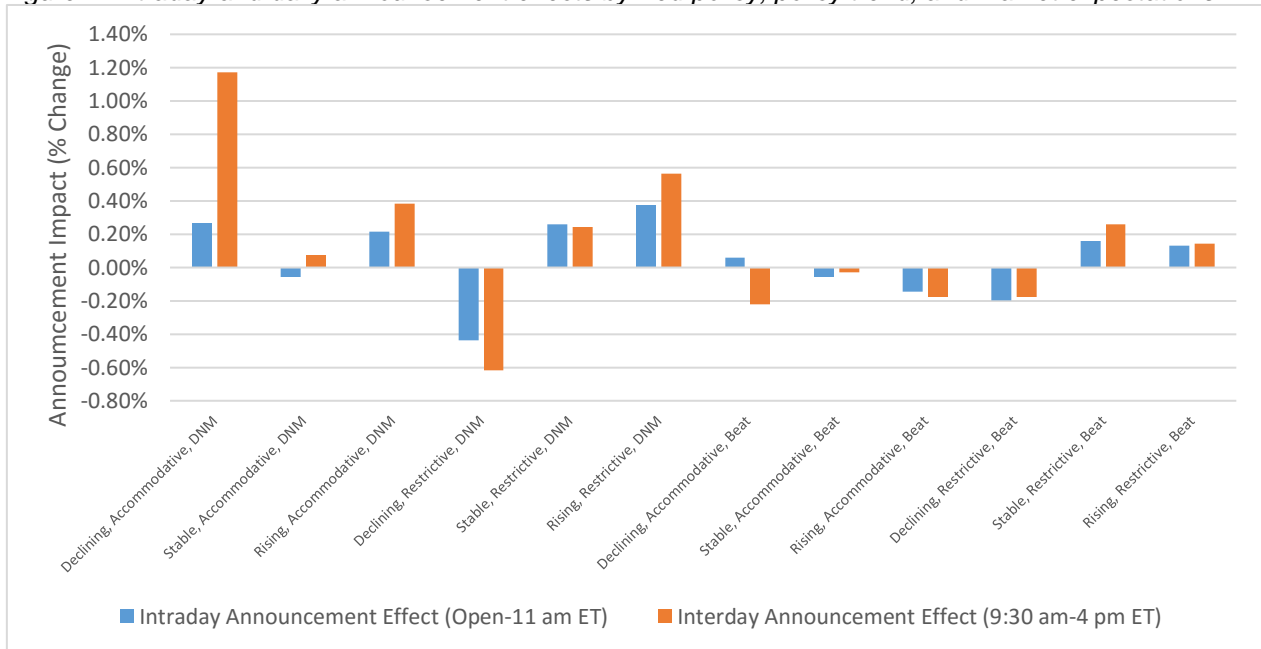
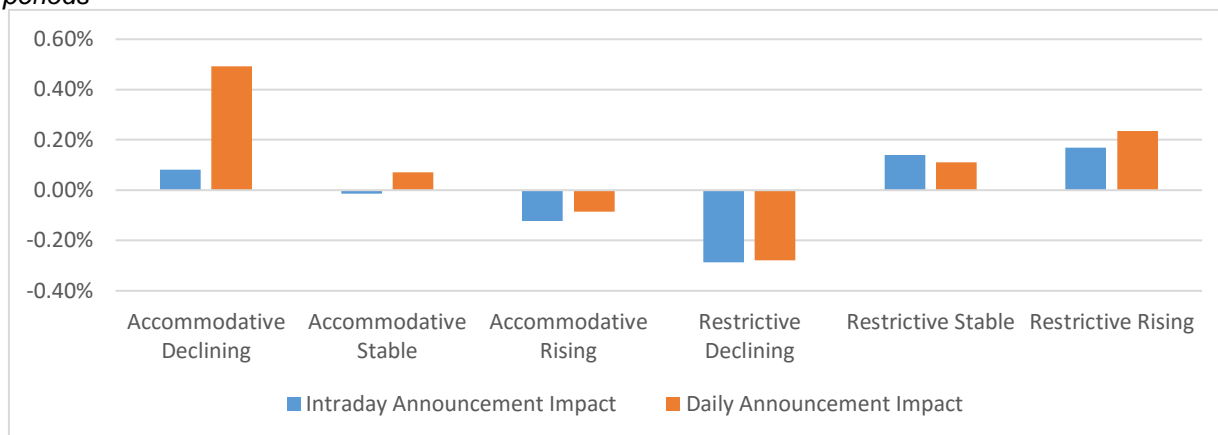


Figure 8: Intraday and daily announcement effects during different Fed policy stance and policy trend periods



instances. For example, during periods with accommodative and declining rates, when the indicator beat the market’s expectations, the average intraday effect was positive while the average interday effect was negative. In this case, the initial price shock occurs as expected, trending upwards by an average of 0.060 percent on better than expected news. However, the intraday effect did more than dissipate, as the impact unexpectedly reversed and the average interday effect was -0.221 percent. The absolute value of the average interday effect was almost four times greater than the average intraday effect for the group. The average interday effect was also more significant than the average intraday effect in the other group with an observed sign change, but the interday effect was positive in the second group.

Figure 8 shows intraday and daily announcement effects during periods of accommodative or restrictive and declining, stable, or rising rates. The daily announcement effect is more significant than the intraday effect for periods of accommodative policy and declining or stable rates, as well as periods of restrictive policy and rising rates. During periods of accommodative policy and rising rates or periods of restrictive policy and declining or

stable rates, the intraday effect was greater than the daily effect. The intraday and daily announcements effects were very similar, within 0.1 percent of each other, except during periods of accommodative policy and declining rates, when the daily effect was more than five times greater than the intraday effect and more than double any other impact.

When rates were accommodative and declining or restrictive and rising, the announcement effect grew more significant as the day progressed. When rates were accommodative and rising or restrictive and stable or declining, the announcement effect was greater at 11:00 a.m. ET and then dissipated by the end of the day. During periods of accommodative and stable rates, the average intraday effect was slightly negative but reversed to a positive trend that was five times more significant by the time the market closed.

Figure 8: Intraday and daily announcement effects during different Fed policy stance and policy trend periods

Conclusion

Markets’ intraday reactions to major macroeconomic announcement surprises were generally less significant than the

interday reactions to the same announcements. In response to a surprise macroeconomic indicator release, one might expect an initial price shock in equity markets that dissipates over the remainder of trading hours.

However, this was not the case, as the intraday announcement effects did not dissipate after the initial surprise. Instead, the announcement effects persisted on equity markets, driving the daily announcement impact to be greater than the initial shock. If Poitras is correct, and market participants' behavior is largely based on predicted Federal Reserve policy, then the surprise announcement impacts persist because market participants' predict that future Fed policy will have a similar economic effect. Announcement effects on financial markets were based on how the data in the release is generally perceived to affect future Fed monetary policy instead of the strength of the economy as measured by the data in the release. When the data in the release are better than anticipated, equity markets react by trending lower. They do this in spite of the better than expected news because this also means that investors predict higher interest rates. This change could be due to the value market participants place on the information contained in the release compared to the value of expected changes to monetary policy. For example, if the investor values stable Fed policy more than a low unemployment rate, the investor could react negatively to a lower than expected unemployment rate figure if it could cause a rate hike. For the same reasons, equity markets would react by trending higher and bond markets would trend lower in response to worse than expected news because investors would expect lower interest rates, decreasing the cost of borrowing capital.

Further, market participants expect a contractionary monetary-policy change after a positive announcement surprise (Barnhart 1989). Contractionary changes increase interest rates, which will send equity markets trending lower (Bernanke and Kuttner 1995) and bond markets trending upward (Barnhart). Therefore, the announcement effect of better-than-anticipated data has equity markets trending lower and bond markets trending upward. Based on this conclusion, macroeconomic announcement effects are not to be found in the market participants' reaction to unexpected historical data. Instead, a macroeconomic announcement effect is found in the market participants' reaction to the predicted monetary policy changes in response to the unexpected historical data.

Barnhart (1989) studied commodity responses to the unanticipated component of the macroeconomic variables over the period 1980 to 1984. He found that macroeconomic announcements affect commodities and T-bills due to the projected Fed reactions in adjusting monetary reserves. This provided evidence for the policy anticipation hypothesis, which states that an unexpected increase in M1 causes nominal interest rates to rise because market participants expect the Fed to tighten credit and thus cause a higher real interest rate. The policy anticipation hypothesis contrasts with the inflationary expectations hypothesis, which predicts a rise in real interest rates after a positive M1 shock because market participants perceive the Fed to have lost control of the money supply and thus expect inflation to rise. Overall, the study provides strong support for the policy anticipation hypothesis and against the inflationary expectations hypothesis. This provides evidence that nominal interest rates change due to market participants' expectations of future Fed policy.

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