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How do Investors react to pre-scheduled Macroeconomic announcements?

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Executive summary

Following the article “How Much Do Investors Care About Macroeconomic Risk? Evidence From Scheduled Economic Announcements” published by Pavel Savor and Mungo WIlson, we will in this paper aim to investigate how investors react to pre-scheduled macroeconomic news. Using news on interest rates, employment reports and the consumer price index we intend to establish a connection to the behaviour of the stock market through measures of volatility and excess return during the announcement period.

1.0 Introduction and motivation

In our thesis we aim to investigate, and possibly establish a link, between the scheduled announcements of certain macroeconomic news and the corresponding behavior of the market. Investors are most often concerned with more than just the risk of the stocks themselves. They often tend to consider macroeconomic risks caused by public announcements of monetary policy decisions, such as inflation, unemployment - and interest rates. In pre-scheduled announcements, the investors know there will be some public news, but not exactly what the news contains. In this research, we will therefore inspect the impact such news have on the volatility of stocks, and further the expected return required by the investors.

There exists lots of theory regarding pre-scheduled macroeconomic news. When investors receive the news, they learn about the future state of the economy. In such, the investors should be rewarded for bearing both market risk and state variable risk. Merton and Wilson introduce a model that is inspired by Merton´s Intertemporal Capital Asset Pricing Model and Bansal and Yaron´s model of long term expected consumption growth.

Because of the US´ leading role in the world economy, we want to focus our research on the US policy decisions and New York stock exchange. By examining historical data of the Nasdaq back to 1960 in light of scheduled macroeconomic announcements that have been, we attempt to establish a pattern. We want to investigate the reactions on news within unemployment, interest rates and inflation rates because these reports are considered to be major macroeconomic indicators (Nikkinen & Sahlstrom, 2001). With these announcement effects, we intend to show how the market respond on the announcement days compared to non-announcement days. We also have an intention to include an investigation of how the market respond the days beforehand, noted by Jones et. al as “the calm before the storm” (Jonesa et. al, 1998).

If we manage to establish a connection between the stock market and macroeconomic announcements, we will see the investors taking the risk of these news into account.
Furthermore, if asset prices respond to this then the risk of holding the securities will be greater. A rational investor would anticipate this and thereby require a higher return (Savor & Wilson, 2013).

2.0 Theory

There exists a lot of theory of how macroeconomic news affect investors behavior. The main theories we will focus on are some of the theories presented in Wilson and Savors article. We have included a great amount of theory in order to get a better understanding of the relationships between the different components that are tested. In this way, we can better prepare for our own research.

2.1 Growth rate process (Bansal & Yaron, 2000)

Bansal and Yaron presents a model of dividend and consumption growth rates in an endowment economy. An endowment economy is an economy which there is no endogenous production, and where the amount of income and output is exogenously given (Sims, 2014). The model implies that dividend yields predict returns and that market volatility have a random probability distribution. The economic insight from the model is that news about growth rates alters the investors´ perceptions of long-run expected growth rates. Times around scheduled news should be periods of higher expected return on risky assets, and in equilibrium the risk-free rates should be lower. Savor and Wilson includes a deterministic indicator variable to account for announcement effects. The change in dividends are determined by the growth:

$$\Delta d_{t+1} = \mu_t + v_{d,t+1}$$

By using change in dividends, they model the growth change as an AR(1)-process. The output variable shows the expected growth in the next period. This is

equated by average change and the expected growth of endowment in current period:

$$\mu_{t+1} = (1 - \emptyset)avg(\mu) + \emptyset\mu_t + v_{\mu,t+1}$$

The conditional variance shows the volatility given some extra information. Further, to calculate the conditional variance the announcement effects are included as a dummy variable which equals 1 when there is a pre-scheduled announcement between time t and t+1. The variance is used to derive the announcement of news on prices and expected returns.

$$\mu_{t+1} = (1 - \emptyset)avg(\mu) + \emptyset\mu_t + v_{\mu,t+1}$$

2.2 Epstein-Zin recursive preferences

Recursive preference models are tools to study economic behavior in a dynamic stochastic environment. Epstein-Zin preferences are needed to ensure separation between risk aversion and the elasticity of substitution parameters. The elasticity of substitution is a measure of responsiveness of the growth of consumption to the real interest rate. The current consumption may decrease due to increased returns on savings if the real increases. If risk aversion is not accounted for, it will result in some unwanted properties. For instance, when risk aversion is greater than one, a positive innovation to expected growth rate in cash flows implies a reduction in the price of the stock relative to the current dividend. When risk aversion is smaller than one, the equity market volatility and the risk premium may be too low (Bansal & Yaron, 2000). The recursive utility is calculated:

$$U_t = \left((1-\beta)C_t^{1-\frac{1}{\varphi}} + \beta\left(E_t\left[U_{t+1}^{1-\gamma}\right]\right)^{\frac{1-\frac{1}{\varphi}}{1-\gamma}} \right)^{\frac{1}{1-\frac{1}{\varphi}}}$$

The output variable is the recursive utility. b is the time discount rate, g is the coefficient of relative risk aversion, and y is the elasticity of intertemporal substitution (Savor & Wilson, 2013). Ct is consumption, which in this case is

equal to dividends Dt such that the supply of whatever is traded is equated to the demand

2.3 Real risk-free rate

In times around macroeconomic news announcements, the intuition is that the risk-free rates should be lower in equilibrium. The log risk-free rate is given by Savor and Wilson as:

$$r_{ft+1} = -ln\beta + \frac{1}{\varphi}\left(\mu_t + \frac{1}{2}Var_t[\Delta d_{t+1}]\right) - \gamma\left(1 + \frac{1}{\varphi}\right)\frac{1}{2}Var_t[\Delta d_{t+1}]$$

$$r_{ft+1} = -\left(\gamma - \frac{1}{\varphi}\right)\left(1 - \frac{1}{\varphi}\right)Var_t\left[\frac{\rho}{1-\rho\emptyset}\mu_{t+1}\right]$$

The first term is dependent on the time discount rate, b. The second term depends on log expected growth rate of consumption. The third term is a saving term that is zero for risk neutral investors. The fourth term is a saving term proportional to the variance of the permanent component of shocks to expected endowment growth (Savor & Wilson, 2013).

2.4 Stock market returns and conditional risk premium

Around the announcement date the expected return on risky assets are supposed to be higher. When the risk increases the investors would desire to increase saving and replace risky assets with risk-free assets.

$$r_{MKT,t+1} = -ln\beta + (\gamma - 1)\left(1 - \frac{1}{\varphi}\right)\frac{1}{2}Var_t\left[v_{d,t+1} + \frac{\rho}{1-\rho\emptyset}v_{\mu,t+1}\right] + \frac{1}{\varphi}\mu_t$$

$$+ v_{d,t+1} + \left(1 - \frac{1}{\varphi}\right)\frac{\rho}{1-\rho\emptyset}v_{\mu,t+1}$$

Further, in Wilson and Savor´s article it is equated the following equations below. The intuition of this is how the conditional market risk premia might increase on announcement days due to expectations of receiving more news about future economic growth.

$$lnE_t\left[\frac{1+R_{MKT,t+1}}{1+R_{f,t+1}}\right] = E_t\left[r_{MKT,t+1}\right] - r_{f,t+1} + \frac{Var_t\left[r_{MKT,t+1}\right]}{2}$$

$$lnE_t\left[\frac{1+R_{MKT,t+1}}{1+R_{f,t+1}}\right] = -Cov_t\left[m_{t+1}, r_{MKT,t+1}\right]$$

$$lnE_t\left[\frac{1+R_{MKT,t+1}}{1+R_{f,t+1}}\right] = \gamma Var_t[\Delta d_{t+1}] + \left(\gamma - \frac{1}{\varphi}\right)\left(1 - \frac{1}{\varphi}\right) Var_t\left[\frac{\rho}{1-\rho\emptyset}\mu_{t+1}\right]$$

$$lnE_t\left[\frac{1+R_{MKT,t+1}}{1+R_{f,t+1}}\right] = \gamma Var_t\left[r_{MKT,t+1}\right] + \frac{\gamma - 1}{\varphi} Cov_t\left[r_{MKT,t+1}, \frac{\rho}{1-\rho\emptyset}\mu_{t+1}\right]$$

Risky assets that have high covariance with the state variable can earn higher risk premia around announcement dates, even if the volatility of the returns is similar. As shown in the last equation, there is a positive covariance between the market return and the permanent shocks to expected economic growth, risk averse investors will demand a higher risk premium on announcement days of macroeconomic news even if the market variance is small (Savor & Wilson, 2013).

3.0 Literature review

Shocks to volatility that occur on announcement days have no subsequent impact on daily volatility of treasury bonds, and the predictable risk is compensated with higher expected excess return (Bomfim, 2003). Fleming and Remolona argues that the historical volatility of the US treasury market is higher when scheduled macroeconomic reports are released (Fleming & Remolona, 1999). As for the stock market, the historical stock return volatility is significantly higher on announcement days (Nikkinen & Sahlstrom, 2001). Similarly, Wilson and Savor find that the realized volatility of stock market returns is higher, but only by 4% (Savor & Wilson, 2013).

In equilibrium, the ex-ante rates of return are determined by the preferences of the agents (Bansal & Yaron, 2000). When investors learn more about the economy on announcement days, they are rewarded for bearing market risk as well as state variable risk (Savor & Wilson, 2013). The idea is that the news affects the investors´ expectations of long-run growth, and thus the expected return should be higher. This idea is consistent with Merton´s intertemporal capital asset pricing model (ICAPM). ICAPM is a consumption-based asset-pricing model that takes into account how investors participate in the market. It allows consumption to depend on the state variable, which predicts future returns. In other words, investors are not only concerned with the terminal wealth that their portfolio produces, but also with the investment and consumption opportunities that they will have in the future (Bali, Brown, & Caglayan, 2014). The volatility of the risk-free rate is determined by the volatility of expected growth rate process and the volatility of the conditional variance of dividend growth (Bansal & Yaron, 2000). For risk-averse investors, increased risk would make them desire to raise their saving or change consumption plans, resulting in reduction of the market-clearing risk-free rate (Savor & Wilson, 2013). Given that the news reveals important information about the future, risk premium can increase even if conditional volatility does not change (Savor & Wilson, 2013).

The phenomenon “calm-before-the-storm” explains how the volatility of the market tends to be lower on the days leading up to the release of major macroeconomic news. This was first introduced in Jones et al. (1998) and addressed how the conditional volatility in the Treasury market was lower the days before an announcement (the calming). On the actual day of announcement, the volatility increased above normal (the storm). This phenomenon is also supported in various articles on other financial markets including (Li and Engle, 1998) and (French et al, 1989).

3.1 Main article - Wilson and Savor (2013)

Our master thesis will closely follow the work of Wilson and Savor in predicting, who have tested the same problem as we want to investigate. They tested how pre-scheduled macroeconomic news effect investors behavior, and to what extent they care about macroeconomic risk. The data sample consists of a sample of news announcements between 1958-2009. The news includes Consumer Price

Index, Producer Price Index, employment reports and FOMC interest rate decisions. They are testing the effect on stock market returns, as well as on T-bills with different maturities.

To test their hypothesis, they have used panel data to investigate the distribution of daily stock market excess returns on announcement days and non-announcement days. They have also used an OLS regression to calculate daily stock market excess return by including a dummy variable for announcement day and control variables. Similarly, they use panel data and OLS regression to calculate the return on treasury bonds.

Their main results are that investors learn more about the future consumption growth and that stock market average returns and sharpe ratios are significantly higher when important macroeconomic news is scheduled for announcement. They also argue for a tradeoff between macroeconomic risk and asset returns.

4.0 Methodology

In our thesis, the main hypothesis and argument is that investors require compensation for the additional risk carried by the possibility of learning bad news on the state of the economy. In order to test this hypothesis, we are in need of data on historical market return and the dates of pre-scheduled macroeconomic news announcements which will later be elaborated on later in this paper. However, the chosen variables; consumer price index, unemployment - and interest rates are highly relevant according to a number of published articles. Among them; Fleming and Remolona (1999), Ederington and Lee (1993) and Harvey and Huang (1991) are all studies that show these announcements have the most significant impact on trading and volatility of financial assets.

To test the main argument of our research we will create a sample of 1 month T-bill returns and value weighted market returns. This will allow us to estimate the excess returns on announcement days and non-announcement days, and finally find the difference. We also have to estimate the implied variance of stocks, the consumption growth and bond betas. Finally, we want to test for the days before

the announcements to check whether the volatility of the stock market decreases before the announcement, and what happens to the corresponding excess return.

Initially we aim to structure this as a panel study and run OLS-regressions where the dependent variables are excess market return and stock market volatility. We intend to measure potential significant news effects using a dummy variable to account for macroeconomic news. The macroeconomic news are those days where our chosen announcement variables are released. Finally, we have to include reasonable control variables. In this part of the process we are not completely sure on how to develop a test for the reactions in the days before the announcement. However, our suggestion is to include dummies for the days before the announcement.

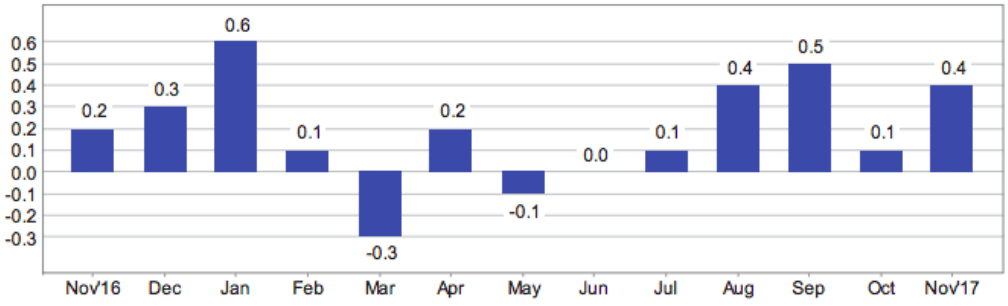
We intend to perform the tests using a sample from 1960 to 2016, and focus on US monetary policy announcements. The program in which we will perform our tests will be MatLab.

5.0 Data

In order to properly commit our research, we are in need of a great amount of different data. The data includes rates and statistics concerning unemployment, interest - and inflation rates. This information will mainly be retrieved from The Federal Reserve, hereinafter Fed, and The Bureau of Labor Statistics, hereinafter BLS. We will also need to collect data on daily stock market return and Treasury bills. This will be retrieved from the Center for Research in Security Prices, hereinafter CRSP, Datastream and Bloomberg. When collecting the data regarding the macroeconomic news we exclude surprises and any unscheduled announcements as our paper aim to explain the connection to the scheduled announcements solely.

From BLS we will gather the monthly scheduled announcements of consumer price index (CPI) dating back to 1960 until as close as possible to current date. The Fed has also an archive for this dating back several decades. If needed, we will also obtain data from here. In the article (Savor, Wilson. (YEAR)) we were made aware of the availability of production price index (PPI) as of 1971. These

numbers are released a few days ahead of CPI measures and might lead to a reduced news effect of CPI announcements. Therefore, we might obtain PPI numbers instead of CPI as of 1971.



The picture shows the one month percentage change in CPI for one year in the US, in a sample form November 16 - November 17.

So far, we have only managed to gather information on the announcements on discount rates (interest rates) back to 2001 from the Fed. These announcements are scheduled approximately twice a month. Optimally, these measures should have been dating further back than 2001. We need a longer sample to ensure our data is not reflecting a period of particular good or bad news, and that the average surprise is relative close to zero. We will therefore focus on collecting data dating back further than 2001 during this process.

Regarding labor statistics, also here is the data dating insufficiently far back. At this point we have only managed to collect monthly announcements back to January 1994 from the BLS. A problem with this may be that we are unfit to rule out surprises completely and periods of abnormally good or bad news.

Data on stock market return and Treasury bills will be obtained from CRSP, Datastream and Bloomberg. These two platforms offer data dating back a sufficient amount of time correspondingly to the news announcements.

The picture is the stock market index from Nasdaq during November 2016 – November 2017

6.0 Progress plan

January	**Data collection** During the first period, we will collect all the data needed and ensure that we have the proper sample sizes. **Make a final draft for disposition of the thesis** Disposition of chapters **Quality check of plan** Ensure with supervisor that we are heading in the right direction and that we manage to implement creative solutions.
February-March	**Data processing and analysis** Process and create data set and analyze in MatLab
April	**Interpretation of data** Interpret our results and ensure a proper context of our findings. **Create a first draft of the thesis** Ensure coherency and remove unnecessary noise. **Hand in first draft**
May-September	**Recieve feedback on first draft** Make necessary adujstments
September	**Hand in master thesis**

7.0 References

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