Assignment 5

Assignment 5: Event Studies: Market Reaction to Macro News: Monetary Policy Surprises

Submission Details

1. This assignment is **individual** assignment. Assignment weight is **10%**
2. Submit through Canvas https://canvas.gatech.edu; Deadline is 6pm on **Oct 17, 2023**.
3. Use Python Jupyter Notebook or Quarto notebook
4. Please get started early as it may require some extensive programming
5. This assignment is split into multiple parts or steps to make it easier for you to execute in step by step fashion. They are not separate assignments.
6. You have to submit ONLY

   - Jupyter Notebook file with rendered code and output
   - You don't need to submit any datasets
   - Short and concise explanation (1-3 lines) for the questions asked

7. This assignment directly builds on the previous assignment, estimating β

Background Reading

Please check the following papers for background reading (and the lecture discussion on Monetary Policy)

1. Ben Bernanke and Kenneth Kuttner, 2005, What Explains the Stock Market's Reaction to Federal Reserve Policy?, Journal of Finance
2. Gurkaynak et al, Journal of Finance, 2023
3. Journal of Economic Perspectives, Winter 2023 Special Issue on Monetary Policy
4. More Information for computing CARs can be found from the following papers:

   - December Doldrums, Investor Distraction, and Stock Market Reaction to Unscheduled News Events

- [Do Credit Default Swaps Mitigae the Impact of Credit Rating Downgrades?](#)
- [Financial Constraints, Monetary Policy Shocks, and the Cross-Section of Equity Returns](#)

Assignment Learning Objectives

The main goal of this assignment is to understand 1. monetary policy suprises and its components 2. impact of monetary policy surprises on firms, portfolios and industries

Towards this end, we are going to look at the stock market reaction on monetary policy dates to monetary policy surprises.

We are going to consider two different (and orthogonal) components of monetary policy: "target" and "path". These are the first two principal components of the change in the yield curve up to one year maturity in a 30-minute window around an FOMC announcement and by construction, orthogonal to each other.

target is related to the change in current policy setting and "path" is related to the change in market perceptions of future policy rates, that is, **forward guidance**. The **path** factor captures only those revisions to expectations of interest rates up to one year ahead that are not driven by the surprise in the current policy action (target).

Data:

There are two different data sources

1. The "daily" CRSP data that you have used in Assignment 4
2. The data on the monetary policy surprises

- The source is the paper "The Perceived Causes of Monetary Policy Surprises" by [Miguel Acosts](#) of Federal Reserve Board.
- The excel spreadsheet downloaded from his website is posted on Canvas
- You can focus on three columns ["fomc", "target", "path"].
- "fomc" is the date of the fomc announcement
- "target" factor is the monetary policy target surprise
- "path" factor is the monetary policy forward guidance surprise

Tasks and Analysis

1. Step 1: Understanding Monetary Policy Surprises

- Compute descriptive stats (N, p25, p50, p75, p90, sd) of the "target" and "path" factors over the entire time period. Comment in 1-2 lines.

- Compute descriptive stats separately for the time period around **Zero Lower Bound**. You can use the effective Fed Funds rate from Assignment 1 to categorize the time period. Comment in 1-2 lines.

2. Step 2: Link between Monetary Policy Surprises and Economic Indicators

- Pick one economic indicator from each of the 8 categories in Assignment 1 that you expect will react **quickly** to revisions in **target** and **path**. Explain in 1 line for each indicator that you picked how $(+/-)$ and the rationale for the reaction
- Correlate the $t, t+1, t+2$ value of the selected variables (i.e. the month of the fomc, next month and two monts later values) with the "target" and "path". Generate a correlation heatmap. Comment on the correlations and any interesting economic insights that you observe.

3. Step 3: Link between Monetary Policy Surprises and Aggregate Stock Returns

- get CRSP value-weighted equity return for the days around each FOMC $(-1, 0, +1)$ and run a regression of each of these returns on the target and path surprises

  –
  $$ret_t^{-1} = \alpha + \beta_1 target_t + \beta_2 path_t + \epsilon_t$$

  –
  $$ret_t^0 = \alpha + \beta_1 target_t + \beta_2 path_t + \epsilon_t$$

  –
  $$ret_t^{+1} = \alpha + \beta_1 target_t + \beta_2 path_t + \epsilon_t$$

- Note: α, β_1 and β_2 will be different for three regressions.
- what are the economic insights from this analysis?

4. Step 4: Link between Monetary Policy Surprises and Firm Level "Raw" Stock Returns

- compute "size" as market caputalization = ("price" as of the previous month) * (number of shares outstanding)
- run a regression of firm stock returns for the days around each FOMC $(-1, 0, +1)$ on the target and path surprises along with firm size for each firm i

  –
  $$ret_{i,t}^{-1} = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

  –
  $$ret_{i,t}^0 = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

  –
  $$ret_{i,t}^{+1} = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

- Note: α, β_1, β_2 and β_3 will be different for three regressions.
- what are the economic insights from this analysis?

5. Step 5: Link between Monetary Policy Surprises and Firm Level Cumulative Abnormal Returns (CARs)

- You need to compute the cumulative abnormal returns (CARs) around FOMC date; the windows are, in relation to the **FOMC date**, {-1,+1}

- Denote $ret_{i,t}$ is the raw return for firm i on day t, and $R_{m,t}$ is the value-weighted NYSE/AMEX/NASDAQ index return ($VWRETD$).

- Then, we define the daily abnormal stock return of firm i on day t, $AR_{i,t}$, as the residual estimated from the **market model**:

$$AR_{i,t} = ret_{i,t} - \left(\hat{\alpha}_i + \hat{\beta}_i * R_{m,t} \right)$$

- Then, calculate the CAR, for example, the 3-day CAR in the 3-day window centered around the FOMC date

- $$CAR_{i,t}(-1,1) = \sum_{t=-1}^{t=+1} AR_{i,t}$$

    - Check section 3 of December Doldrums, Investor Distraction, and Stock Market Reaction to Unscheduled News Events paper for detailed explanation

- Once these CARs are computed, check (using statistical test) if it is different from 0 and compute some descriptive statistics of the CAR along with the plotting the distribution

- run a regression of firm CAR for the days around each FOMC $(-1,+1)$ on the target and path surprises along with firm size for each firm i

- $$CAR_{i,t}(-1,1) = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

- what are the economic insights from this analysis? Are they diffrent from Step 4? Explain the differences or lack of differences from Step 4.

6. Step 6: Link between Monetary Policy Surprises and Portfolio Level "Raw" Stock Returns

- let us form 3 groups or portfolios of firms for every fomc announcement based on previous month's size. You can label them $size_{large}$, $size_{medium}$ and $size_{small}$
- within each group "value weigh" the portfolio based on the previous month's size i.e. you should have one return for each portfolio per each fomc
- one quick way to check you are doing it correctly is to check the N after forming portfolios for the portfolio level returns

- show the descriptive statistics for each portfolio over the sample period (N, p25, p50, p75, p90, sd))
- run regressions of portfolio returns on target and path surprises along with indicator (dummy) variables for $size_{large}$, $size_{medium}$ and $size_{small}$

    –
    $$ret_t^{-1} = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

    –
    $$ret_t^{0} = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

    –
    $$ret_t^{+1} = \alpha + \beta_1 target_t + \beta_2 path_t + \beta_3 size_{i,t} + \epsilon_t$$

- what are the economic insights from this analysis?

7. Step 7: Link between Monetary Policy Surprises and Industry Level Stock Returns

    - Use the industry defintions from Assignment 3. You can reuse the same code. For completeness, reproduced below

Use the following for the definition of industry

SIC CODE	Industries
1 – 999	Agriculture, Forestry and Fishing
1000 – 1499	Mining
1500 – 1799	Construction
2000 – 3999	Manufacturing
4000 – 4999	Transportation and other Utilities
5000 – 5199	Wholesale Trade
5200 – 5999	Retail Trade
6000 – 6799	Finance, Insurance and Real Estate
7000 – 8999	Services
9000 – 9999	Public Administration

- for each industry portfolio "value weight" the returns based on the previous month's firm size i.e. you should have one return for each industry portfolio per each FOMC meeting
- show the descriptive statistics for each portfolio over the sample period (N, p25, p50, p75, p90, sd))
- what are the economic insights from this analysis? how do you explain them?