

The Timing of Market Reactions to Data Releases
Analysis Prepared by the Council of Economic Advisers for OMB
February 14, 2024

At the request of OMB to aid its response to public comments, CEA performed the following analysis of the timing of market reactions to economic data releases. This analysis focuses on the Principal Federal Economic Indicators (PFEIs), which include the major statistical series that describe the current condition of the economy and are produced by government agencies such as the Bureau of Labor Statistics and the Bureau of Economic Analysis. This literature review and analysis find that both Treasury and equity futures react relatively quickly, typically within minutes (and in some case, seconds) to data releases. This analysis, which uses recent data and therefore captures current market timing dynamics, shows virtually no statistically significant financial market indicator reactions after 5 minutes.

Literature Review

Balduzzi et al. (2001) use intra-daily data to consider the market response to a broad range of news announcements.¹ Specifically, they study the response of Treasury securities at various maturities to the releases of 26 different economic data series (which cover a number of Principal Federal Economic Indicators (PFEIs) such as Consumer Price Index (CPI), Producer Price Index (PPI), retail sales, personal income, etc.), occurring at different times of the day, from 1991 to 1995. The researchers first estimate the unexpected part of the announcement that might affect the direction of asset prices forecasts by using a panel of economic data forecasts from the Money Market Services. For each data announcement, the difference between the released value and the median forecast (a proxy for the expected value) is the “surprise” component in the announcement. The researchers related the unexpected part of the announcement to asset price changes in a small window of time right around the release. Using one-minute price intervals, Balduzzi et al. find that most of the price adjustment attributable to newly released public information occurs within the first minute of trading.

Andersen et al. (2007) corroborate the results of Balduzzi et al. (2001), and additionally allow for cross-market effects by broadening the analysis to different countries and asset markets.² They study the responses of the U.S., German, and British stock, bond, and foreign exchange markets to 25 economic data series (including many PFEIs such as GDP, industrial production, retail sales, CPI, and PPI) from 1992 to 2002. The analysis finds that the response in these markets—the price response to the unexpected component of the data announcement—is nearly instantaneous with the data release, and that across assets and macroeconomic data releases “any systematic effect is almost exclusively restricted to the five-minute interval following the news release.”³

¹ Pierluigi Balduzzi, Edwin J. Elton, and T. Clifton Green, “Economic News and Bond Prices: Evidence from the U.S. Treasury Market,” *The Journal of Financial and Quantitative Analysis* 36, no. 4 (2001): 523-543.

² Torben G. Andersen, Tim Bollerslev, Francis X. Diebold, Clara Vega, “Real-time Price Discovery in Global Stock, Bond and Foreign Exchange Markets,” *Journal of International Economics* 73 (2007): 251-277.

³ *Id.* at 261.

Beechey and Wright (2009) test whether the change in bond prices immediately following a data surprise is significantly different from the response over a longer period of time.⁴ The researchers study the impact of fourteen different types of news announcements—including PFEIs such as core CPI, core PPI, GDP, and nonfarm payrolls—on the yields of nominal and Treasury Inflation Protected Securities (TIPS) from February 17, 2004 to June 13, 2008, to better understand how different types of news affect different components of the yield curve. Comparing the nominal and TIPS markets, Beechey and Wright explore whether the nature of price response differs due to market liquidity differentials in these two security types. The data show that the relatively less-liquid TIPS securities do not have a delayed reaction or a reversal of any initial jump in the price, which for both securities “is of the nature of a jump in the conditional mean.”⁵ Additionally, the study establishes that the data response occurs entirely in a small window of time around the release, by finding no statistically significant difference in parameters estimated with daily versus intra-daily (15 minutes after release) data.

More recent research by Brogaard et al. (2014)⁶ and Hu et al. (2017)⁷ examines price responses with higher resolution data. Brogaard et al. estimate price responses to data releases in one-second intervals, examining a stratified sample of 120 randomly selected stocks listed on NASDAQ and the NYSE in the years 2008 and 2009. They study the impact of eight macroeconomic news announcements that occur during trading hours—including the PFEI of construction spending—using the time of the news announcement release from Bloomberg. Hu et al. estimate the response of asset prices to the release of three macroeconomic announcements; the index of consumer sentiment (ICS), the Institute of Supply Management (ISM) non-manufacturing index, and the ISM manufacturing index. They consider the price response in millisecond intervals from January 2009 to June 2013 of E-mini S&P 500 futures contracts. Both studies find that the primary response to economic data releases occurs within the first 3-4 seconds after the news announcement is made, and that after approximately 9 seconds, asset price movements can no longer be related to the announcement.

Additional Analysis

To investigate the relationship between macroeconomic news announcements and asset prices with the most recent data, we conduct an analysis over the January 2021 to November 2023 sample period. We relate the unexpected component in macroeconomic data releases to the 2-year Treasury futures, 10-year Treasury futures, and S&P Mini futures contracts. These contracts were

⁴ Meredith J. Beechey and Jonathan H. Wright, “The High-frequency Impact of News on Long-term Yields and Forward Rates: Is It Real?” *Journal of Monetary Economics* 56, no. 4 (2009): 535-544.

⁵ *Id.* at 539.

⁶ Jonathan Brogaard, Terrence Hendershott, and Ryan Riordan, “High-Frequency Trading and Price Discovery,” *The Review of Financial Studies* 27, no. 8 (2014): 2267-2306.

⁷ Grace Xing Hu, Jun Pan, and Jiang Wang, “Early Peek Advantage? Efficient Price Discovery with Tiered Information Disclosure,” *Journal of Financial Economics* 126, no. 2 (2017): 399-421.

selected because they are among the most heavily traded contracts,⁸ and most relevant to this analysis.⁹ We regress the contract returns over different time intervals onto the surprise component of the macroeconomic data releases.¹⁰ First, we consider eight high profile macroeconomic data releases (Figure 1), and then we restrict our analysis to only the PFEI sub-sample (Figure 2). We select data releases that are among the most closely studied macroeconomic series by market participants, and thus are most likely to garner asset price responses to data surprises. Because of their high-profile status, a large number of forecasts for these series—both PFEIs and non-PFEIs—are submitted before the releases, improving the robustness of the analysis. Most importantly, these releases are likely among those that would receive the most official government commentary.¹¹

Figure 1:

⁸ According to the Chicago Mercantile Exchange (CME) transaction volume data for 2023 (through Dec. 20, 2023), interest rate futures are the most heavily traded asset class, followed by equity index futures. Together, these two categories account for around 79% of total volume. Within equity index futures, the S&P Mini contract's volume alone accounts for about 27% of the combined volume of all equity futures contracts. Within interest rate futures, the 2- and 10-year Treasury contracts combined account for about 22% of the total interest rate futures volume. Together, the S&P mini, 2-year Treasury and 10-year Treasury futures contracts account for around 19% of aggregate CME futures trading volume (including interest rate, equity index, metals, energy, foreign exchange, and agriculture contracts).

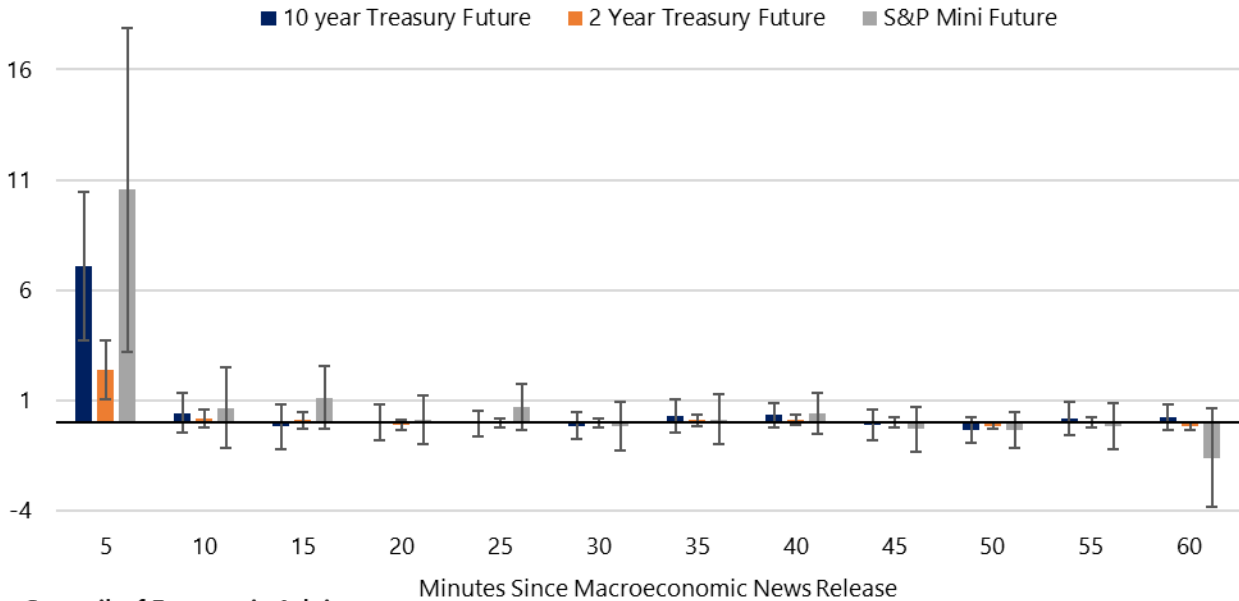
⁹ The 2- and 10-year Treasury futures contracts capture the short and long maturities of the yield curve. Releases affecting expectations about monetary policy would likely influence the 2-year Treasury contract whereas releases affecting expectations for growth or inflation would likely influence the 10-year Treasury contract. These contracts would capture a steepening or flattening of the yield curve as well as a move up or down in the entire curve. The S&P futures contract price is influenced by a broad set of shares, and is interpreted by some as a proxy for market sentiment. The S&P Mini futures contract's small size makes it a particularly flexible contract with which investors can express views.

¹⁰ The surprise values are the difference between the macroeconomic release and the median forecast release, expressed in units of standard deviations of the distribution of economic forecasts. The regressions are pooled across different types of data releases. Data releases considered are headline CPI, nonfarm payrolls, consumer confidence, GDP releases (1-3), employment cost index (ECI), ISM manufacturing, JOLTS, and personal income. The confidence intervals include a Bonferroni correction.

¹¹ While it is difficult to demonstrate that these releases receive the most official government commentary quantitatively, rather than qualitatively, the series that receive more forecaster estimates can be used as a gauge for market and government interests. Bloomberg publishes surveys of forecaster estimates for forthcoming economic data releases, and all eight of these data releases receive at least 28 (JOLTS) to 79 (nonfarm payrolls) forecaster estimates before release.

Price Response to Macroeconomic News

Basis points per unit of economic surprise



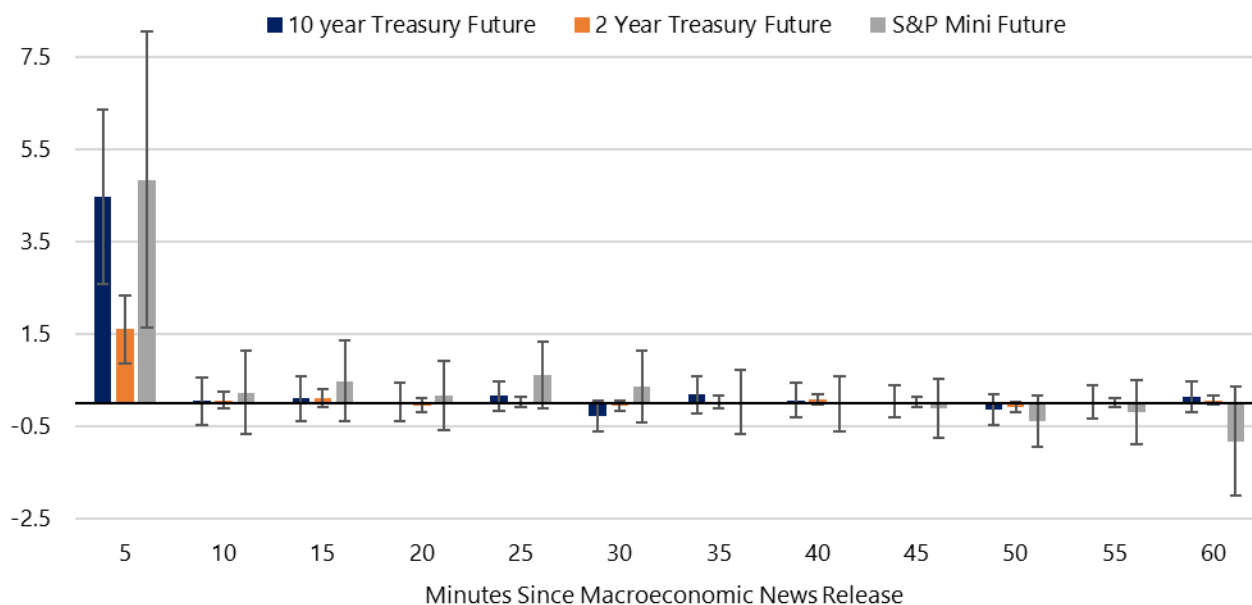
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Sources: Bloomberg, CEA Analysis.
Note: Point estimates (shaded bars) and 95% confidence intervals (brackets) from regressions of returns at various horizons onto economic surprises of variables. This is conducted on data from Jan 2021 - Nov 2023.
As of Nov 28 2023

Figure 2:

Price Response to Macroeconomic News – PFEI Only

Basis points per unit of economic surprise



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Sources: Bloomberg, CEA Analysis.

Note: Point estimates (shaded bars) and 95% confidence intervals (brackets) from regressions of returns at various horizons onto economic surprises of variables. This uses only the PFEI variables in our sample and is conducted on data from Jan 2021 - Nov 2023. As of Nov 28 2023

The study considers 5-minute intervals, from just prior to the release until 60 minutes after release.¹² Figures 1 and 2 show coefficient estimates of the asset returns over 5-minute intervals (from 0 to 60 minutes) to a positive one-unit surprise in macroeconomic news, and include 95% confidence interval bars for the entire sample and the PFEI sub-sample, respectively. The results are qualitatively similar in that they show statistically significant return responses for the surprise component of the announcement within the first 5 minutes of data releases. The point estimates range from 1 to 11 basis points for the entire sample (Figure 1) to 1 to 5 basis points for the sub-sample (Figure 2). The PFEI sub-sample results show that in the first 5 minutes of a positive-surprise macroeconomic data release, the S&P Mini and the 10-year Treasury futures contract returns increase 4 to 5 basis points, and the 2-year Treasury futures contract rises 1 to 2 basis points. Both figures show that after the first five-minute interval, the estimates are very close to zero and not significantly different from zero. These results are in line with the academic literature; asset markets absorb the content of economic data within the first few minutes of public release.

¹² 60 minutes from the time of the data announcement is the 1985 Directive No. 3 standard for when Executive Branch employees can comment on the releases.