Journal of Financial Economics 153 (2024) 103790

Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

Fearing the Fed: How wall street reads main street ☆

Vadim Elenev [a], Tzuo-Hann Law [b], Dongho Song [a,*], Amir Yaron [c,d]

[a] Carey Business School, Johns Hopkins University, 100 International Drive, Baltimore, 21202, MD, USA
[b] Boston College, 140 Commonwealth Avenue, Chestnut Hill, 02467, MA, USA
[c] The Wharton School, University of Pennsylvania, 3620 Locust Walk, Philadelphia, 19104, PA, USA
[d] Bank of Israel, 2 Bank of Israel Street, Kiryat Ben-Gurion, Jerusalem, 91007, Israel

ARTICLE INFO

Dataset link: https://doi.org/10.17632/w9ywjnmcv5.3

JEL classification:
G12
E30
E40
E50

Keywords:
Cyclical return variation
Macroeconomic news announcements
Monetary policy expectations

ABSTRACT

We provide strong evidence of a countercyclical sensitivity of the stock market to major macroeconomic announcements. The most notable cyclical variation takes place within expansions: sensitivity is largest early in an expansion and essentially zero late in an expansion. By exploiting the comovement pattern between stocks and bonds around announcements, we show that the stock market sensitivity is large when the cash flow component of news is least offset by news about future risk-free rates. Observed fluctuations in stock sensitivities can be attributed to shifting perceptions of monetary policy responsiveness.

1. Introduction

Stock prices respond to macroeconomic news announcements (MNAs) that reveal information about the economy, such as non-farm payrolls and the manufacturing index. Anecdotal evidence suggests that the response of stock prices to MNAs is time-varying as there are periods in which stock prices overreact, under-react, or even inversely react to news that suggest a strengthening economy.[1] One common explanation for this time variation is revisions to policy expectations embedded in the news. For instance, a recent CNN article read, “Wall Street has hoped for cool monthly economic data that would encourage the Federal Reserve to halt its aggressive pace of interest rate hikes to tame inflation.”[2] In other words, good news about the economy is consistently good news for cash flows, but sometimes it is also bad news for discount rates. The relative intensity of the latter affects the intensity of the net effect. However, evidence of this explanation is lacking. The exact nature of the relationship between these two channels and the drivers of their time variation are unclear.

Ultimately, can we formalize the economic mechanism underlying the time variation in stock price sensitivity to news?

In this paper, we document that stocks are most sensitive to MNAs when the output gap is large and negative. By exploiting the comovement pattern between stock returns and bond returns around MNAs, we show that the stock price sensitivity is largest because the cash flow news component of MNAs is least offset by news about future risk-free rates. Survey evidence on monetary policy responsiveness provides additional validation.

The first contribution of the paper establishes empirical stylized facts about the time variation in the stock market's reaction to major MNAs. Initially, we consider the same from 1999 to 2019. Using nonlinear regressions of high-frequency stock returns on surprise components of 19 MNAs, we provide strong evidence of a countercyclical sensitivity of

☆ Toni Whited was the editor for this article. Funding: This work was supported by the Rodney White and Jacobs Levy Centers and by the Carey Business School, Johns Hopkins University. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Bank of Israel.

* Corresponding author.
E-mail addresses: velenev@jhu.edu (V. Elenev), tzuo.law@bc.edu (T.-H. Law), dongho.song@jhu.edu (D. Song), yarona@wharton.upenn.edu (A. Yaron).

[1] See reports in the financial press, for example, Jayakumar (2013), Shell (2018), and Tengler (2020). Similar findings exist for news that suggest a weakening economy.

[2] https://www.cnn.com/2023/04/09/business/stocks-week-ahead/index.html.

https://doi.org/10.1016/j.jfineco.2024.103790
Received 18 May 2023; Received in revised form 11 January 2024; Accepted 11 January 2024
Available online 22 January 2024

the stock market to MNAs. Our notion of counter-cyclicality relates to the level of output relative to its trend (not in terms of output growth rates). Prior literature has contrasted responses in expansions versus recessions.[3] Given that stock prices are more volatile in recessions, this distinction drew focus to risk-based explanations for the time variation. In contrast, we find that the most notable cyclical variation takes place within expansions: sensitivity is largest early in an expansion and essentially zero late in an expansion. Our evidence brings a new perspective to the literature in that periods of peak stock return sensitivity do not coincide with more volatile (e.g., measured by the VIX index) or negative growth periods. We also rule out the possibility that changing stock return sensitivity to news could arise from time variation in the amount or accuracy of news. There is no evidence of differences in the distribution or predictability of news surprises across different phases of the business cycle. The business cycle frequency of variation points towards a macroeconomic explanation.

Through various regression exercises, we show that stock returns respond more aggressively when interest rates are expected to fall and economic slack is greater (i.e., the output gap is more negative).

The second contribution of the paper shows that the observed time variation in stock sensitivities is consistent with varying expectations of monetary policy responses to macro news. We document this by jointly estimating the MNA responses of stocks as well as bonds of varying maturities. On average, bond responses are opposite to those of stocks at both short and long maturities, suggesting that investors are pricing in expected increases (decreases) in rates following good (bad) macro news. Furthermore, bond sensitivities are time-varying in the way predicted by our hypothesis. When the economy is strong, bonds respond more strongly to news than when the economy is weak.[4] The macroeconomic driver of time-varying sensitivity is monetary policy expectations. Survey evidence provides additional support for this claim.

Lastly, we document the evolving nature of the business cycle-stock return sensitivity relationship since the Covid-19 pandemic by incorporating data up to 2023. The prior two decades were marked by low and stable inflation, and so the output gap was the primary driver of monetary policy. As a result, it was also the main factor in explaining time-varying sensitivity of stock returns to MNAs. However, starting in 2022, inflation rose sharply, and with that rise came concerns about how inflation news would translate into Fed rate hikes. Higher-than-expected CPI triggered larger sell-offs than ever before. For the first time this century, positive surprises in labor or other macroeconomic announcements not just failed to boost stock prices but actually led to price declines. While the stock return responses in the recent tightening cycle are consistent with prior periods of rising rates – sensitivities are low – inflation now plays a more prominent role. Our findings suggest that over a long sample both inputs into monetary policy – output gap and inflation – likely affect the sensitivity of stock returns to MNAs with low-frequency shifts in their relative importance.

Our work builds on existing papers that argue the stock market's reaction to announcement surprises may depend on the state of the economy. McQueen and Roley (1993) first demonstrate that the link between MNAs and stock prices is much stronger after accounting for different stages of the business cycle. Boyd et al. (2005) use model-based forecasts of the unemployment rate, and Andersen et al. (2007) rely on survey forecasts of major MNAs to emphasize the importance of measuring the impact of MNAs on stock prices over different phases of the business cycle. Although these contributions are insightful, the previous literature has been concentrated on comparing the stock market's reactions in recessions to those in expansions.

[3] See, e.g., McQueen and Roley (1993), Boyd et al. (2005), and Andersen et al. (2007).

[4] In the Appendix, we provide a simple New Keynesian model to formalize the mechanism.

Our paper is distinct from existing work along three important dimensions. First, from a technical point of view, we substantially improve on the measurement and characterization of the time-varying stock market response to news using a broader set of MNAs and high-frequency returns. Second, we document that the variation happens within expansions as the economy grows from trough to peak of the business cycle, which points to macreonomic drivers of this phenomenon, rather than volatility-based explanations in the context of expansions vs. recessions. Third, we jointly assess evidence from stock and bond markets to shed light on the origins of the observed time variation.

This paper is also related to the literature exploring the relationship between various news announcements, including FOMC announcements and asset prices. Faust and Wright (2018) and Savor and Wilson (2013) find positive risk premia in bond markets for macroeconomic announcements. Lucca and Moench (2015) find the stock market on average does extremely well during the 24 hours before FOMC announcements. Ai and Bansal (2018) explore the macro announcement premium in the context of generalized risk preferences.

Broadly speaking, our paper can be linked to the large literature that studies asset markets and policy (e.g., Pearce and Roley (1985), Thorbecke (1997), Cochrane and Piazzesi (2002), Rigobon and Sack (2004), Bernanke and Kuttner (2005), Gurkaynak et al. (2005a), Bekaert et al. (2013), Neuhierl and Weber (2019), and Tang (2017), among others). Recently, Cieslak and Vissing-Jorgensen (2017) focus on a related and complementary channel by relating stock market movements to subsequent monetary policy actions by the Fed. Nakamura and Steinsson (2018) estimate monetary nonneutrality based on evidence from yield curves and claim the FOMC announcements affect beliefs not only about monetary policy but also about other economic fundamentals. Paul (2020) estimates the time-varying responses of stock and house prices to changes in monetary policy and finds that asset prices have been less responsive to monetary policy shocks during periods of high and rising asset prices. A recent paper by Xu and You (2023) looks at the role of fiscal rather than monetary policy expectations in stock return responses to macro surprises during and immediately after the Covid-19 recession.

Lastly, this paper is related to work that analyzes the relative importance of cash flows versus discount rates. Campbell and Shiller (1988), Campbell (1991), Campbell and Ammer (1993), and Cochrane (2011), among others, claim variations in discount rate news account for most of the variation in asset prices. Other papers ascribe a significant role to cash flow news in generating variation in asset prices (see Bansal and Yaron (2004), Bansal et al. (2005), Lettau and Ludvigson (2005), Hansen et al. (2008), and Schorfheide et al. (2018), among others). The findings in the recent paper by Diercks and Waller (2017) complement ours. The authors find that the Fed plays a key role in how equity markets interpret news about cash flows and discount rates, but their focus is on the effect of changes in personal taxes.

The remainder of the paper is structured as follows. Section 2 presents the main empirical results. Section 3 discusses the economic drivers of time variation. Section 4 concludes.

2. The stock market's reaction to news

In this section, we establish empirical stylized facts about the time variation in the stock market's reaction to major MNAs.

2.1. Data

Macroeconomic news announcements. MNAs are officially released by government bodies and private institutions at regularly prescheduled intervals. In this paper, we use MNAs from the Bureau of Labor Statistics, the Census Bureau, the Bureau of Economic Analysis, the Federal Reserve Board, the Conference Board, the Employment and Training Administration, and the Institute for Supply Management. We use MNAs as tabulated by Bloomberg Financial Services. Bloomberg also surveys professional economists on their expectations of these macroeconomic announcements. Forecasters can submit or update their predictions up to the night before the official release of the MNAs. Thus, Bloomberg forecasts could in principle reflect all available information until the publication of the MNAs. Most announcements are monthly, except for initial jobless claims (weekly) and gross domestic product (GDP) annualized QoQ (quarterly). Except for industrial production MoM, which is released at 9:15 a.m., all announcements are released at either 8:30 a.m. or 10:00 a.m. We consider all announcements released between January 1999 and June 2023. The appendix provides the details. For robustness, we also consider the Money Market Services (MMS) real-time data on expected U.S. macroeconomic fundamentals to measure MNA surprises. None of the results are affected.

Standardization of MNA surprises. Denote MNA i at time t by $\text{MNA}_{i,t}$, and let $E_{t-\Delta}(\text{MNA}_{i,t})$ be proxied for by the median surveyed forecast made at time $t-\Delta$.

Individual MNA surprises (after normalization) are collected in a vector X_t, whose ith component is

$$X_{i,t} = \frac{\text{MNA}_{i,t} - E_{t-\Delta}(\text{MNA}_{i,t})}{\text{Normalization}}.$$

The units of measurement differ across macroeconomic indicators. To allow for meaningful comparisons of the estimated surprise response coefficients, we consider two normalization scales. The first normalization scales the individual MNA surprise by the cross-sectional standard deviation of the individual forecasters' prediction for each announcement. The key feature of this standardization is that the normalization constant differs across time for each MNA surprise. The second normalization scales each MNA surprise by its standard deviation taken over the entire sample period.[5]

The key feature of the second approach is that for each MNA surprise, the normalization constant is identical across time. Thus, this normalization cannot affect the statistical significance of the sensitivity coefficient. We find that the two different approaches yield highly correlated surprise measures. We use the first normalization as our benchmark approach, because it scales the surprises by the disagreement to make them economically interpretable. Our results are robust across both methods. The appendix provides the details.

Financial data. We consider futures contracts for the asset prices in our analysis: the S&P 500 E-Mini Futures (ES), the Eurodollar futures (ED), and the Treasury futures (FV,TY). Futures contracts allow us to capture the effect of announcements that take place at 8:30 a.m. Eastern time before the equity market opens. We use the first transaction in each minute as our measure of price and fill forward if there is no transaction in an entire minute. We also consider SPDR S&P 500 Exchange Traded Funds (SPY) to confirm the robustness of our findings. Asset prices come from TickData. We use the S&P 500 Volatility (VIX) index from the Chicago Board Options Exchange (CBOE). We take the price-to-dividend ratio from Robert Shiller's webpage.

Macroeconomic data. All macroeconomic data come from the Federal Reserve Bank of St. Louis. We use survey forecasts from the Survey of Professional Forecasters provided by the Federal Reserve Bank of Philadelphia.

2.2. Estimating the stock return's sensitivity to news pre-Covid

We first present estimation results for the period preceding the Covid-19 pandemic. While our sample covers January 1999 to June 2023, we exclude the covid and post-covid periods to remove the influence of potential structural changes caused by the unprecedented decline in economic activity in 2020. As formally shown in Schorfheide and Song (2022), the pandemic led to significantly higher variance in macroeconomic variables compared to the Great Recession. Moreover, we exclude the recovery ("post-covid") period due to concerns about the pandemic-related surge in inflation potentially changing the dynamics of macroeconomic variables, ending the low-inflation era, and altering the drivers of monetary policy expectations. By focusing on the baseline estimation sample from 1999 to 2019, we aim to isolate and thoroughly examine the impact of macroeconomic news announcements on stock returns during a 'normal' period. In the subsequent section, we extend our estimation to include data up to June 2023 and compare the pre- and post-covid samples.

2.2.1. Cumulative stock returns around news announcements

When considering stock market responses to scheduled news releases about the aggregate economy, FOMC announcements, i.e., announcements of policy rate changes, are often the primary focus for many researchers. Studies like Lucca and Moench (2015) have shown that stock prices are influenced by FOMC announcements in two ways. First, they react immediately after the announcement in response to unexpected rate changes. Second, stock prices increase leading up to the release, regardless of the subsequent surprises, a phenomenon termed "pre-announcement drift."[6]

This pre-announcement drift is unconditional, meaning stock prices prior to the release are consistently higher than those several hours before, regardless of whether the announced rate aligns with market expectations. The left two panels of Fig. 1 display the presence of this unconditional drift, illustrating cumulative stock returns from 5 or 24 hours before the announcements.

Conversely, for macroeconomic news announcements on non-FOMC days, the evidence of pre-announcement drift is weak, making it difficult to identify significant movement in stock prices (see the right two panels of Fig. 1). We find that the key contrast between FOMC days and MNA days lies in the first moment (i.e., the average pre-announcement return), while the second moment (i.e., volatility) exhibits similar magnitudes for both. In other words, stocks are as sensitive to MNAs as they are to FOMC announcements. Further details can be found in Appendix C.

This *conditional* response of stocks to macroeconomic news forms the precise focus of our paper. Our objective is to precisely measure and establish the stylized facts regarding the reaction of stock returns to scheduled MNAs. We provide a thorough explanation of this in the following sections.

2.2.2. Estimating the time-varying sensitivity of returns to news

To precisely measure the effect of MNA surprises on stock prices, we obtain intraday futures prices and compute returns r_t in a Δ-minute window around their release time. For our benchmark results, we use the ES contract, which is most actively traded during the MNA release times, to measure stock returns. To determine which MNAs affect returns, we estimate the following nonlinear regression over the τ-subperiod as suggested by Swanson and Williams (2014):

$$r_{t-\Delta_l}^{t+\Delta_h} = \alpha^\tau + \beta^\tau \gamma' X_t + \epsilon_t, \tag{1}$$

where the vector X_t contains various MNA surprises; γ measures the sample average responses; ϵ_t is a residual representing the influence of other factors on stock returns at time t; and α^τ and β^τ are scalars that capture the variation in the return response to announcements during the τ subperiod. For the empirical analysis, τ indexes the calendar year.

[5] Balduzzi et al. (2001) propose this standardization, which is widely used in the literature.

[6] According to Lucca and Moench (2015), the S&P 500 index typically increases 49 basis points in the 24 hours before scheduled FOMC announcements. Other research, such as Savor and Wilson (2013), finds that average stock returns are notably higher on days when crucial macroeconomic news, including inflation indexes, employment figures, and FOMC announcements, are scheduled.

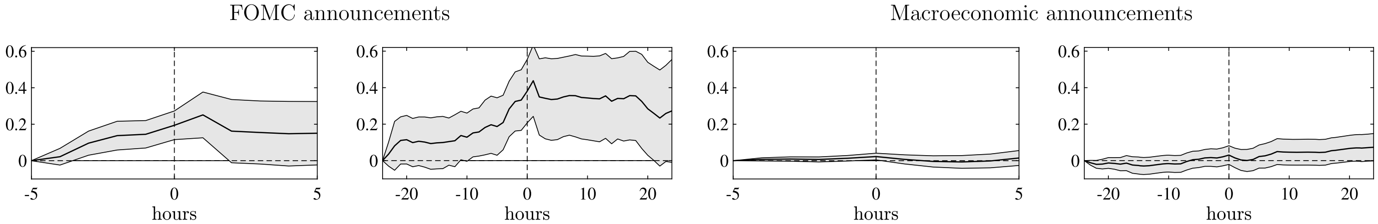

Fig. 1. Cumulative stock returns around announcements. *Notes:* We plot the average cumulative stock returns in percentage points around scheduled announcements. The benchmark macroeconomic news announcements are the change in nonfarm payrolls (CNP), initial jobless claims (IJC), ISM manufacturing (ISM), and the consumer confidence index (CCI). The sample period is from January 1999 through December 2019. The shaded light-gray areas are ±2-standard-error bands around the average returns. The vertical dashed lines represent the time at which announcements are typically released in this sample period.

As discussed in Swanson and Williams (2014), the primary advantage of this approach is that it substantially reduces the small sample problem by including more data in the estimation of β^τ. The underlying assumption is that, although the relative magnitude of γ is constant, the return responsiveness to all MNA surprises shifts by a proportionate amount over the τ subperiod. In other words, we assume a one factor structure to the time variation in return sensitivities. A battery of empirical tests confirms the validity of this assumption for our baseline sample. The identification restriction is that β^τ on average is equal to one. This implies that the sample average of $\beta^\tau\gamma' X_t$ is identical to $\gamma' X_t$. When β^τ is always one, then (1) becomes the ordinary least squares (OLS) regression motivated by Gurkaynak et al. (2005b) and others.

We first determine the most impactful announcements across various window intervals, select the return window, and then analyze the cyclicality of the return response.

Selection of MNA surprises and the return window intervals. We now turn to the selection of the MNAs. We find that changes in nonfarm payrolls, initial jobless claims, ISM manufacturing, and the consumer confidence index are, broadly speaking, the most influential MNAs for the stock market.[7] These announcements are the only ones to be universally significant for stock returns across a wide variety of specifications (see Appendix D for details on the selection criteria). Our choice of the four announcements is consistent with the findings in the literature.[8]

Our results depend on the size of the return window, so we consider all combinations of Δ_l and Δ_h between 10 and 90 minutes in 10-minute increments (81 regressions in total) and confirm that our results are robust across various return window intervals.[9] For ease of exposition, we present the regression results with $\Delta = \Delta_l = \Delta_h = 30$ min in the main body of the paper. Having fixed $\Delta = 30$ min and restricted the set of MNAs to the top-four most influential MNAs, we turn our attention to measuring the time-varying sensitivity of the returns to macroeconomic announcements.

Cyclical return response. The coefficients that measure the average sensitivity, that is, $\hat{\gamma}$, are significant at the 1% level and are reported in rank order (in terms of their economic significance) in the legend to Fig. 2. To understand their economic impact, one should scale $\hat{\gamma}$ with the number of observations keeping in mind that initial jobless claims follow a weekly release schedule as opposed to the remaining three monthly announcements. Our findings agree with the existing literature on the significance of the change in nonfarm payrolls and initial jobless claims on the stock market.

Fig. 2 shows the estimates of the time-varying sensitivity coefficient $\hat{\beta}^\tau$ (solid-black line) in (1). We find strong evidence of persistent cyclical variation in the stock market's responses to the MNAs.[10] The evidence suggests that stock return sensitivity to the MNAs can increase by a factor greater than two post-recession and remain above average for about 1 to 2 years. It is important to point out that the peak is obtained at the early stage of an expansion. We find that the stock market's prolonged above-average reaction (3 to 4 years) is unique to the economy's recovery from the Great Recession, during which interest rates were bounded from below by zero. The stock market's reaction attenuates as the economy expands, and moving from peak to trough sensitivity takes about four years. During this period, stock returns hardly react to news.

This evidence is consistent with existing papers that argue that the stock market's reactions to announcement surprises may depend on the state of the economy (e.g., McQueen and Roley (1993), Boyd et al. (2005), and Andersen et al. (2007)). While insightful, the previous literature concentrated on comparing the stock market's reactions in recessions to those in expansions. Our evidence brings a new perspective to the literature by clearly presenting the cyclical nature of the stock market's response to macroeconomic announcements. Importantly, we find that periods of peak stock return sensitivity do not coincide with periods of economic recession.

Augmenting the vector X_t with other MNAs does not change our results. We re-run the regression in (1) with every possible combination of the next eight influential MNAs as listed in Table A-3 in the Online Appendix, e.g., retail sales and CPI, and plot the results as solid gray lines in Fig. 2. The results are so similar to the benchmark case and each other that they appear as a thin gray band around the solid black line plotting the baseline results.

Decomposing movements around news announcements. To better understand how information contained in the MNAs is conveyed to the stock market, we decompose $\hat{\beta}^\tau$ to sensitivity attributable to periods before and after announcements. We write $\hat{X}_t = \hat{\gamma}' X_t$, where $\hat{\gamma}$ is based on the estimates provided in the legend to Fig. 2.

We estimate the modified (restricted) regression in which we regress return $r_{t-\Delta_l}^{t+\Delta_h}$ on $\hat{X}_t$,

$$r_{t-\Delta_l}^{t+\Delta_h} = \alpha^\tau + \beta^\tau \hat{X}_t + \epsilon_t, \tag{2}$$

and obtain the estimate of $\hat{\beta}^\tau$ for each combination of $(\Delta_h, \Delta_l) \in \{-5m, 0m, 5m, 30m\}$, which we denote by $\hat{\beta}^\tau_{(-\Delta_l,+\Delta_h)}$.

See Panel (A) of Fig. 3.

It follows that $\hat{\beta}^\tau_{(-30m,30m)}$ in (1) by construction equals $\hat{\beta}^\tau_{(-30m,30m)} = \hat{\beta}^\tau_{(-30m,-5m)} + \hat{\beta}^\tau_{(-5m,0m)} + \hat{\beta}^\tau_{(0m,5m)} + \hat{\beta}^\tau_{(5m,30m)}$.

[7] This is consistent with Gilbert et al. (2017), who claim that investors care about certain macro announcements more than others based on evidence from Treasury yields.

[8] For example, Andersen et al. (2007) analyze the impact of 20 monthly macroeconomic announcements on the high-frequency S&P 500 futures returns to study announcement surprises. They argue that the change in nonfarm payrolls, often referred to as the "king" of announcements by market participants, is among the most significant of all announcements for the markets. Bartolini et al. (2008) discuss the significance of the change in nonfarm payrolls as well as three other announcements, all of which are also significant in our regressions.

[9] Bollerslev et al. (2008) show that sampling too finely introduces microstructure noise, whereas sampling too infrequently confounds the effects of MNA surprises with all other information aggregated into stock prices over the time interval.

[10] For robustness, we also plot the results from additionally including every possible combination of the next eight influential MNAs. All these regressions yield the solid light-gray lines that are very close to each other and, hence, appear as a darker gray band when viewed from a distance.

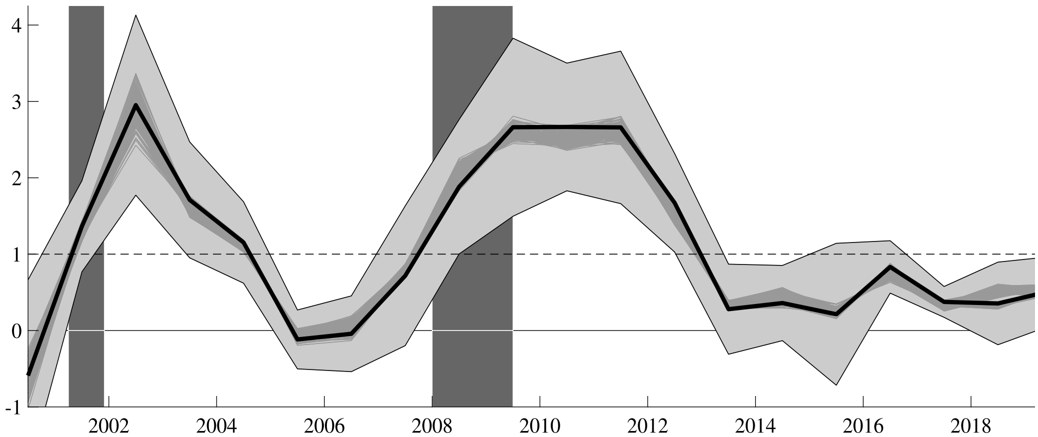

Fig. 2. Time variation in stock return's sensitivity to macroeconomic news: 1999-2019. *Notes:* The benchmark MNAs are the change in nonfarm payrolls (CNP), initial jobless claims (IJC), ISM manufacturing (ISM), and the consumer confidence index (CCI). We set $\Delta = 30$ min. We impose the following restriction: that β^τ (solid-black line) in (1) averages to one. We provide $\pm$2-standard-error bands (light-shaded area) around β^τ. The shape is robust to all possible combinations (solid light-gray lines) of the next eight influential MNAs. NBER recession bars are overlaid on the graph. Individual estimates and standard errors (in parentheses) for γ are as follows:

CNP	IJC	ISM	CCI
0.087	-0.021	0.071	0.051
(0.011)	(0.003)	(0.011)	(0.008)

The sample period is from January 1999 through December 2019.

The stock return sensitivity is in respect to the linearly transformed MNA surprises, $\hat{X}_t$.

We do not find any evidence of a preannouncement phenomenon. Stock prices react significantly to the MNA surprises, but there is no statistically significant movement 5 minutes after the announcement. We interpret this finding to mean there is no immediate mean reversion in the stock market's reaction. We extend our analysis to the daily data and further confirm that the market's reactions do not reflect temporary noise.

Evidence from lower-frequency data. To show that the impact of the MNA surprises on the stock market is not short-lived, we estimate the restricted regression (2) with larger window intervals in Panel (B) of Fig. 3. Because we aim to compare the precision of the sensitivity coefficient estimates when we replace the dependent variable with lower-frequency returns, we fix the unconditional impact of the MNA surprises to be *ex ante* identical across various cases. Thus, the coefficient $\hat{\beta}^\tau_{(-\Delta_l,+\Delta_h)}$ can be interpreted with respect to $\hat{X}_t$ only. Notably, when constructing (near) daily returns, we remove all days with FOMC-related news. We find that the mean estimates are broadly similar across various window intervals. As expected, the standard error bands increase when we move from the case of hourly returns to that with daily returns. The results from the unrestricted regression are qualitatively similar.

Evidence for asymmetry. Our four benchmark MNAs can be grouped into labor- and non-labor-related announcements. Boyd et al. (2005) look at the stock market's response to the former type of MNAs, for example, unemployment rate. Here, we ask if there is something profoundly different about labor-related announcements compared with other types of announcements. Panel (C) of Fig. 3 documents that similar patterns of cyclical response are present across both types of MNAs.[11]

We then decompose the macroeconomic news announcements into "good" (better-than-expected, or positive) and "bad" (worse-than-expected, or negative) announcements and examine whether the stock return responses to good and bad MNA surprises are different from each other.[12] Here, we flip the sign of initial jobless claim surprises for ease of comparison across other "good" surprises. We then run the following regression:

$$r^{t+\Delta}_{t-\Delta} = \alpha^\tau + \beta^\tau_{\text{good}}\gamma' X_{\text{good},t} + \beta^\tau_{\text{bad}}\gamma' X_{\text{bad},t} + \epsilon_t. \tag{3}$$

Note that if β^τ_{good} and β^τ_{bad} are identical, this equation becomes (1). Panel (D) of Fig. 3 displays the corresponding estimates for $\hat{\beta}^\tau_{\text{good}}$ and $\hat{\beta}^\tau_{\text{bad}}$. Surprisingly, the standard error bands on $\hat{\beta}^\tau_{\text{good}}$ and $\hat{\beta}^\tau_{\text{bad}}$ almost always overlap, and, thus, the sensitivity estimates are statistically indifferent from one another. In sum, there is no evidence for asymmetry in the response to good and bad MNA surprises.

Robustness. We want to ensure that our results survive a variety of robustness checks. To save space, we only briefly explain them here.

We first consider the possibility that the stock market's changing sensitivity is merely tracking volatility changes, because the magnitudes of news surprises can be larger during downturns. However, we do not find any supporting evidence for this claim.[13] We create two dummy variables to locate the high-beta ($\hat{\beta}^\tau > 1.5$) and low-beta ($\hat{\beta}^\tau < 0.5$) periods and regress the raw and absolute MNA surprises on these dummy variables. We find that the coefficients for these two dummy variables are largely insignificant. To ensure our results are fully robust, we estimate (1) by using the residuals from this regression as the "clean" measure of surprises. We find that the estimated time-varying sensitivity of the stock return did not change much from Fig. 2. We also check the possibility that the changing stock return sensitivity to news could arise from time variation in the accuracy of news. We do not find enough evidence for superior forecast accuracy during times in which stock return sensitivity is high. We then consider the possibility that our benchmark specification may suffer from omitted variables problems. We augment the benchmark regression (1) with other predictor variables that are known before the announcements and find that the regression results are not affected.

[11] The pattern is robust to the inclusion of the unemployment rate announcement as in Boyd et al. (2005).

[12] We also repeat this exercise using only the better half of good news (the most positive) and the worse half of bad news (the most negative) and find that the results do not change.

[13] McQueen and Roley (1993) and Balduzzi et al. (2001) find little evidence that these survey forecasts are biased predictors of announcements.

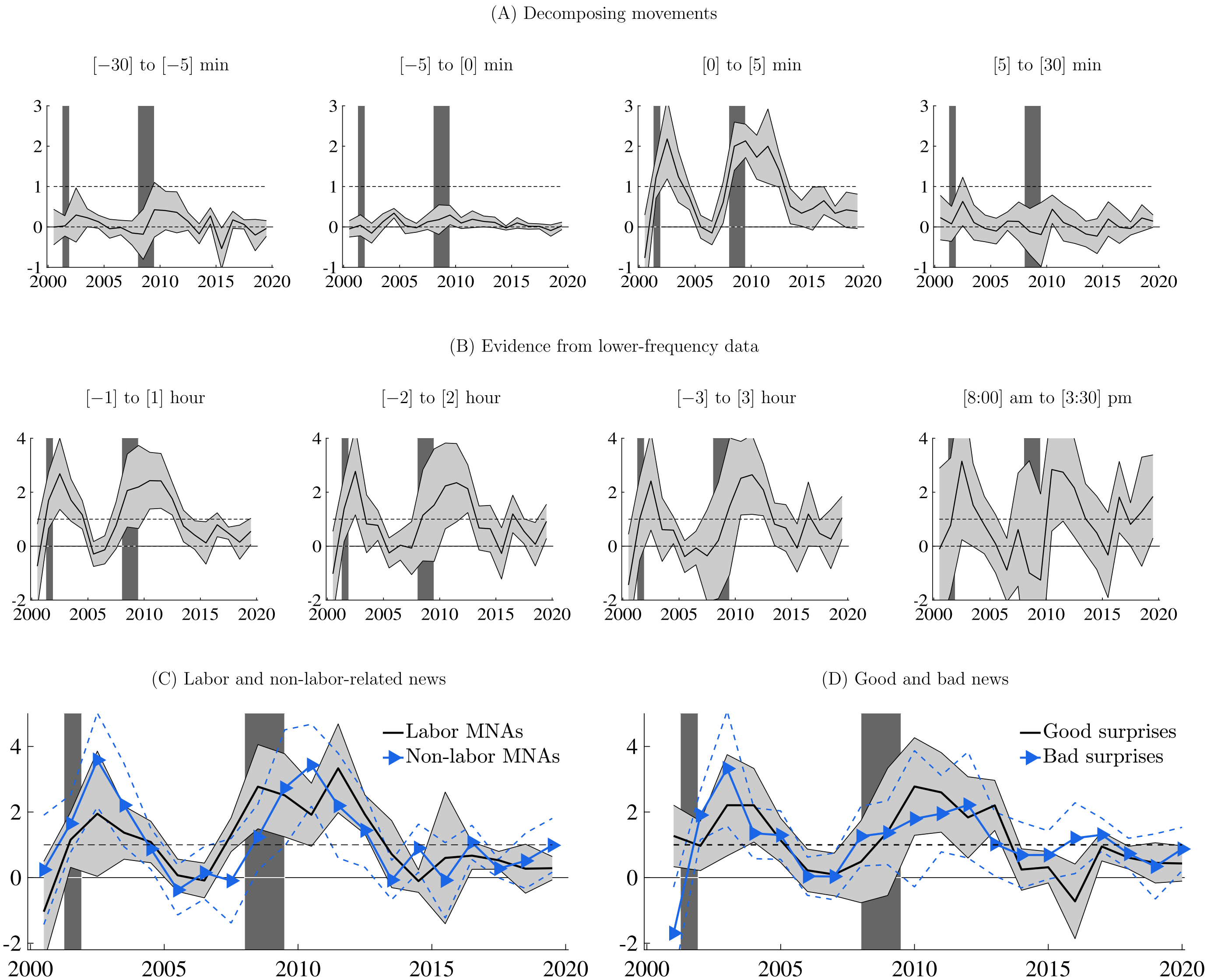

Fig. 3. Decomposing the stock return's sensitivity to macroeconomic news. *Notes:* For panels (A) and (B), the individual $\hat{\beta}^{\tau}_{(-\Delta_l,+\Delta_h)}$ is shown with ±2-standard-error bands. Here, we do not impose the restriction that the average of $\hat{\beta}^{\tau}_{(-\Delta_l,+\Delta_h)}$ is equal to one. The regressor is already restricted to $\hat{X}_t$. For Panel (A), by construction, the sum of individual $\hat{\beta}^{\tau}_{(-\Delta_l,+\Delta_h)}$ equals $\hat{\beta}^{\tau}$, which is shown in Fig. 2. For Panel (B), when constructing daily returns, we remove all days with FOMC-related news. For panel (C), labor-related macroeconomic announcements are the change in nonfarm payrolls and initial jobless claims. Non-labor-related macroeconomic announcements are the consumer confidence index and ISM manufacturing. For panel (D), we decompose the macroeconomic news announcements into "good" (better-than-expected, or positive) and "bad" (worse-than-expected, or negative) announcements. We flip the sign of initial jobless claims surprises for ease of comparison across other "good" surprises. For panels (C) and (D), we set $\Delta = 30$ min and impose the restriction that β^{τ} is on average equal to one.

2.3. Stock return's sensitivity to news after the Covid pandemic

Do the patterns documented above persist during the Covid pandemic and after? On one hand, the sharp contraction during the pandemic and recovery since provide an additional business cycle during which we can observe the variation in stock return sensitivity. This provides a valuable opportunity for out-of-sample checks, considering that our initial draft was prepared well before the Covid pandemic. On the other hand, the recent period is unique. The 2020 recession was severe yet remarkably short-lived. The recent recovery, unlike the booms of the mid-2000s or 2010s, exhibited an appreciable spike in inflation, meaning that for the first time in several decades the price stability mandate of the Federal Reserve rose to preeminence.

Fig. 4 provides the time variation in stock return sensitivity to macroeconomic news after the Covid pandemic. Two notable observations emerge, broadly aligning with previous findings yet reflecting the uniqueness of the macroeconomic setting.

Firstly, consistent with our narrative, we observe an increase in stock return sensitivity to macroeconomic news after the Covid pandemic, although this increase is relatively modest compared to previous recessions. This pattern becomes evident when using significantly reduced smoothing parameter values, such as $\tau = 3$ or 6 months, instead of our baseline method of pooling information within a year. By employing these shorter pooling periods, we capture more pronounced but noisier time variations. The observed relatively modest sensitivity pattern may be attributed to the brief duration of the 2020 recession, indicating that the Federal Reserve may not have adopted the same accommodative stance as in previous cycles, or adopted it for a much shorter duration, given the swift recovery.

Secondly, we discover an intriguing aspect during the 2022-2023 period, where the coefficient becomes significantly negative for the first time. In other words, positive (negative) macroeconomic news become

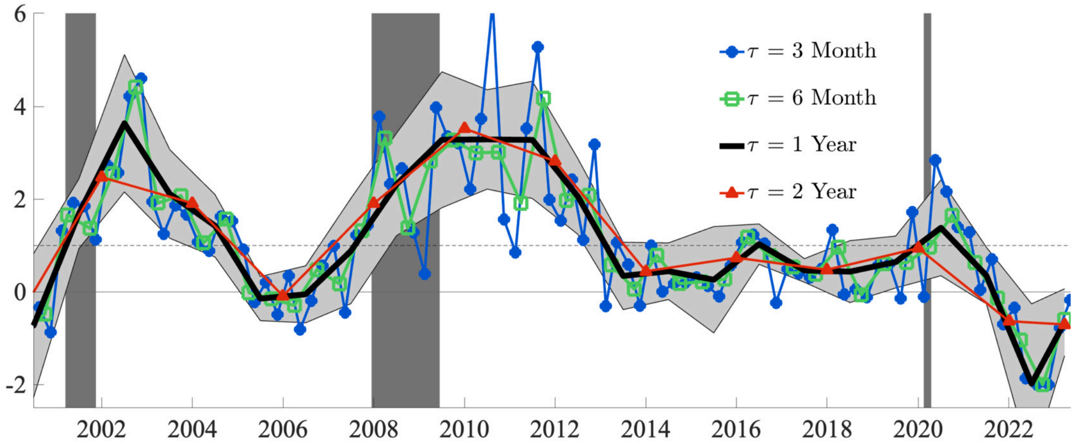

Fig. 4. Time variation in stock return's sensitivity to macroeconomic news: 1999-2023. *Notes:* The benchmark MNAs are the change in nonfarm payrolls (CNP), initial jobless claims (IJC), ISM manufacturing (ISM), and the consumer confidence index (CCI). We set $\Delta = 30$ min. We impose the following restriction: that β^τ averages one. We provide $\pm$2-standard-error bands (light-shaded area) around β^τ. NBER recession bars are overlain on the graph. The sample period is from January 1999 through June 2023.

associated with negative (positive) stock returns.[14] This period coincides with the largest levels of inflation and the first 75 basis point rate hikes seen since the 1980s. Could aggressive monetary policy explain the sensitivity's sign reversal? In the next section, we formally link time-varying stock return sensitivities to time-varying investor perceptions of monetary policy aggressiveness both before the pandemic and since, when this relationship becomes particularly pronounced.

In sum, the heightened sensitivity observed after exiting the 2020 recession and the subsequent sharp reversal in 2022 are both consistent with our previous findings. Next, we shift our focus to examining the differences between the period of 2020 to 2023 and the period of 1999 to 2019.

Specifically, we study the stock return sensitivity to news about individual macroeconomic variables, allowing for differential responsiveness for each variable instead of assuming a proportionate shift across all surprises. To achieve this, we estimate equation (1) separately for each macroeconomic announcement. The estimation results, indicating the individual sensitivity values, are presented in Fig. 5. In addition to the four announcement series included in our baseline results, we also consider retail sales and CPI inflation.

Despite higher standard errors, Fig. 5 replicates the previous cyclical pattern for the first five individual macroeconomic news surprises, with peaks typically observed early in an expansion and approaching zero as the expansion phase progresses. Notably, a sharp reversal in the pattern is observed in 2022 and 2023 for most individual series.

However, CPI is different. Between 1999 and 2019 stock market responses to inflation surprises do not follow a clear cyclical pattern and the estimated sensitivities are rarely significantly different from the average. Specifically, while larger-than-expected CPI surprises do result in declines in stock returns and vice versa (indicating a negative estimated γ), we observe limited time variation in the sensitivity of stock returns. These changes sharply following the Covid pandemic. Notably, the magnitude of the stock response is approximately 7-8 times greater in 2022-2023 compared to previous periods, emphasizing the emerging significant role of inflation as a key macroeconomic announcement for stock markets.

[14] Our findings align with the narrative presented by Xu and You (2023), who argue that positive surprises in initial jobless claims (i.e., bad news) result in significant increases in stock market returns during the Covid pandemic. However, when considering various types of MNAs and considering a tight window around the announcement, we observe these patterns emerging only from 2022 rather than at its height in February 2020 to March 2021.

As per Cascaldi-Garcia et al. (2022), in this period inflation accelerated across the globe. Demand surged as economies reopened after stringent pandemic lockdowns, and prices of food, energy, and other commodities rose after Russia invaded Ukraine. Fig. 5 demonstrates the newly high sensitivity of the stock market to inflation news. Cieslak and Pflueger (2022) provide a rationale for this renewed attention, arguing that inflation persists and exhibits stagflationary characteristics similar to the 1970s and 80s, stock valuations may decline.

Overall, it is still the case that business cycle dynamics explain the time-variation in stock sensitivity. For most of our sample, stable inflation meant that the key business cycle variable driving the variation was output, leading us to model it using a one-factor structure. Since 2022, inflation matters too. The newly emerging strong response of stocks to CPI news suggests that a second inflation-related factor is necessary to explain time variation in the full panel macroeconomic announcements. In Appendix F, we provide some supporting evidence for this claim, yet confirm that the dynamics of our main factor documented in Fig. 4 are robust to the inclusion of a second factor. Therefore, we concentrate our analysis on the four benchmark announcement series that exclude inflation.

3. Identifying the economic drivers

Having documented robust evidence of cyclicality in stock market responses, we turn to the economic drivers behind this pattern. We rely on the same regression (1) as before but impose a parametric restriction on the sensitivity coefficient:

$$r_{t-\Delta}^{t+\Delta} = \alpha^\tau + \beta^\tau \gamma' X_t + \epsilon_t, \quad \beta^\tau = \beta_0 + \beta_1' Z_{\tau-1}. \tag{4}$$

We examine whether the time variation in stock return sensitivity, β^τ, can be explained by key economic observables, $Z_{\tau-1}$. Potential explanatory variables include measures of the business cycle—the demeaned output gap, inflation, short-term interest rate and recession probability forecasts—as well as measures of risk premia —term premium, the price-to-dividend (PD) ratio, and the VIX.

For the purpose of decomposition, we take our estimates of $\hat{\gamma}$ from the stock return regression as given and only re-estimate α^τ and β^τ in (4). Because our sample is somewhat short, here we set τ to index a quarter (i.e., the corresponding unrestricted β^τ is represented by the blue (circle) line in Fig. 4) to include more data in the estimation. For variables that are not forecasted, a lag of one quarter is introduced to the predictor variables. This lag helps reduce the potential bias caused by contemporaneous relationships between predictors and the outcome.

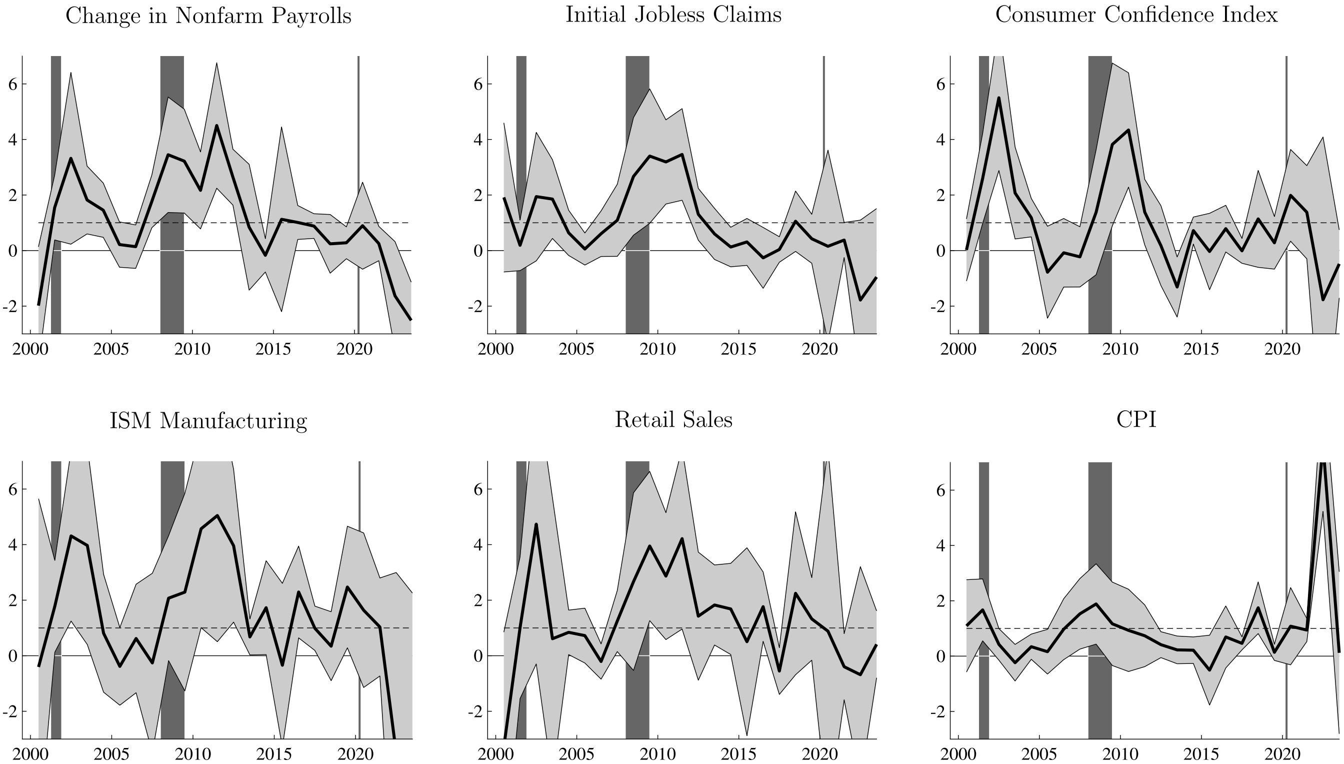

Fig. 5. Stock return sensitivity: Evidence from an individual regression. *Notes:* We consider the change in nonfarm payrolls, initial jobless claims, ISM manufacturing (ISM), the consumer confidence index, the retail sales advance, and the consumer price index. We set $\Delta = 30$ min for stock returns. We impose the following restriction: that β^τ averages one. We provide $\pm$2-standard-error bands (light-shaded area) around β^τ. NBER recession bars are overlain on the graph. The sample period is from January 1999 through June 2023.

3.1. Stock market evidence

Baseline period of 1999 to 2019. Table 1 reports the estimation results for stock return sensitivity $\hat{\beta}_0$ and $\hat{\beta}_1$ based on the estimation sample from 1999 to 2019. We begin by discussing the coefficients from a series of univariate specifications, which are summarized in rows (1) to (9) of Table 1. We document that an increase in each of the output gap, the interest rate (either the level or a change), inflation, and the PD ratio significantly predicts lower stock return sensitivity. On the other hand, the term premium, VIX index and the recession probability forecast significantly predict higher stock return sensitivity.

Rows (10) to (15) of Table 1 display the estimation results from multivariate specifications. Specification (10) illustrates the joint significance of output gap and expected interest rate changes, the two variables directly tracking the state of the business and monetary cycle. Neither inflation nor the level of interest rates further improves the fit of the model in the pre-Covid sample, as shown by (11) and (12). We retain inflation in subsequent specifications to facilitate comparison with recent years. In (13) and (14), we investigate two measures of investors' appetite for risk. (13) shows that quarters with high term premia coincide with high stock sensitivities, while there is no significant relationship for P/D ratios, according to (14). Keeping the term premia measure, in (15) we find that heightened recession fears and stock market volatility do not provide any additional explanatory power.

Overall, we highlight that the fitted $\hat{\beta}^\tau$ based on the estimates in rows (10) to (15) look very similar to our benchmark stock return sensitivity estimates in Fig. 2. Through various non-collinear permutations, we consistently observe the significance of coefficients linked to the output gap, the expected change in short-term interest rates, and the term premium. On the contrary, coefficients associated with inflation, financial variables, or recession probability are either insignificant or exhibit a change in sign when compared to the results obtained from the univariate specification. These regression results confirm that periods of peak stock return sensitivity do not coincide with periods of heightened stock market volatility (e.g., measured by the VIX index) or economic recession.

Our evidence suggests that periods of peak stock return sensitivity coincide with periods during which the output gap is large and negative and interest rates are not expected to increase—both measures indicating the trough of the business cycle.[15] Because bond risk premia have a marked countercyclical component, as shown by Ludvigson and Ng (2009), the positive relationship between term premia and stock return sensitivity further highlights that stocks respond stronger in bad times.

Including the post-pandemic period. Earlier, we saw that in the aftermath of the pandemic investors became much more sensitive to news about inflation. Here, we ask a related, but distinct question—does the newly emerging regime of high inflation and significant monetary tightening alter investors' responsiveness to the benchmark set of MNAs that we examine throughout our work? Table 2 expands our analysis to include the post-pandemic period, investigating any notable changes in the economic drivers influencing cyclical stock return responses. Row (1) in Table 2 displays coefficients of the same multivariate specification as in row (13) of Table 1 after re-estimating with the extended sample. While the coefficient on expected change in short-term interest rates gets larger in magnitude, our conclusions are unaltered. The estimated inflation coefficient remains insignificant. Moreover, removing inflation from the predictor vector does not diminish the regression's fit, as evidenced by row (2).

Most of the observations in the expanded sample are still from the pre-pandemic period, so it is not surprising that the estimated coefficients are similar. Next, we specifically investigate whether the economic drivers of cyclical stock return responses changed after the

[15] Expected rate changes co-move with the output gap, with the expected rate changes leading the output gap by several quarters.

Table 1
Economic drivers behind cyclical return responses: Excluding post-Covid periods.

	β_0	Output gap	ΔT-bill	T-bill	Inflation	Term premia	PD ratio	Recession prob.	VIX	R^2
(1)	0.96***	-0.35***								0.13
	(0.10)	(0.06)								
(2)	0.93***		-2.72***							0.12
	(0.11)		(0.66)							
(3)	0.96***			-0.31***						0.11
	(0.10)			(0.06)						
(4)	0.88***				-0.30**					0.10
	(0.11)				(0.12)					
(6)	0.82***					0.62***				0.12
	(0.10)					(0.10)				
(7)	0.92***						-2.15***			0.11
	(0.11)						(0.61)			
(8)	0.99***							0.03***		0.12
	(0.10)							(0.01)		
(9)	0.97***								0.06***	0.11
	(0.11)								(0.02)	
(10)	0.94***	-0.33***	-2.21***							0.14
	(0.10)	(0.06)	(0.64)							
(11)	0.95***	-0.34***	-2.27***		0.05					0.14
	(0.10)	(0.06)	(0.65)		(0.12)					
(12)	0.95***	-0.32**	-2.29***	-0.01	0.05					0.14
	(0.10)	(0.14)	(0.71)	(0.13)	(0.12)					
(13)	0.83***	-0.27***	-2.16***		0.01	0.47***				0.16
	(0.09)	(0.06)	(0.61)		(0.12)	(0.09)				
(14)	0.94***	-0.29***	-2.42***		0.05		-0.59			0.14
	(0.10)	(0.08)	(0.74)		(0.12)		(0.79)			
(15)	0.85***	-0.25***	-2.13***		0.03	0.45***		0.01	-0.01	0.16
	(0.10)	(0.06)	(0.69)		(0.12)	(0.11)		(0.01)	(0.02)	

Notes: We only report the coefficients associated with β^{τ} in the regression under both univariate and multivariate specifications. Output gap is the difference between real and potential GDP. Inflation is log changes in the GDP deflator; T-bill (3m) is the 3-month Treasury bill rate; and ΔT-bill (3m) is the difference between the one-quarter-ahead forecast and nowcast rate of the 3-month Treasury bill. The Treasury term premium for a maturity of 10 years is constructed by Adrian et al. (2013). The PD ratio is the price-to-dividend ratio from Shiller, and the VIX is the CBOE volatility index. The recession probability is the nowcast recession probability. All nowcast and forecast variables are collected from the Survey of Professional Forecasters. All variables are demeaned. Non-forecasted predictor variables are lagged one quarter. We use the four baseline macroeconomic announcements. We report Newey-West-adjusted standard errors. The estimation sample period is from 1999 to 2019. $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Table 2
Economic drivers behind cyclical return responses: Including post-Covid periods.

		Output gap	ΔT-bill	Inflation	Term premium		Value
Specification:	$\beta^{\tau} = \beta_0 + \beta_1' Z_{\tau-1}$						
(1)	β_1	-0.25***	-2.44***	-0.05	0.45***	β_0	0.82***
		(0.05)	(0.56)	(0.06)	(0.08)		(0.09)
						R^2	0.14
(2)	β_1	-0.26***	-2.60***		0.46***	β_0	0.82***
		(0.05)	(0.54)		(0.08)		(0.09)
						R^2	0.14
Specification:	$\beta^{\tau} = \beta_0 + \beta_1' \mathbb{1}_{\tau<2020} Z_{\tau-1} + \beta_2' \mathbb{1}_{\tau\geq 2020} Z_{\tau-1}$						
(3)	β_1	-0.27***	-2.15***	0.01	0.47***	β_0	0.83***
		(0.06)	(0.61)	(0.12)	(0.09)		(0.09)
	β_2	-0.07	-3.43***	-0.17	0.15	R^2	0.14
		(0.10)	(1.33)	(0.12)	(0.26)		
(4)	β_1	-0.27***	-2.15***		0.47***	β_0	0.82***
		(0.06)	(0.59)		(0.09)		(0.08)
	β_2		-3.16***	-0.24***		R^2	0.14
			(1.13)	(0.06)			
(5)	β_1	-0.27***	-2.17***		0.48***	β_0	0.78***
		(0.06)	(0.60)		(0.09)		(0.08)
	β_2		-5.54***			R^2	0.14
			(1.06)				

Notes: We only report the estimates associated with β^{τ} in the regression. Output gap is the difference between the output and its potential trend. Inflation is a GDP deflator; ΔT-bill is the difference between the one-quarter-ahead forecast and nowcast rate of the 3-month Treasury bill. The Treasury term premium of maturity 10 years is constructed by Adrian et al. (2013). All nowcast variables are collected from the Survey of Professional Forecasters. All variables are demeaned. These predictor variables are lagged one quarter. We use the benchmarked macroeconomic announcements. We report Newey-West-adjusted standard errors. The estimation sample period is from 1999 to 2022. $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

pandemic and find that they do not appear to have undergone significant changes at first glance. The evidence in rows (3) to (5) in Table 2 is nuanced. The notable spike in CPI since late 2021 has elevated inflation over the output gap as the primary business cycle indicator. This is evident in the heightened sensitivity of stocks to CPI news post-pandemic, as shown in Fig. 5, as well as the shifting driver of stock sensitivity from the output gap to inflation, as depicted in rows (3) and (4).

Nevertheless, whether it is the output gap or inflation level driving stock sensitivity, both factors ultimately manifest themselves in expectations of monetary tightening, as captured by the ΔT-bill coefficient. This coefficient is significant even before the pandemic, but its magnitude increases by a full point in the recent period. Given the concurrent rise in inflation and tightening expectations, it becomes challenging to distinguish and interpret the individual effects of the ΔT-bill and inflation coefficients in the post-pandemic sample. When we drop inflation moving from row (4) to (5), we find that the coefficient on expected rate changes more than doubles from pre- to post-pandemic, meaning that expectations of monetary tightening strongly dampen —and even overturn—stock increases on good macro news.

The business cycle variation in sensitivity—and specifically its relationship to measures of expected changes in short rates—suggests that expectations of what the Fed will do in response to macro news have a meaningful effect on how stocks react to this news. In the next section, we turn to evidence from the bond market to explore this hypothesis.

3.2. Bond market evidence

Macroeconomic news not only influence investors' perceptions of current and future macroeconomic performance but also prompt policymakers to adjust their level of accommodation or restraint. Positive macro news surprises may raise the likelihood of the Fed tightening monetary policy, such as increasing interest rates or reducing quantitative easing. Consequently, macro news contains potentially offsetting policy implications. While positive macro news revisions may lead investors to revise stock valuations upward based on future dividend expectations, the anticipation of policy tightening can temper this revision and prompt an upward adjustment in the discount rates applied to these dividends. This ultimately lowers stock valuations. The greater responsiveness of stocks to macro news during below-trend economic periods arises because such periods correspond to times when policy responsiveness is reduced.

To directly assess whether variations in stock market sensitivity during different business cycles are driven by discount rates, we examine the bond market. If there is evidence of a more responsive Fed (in terms of expectations), it should reflect in the sensitivity of bond prices to macroeconomic news. We condition on our estimates of $\hat{\gamma}$ from the stock return regression and re-estimate β_0 and β_1 in (4) using the EuroDollar futures returns of 3 and 12 month maturities and the Treasury futures returns of 5 and 10 year maturities. As a result, the average beta for bonds of each maturity measures its response to MNAs, relative to the stock response.

If MNAs change expectations of future monetary policy, then in response to good news bond yields should rise and prices fall, producing negative realized returns. When bond investors expect the Fed to respond aggressively to MNAs, we should see larger movements in relatively short-duration bond yields than if bond investors expect the Fed to be sluggish. If our explanation is correct and time variation in stock sensitivity is driven by time variation in policy sensitivity, we should find that bond return sensitivities are less negative when the economy is below trend and more negative above trend.

Table 3 displays results for each bond instrument where we estimate the specification from row (2) of Table 2 but with bond rather than stock returns on the left-hand side. The policy channel outlined above predicts negative $\hat{\beta}_0$ estimates for bonds. Our findings confirm this expectation, with negative and significant $\hat{\beta}_0$ coefficients in Table 3 across all bond maturities. Good macro news are bad news for bonds. And this is true even more so when the economy is above trend—when the output gap is larger (more positive) and term premia are large. These coefficients are estimated more precisely for shorter maturities, consistent with the intuition that monetary policy expectations show up more in shorter maturity bonds, which are less contaminated by changing term premia. We find that the return sensitivity for longer-maturity bonds is determined by the level of term premia, suggesting that investors may be more sensitive to MNAs when term premia are large. Broadly speaking, this evidence is consistent with our proposed explanation. When the economy is above trend and late in the expansion cycle, the Fed is more likely to "lean against the wind" of macroeconomic news. A more aggressive Fed means a stronger offsetting effect on stocks, leading to lower stock sensitivities in these times.

It is important to interpret our findings with caution, as the output gap, expectations of monetary tightening, and term spread exhibit significant comovement. Therefore, we cannot isolate structural economic shocks that drive the variation in these variables. Despite this caveat, these regression results support our primary hypothesis of investors being apprehensive about the Fed's policies and decisions.

3.3. Evidence from survey forecasts

Further supporting evidence for time-varying central bank aggressiveness can be found in the survey forecasts. In particular, we consider whether the observed variations in stock sensitivities can be attributed to changing survey forecaster perceptions of monetary policy responsiveness.

A recent paper by Bauer et al. (2022) provides compelling evidence of cyclicality in the relationship between interest rate expectations and expectations of output gap and inflation – the two variables in the Taylor rule – using panels of Blue Chip survey forecasts. We multiply the estimated perceived policy rule coefficients from Bauer et al. (2022) by the corresponding output gap and inflation values.[16] This process generates a time-series of the component of forecasted interest rates attributable to macroeconomic drivers. To the extent macroeconomic news change expectations about monetary policy conditional on the perceived aggressiveness of the Fed response, it will be reflected in this measure. After aggregating the fitted values to an annual frequency, we plot it alongside our estimated stock return sensitivity.

Panel (A) of Fig. 6 presents separate plots of the perceived policy rule based only on the output gap, only on inflation, and on the combination of both variables. The policy rule is on the left axis, while the stock return sensitivity is on the left. To facilitate comparison, the right axis is inverted i.e., low values are plotted at the top. It is apparent that policy rates implied by the output gap strongly comove with the return sensitivity for the first part of the sample, while inflation becomes the primary driver in recent years. The combined series has a correlation with the stock return sensitivity of approximately -0.74 (as depicted in the third plot of Fig. 6), while the output gap series (first panel) has a correlation of -0.57. These results align with our previous understanding of the macroeconomic drivers of stock return sensitivity to MNAs.

Panel (B) of Fig. 6 shows the annual change in perceived interest rate rule plotted in the third plot of Panel (A), analogous to the ΔT-bill in Table 1 or Table 2. A significant correlation of approximately -0.47 with stock return sensitivity supports our claim that cyclical stock return responses are driven not just by perceived interest rate changes but specifically by changes in the perceived monetary policy rule that gives rise to interest rate expectations.

Both bond market and survey evidence tell the same story. In good times, positive macroeconomic surprises increase the likelihood of a Fed rate hike. So the positive direct effect of good macro news on stocks is offset by the indirect effect of monetary policy expectations. In

[16] We thank Carolin Pflueger for providing the estimates of perceived policy rule.

Table 3
Economic drivers behind cyclical return responses: Bond market evidence.

	Constant	Output gap	ΔT-bill	Term premium	R^2
Stock	0.82***	-0.26***	-2.60***	0.46***	0.14
	(0.09)	(0.05)	(0.54)	(0.08)	
EuroDollar 3m	-0.05***	-0.01***	0.06	-0.02***	0.14
	(0.01)	(0.00)	(0.05)	(0.00)	
EuroDollar 12m	-0.14***	-0.02***	-0.09	-0.07***	0.24
	(0.01)	(0.01)	(0.08)	(0.01)	
Treasury 5y	-0.61***	-0.03*	-0.30	-0.25***	0.25
	(0.04)	(0.02)	(0.26)	(0.04)	
Treasury 10y	-0.86***	-0.02	-0.49	-0.32***	0.24
	(0.05)	(0.02)	(0.34)	(0.05)	

Notes: We only report the estimates associated with β_0 (=constant) and β_1 in $\beta^\tau = \beta_0 + \beta_1' Z_{\tau-1}$ in the regression under multivariate specifications. We consider future returns defined over 30-minute intervals around MNAs for the E-mini stock, EuroDollar of maturity up to 3- and 12-months, Treasury of maturities 5- and 10-years, respectively. Output gap is the difference between the output and its potential trend. ΔT-bill is the difference between the one-quarter-ahead forecast and nowcast rate of the 3-month Treasury bill. The Treasury term premium of maturity 10 years is constructed by Adrian et al. (2013). All variables are demeaned. These predictor variables are lagged one quarter. We use the benchmarked macroeconomic announcements. We report Newey-West-adjusted standard errors. The estimation sample period is from 1999 to 2022. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

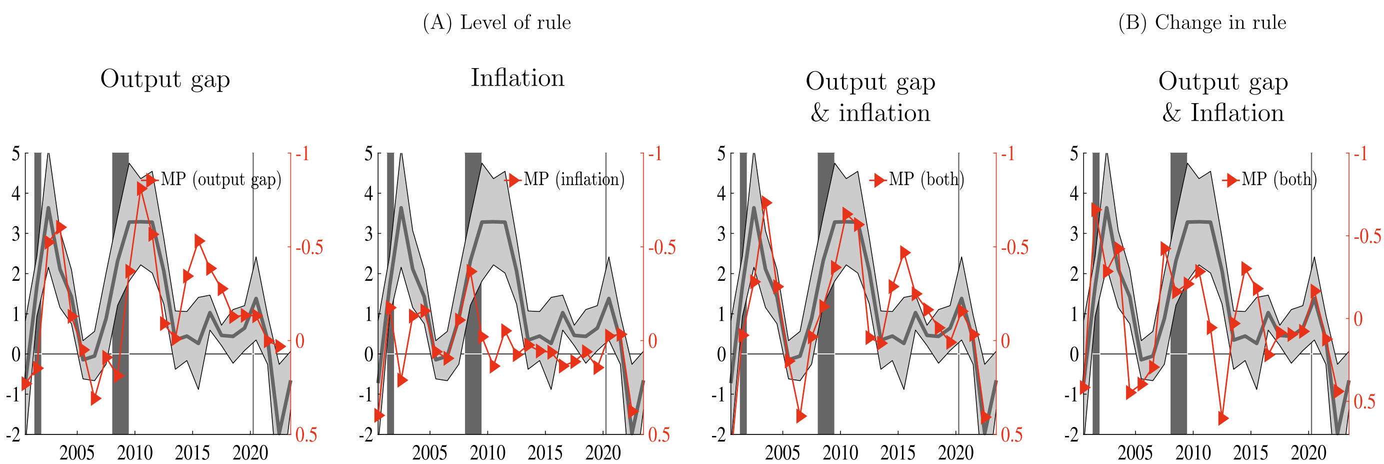

Fig. 6. Stock return sensitivity and perceived interest rate rule. *Notes:* In this graph, the black-solid lines represent the estimated β^τ in Fig. 4 based on the benchmark macroeconomic announcements: the change in nonfarm payrolls, initial jobless claims, ISM manufacturing (ISM), and the consumer confidence index. We provide ±2-standard-error bands (light-shaded area) around β^τ. NBER recession bars are overlain on the graph. The red-triangled lines represent interest rates derived from the perceived policy rule coefficients discussed in Bauer et al. (2022). To faciliate visual comparison, we reverse the right axis, so low rates are at the top and high rates at the bottom. To calculate these rates, we multiply the estimated coefficients of the perceived policy rule with the corresponding values of the output gap and inflation. The resulting calculations yield a time-series of implied interest rates. We aggregate these rates to an annual frequency. The data are from 2000 to 2022.

Appendix G, we formalize this argument using a small-scale New Keynesian model. A more aggressive central bank response to positive macro shocks leads to weaker cash flow and stronger discount rate news, both of which lower stock prices relative to a less aggressive central bank response.

4. Conclusion

This paper examines the stock market's cyclical reaction to macroeconomic news announcements. We provide strong evidence of a countercyclical sensitivity of the stock market to news across a wide range of macroeconomic news announcements. The most notable cyclical variation takes place within expansions: sensitivity is largest early in an expansion and essentially zero late in an expansion. We bring a new perspective to the literature in that periods of peak stock return sensitivity do not coincide with periods of heightened stock market volatility or economic recession.

We then jointly assess evidence from stock and bond markets. While stock responses are positive and largest when the economy is below trend, bond responses are negative and strongest when the economy is close to the business cycle peak. These contrasting results are consistent with investors revising expectations about future interest rate changes in the aftermath of MNAs. Large revisions, evident in strong bond market responses, constitute a substantial discount rate component in stock responses to MNAs that goes in the opposite direction of the intuitive cash flow response. When the output gap is most negative, MNAs contain the least risk-free rate news. As a result, in these times the cash flow news component of stock responses is least offset by discount rate news, leading to high sensitivity. Survey evidence supports these conclusions.

Monetary policy expectations remain a key driver of time-varying stock return sensitivities even as the macroeconomic predictors of the expectations themselves change in importance. After the Covid-19 pandemic, expectations of rate hikes are motivated not just by the level of the output gap but also by inflation. As a result, inflation has gained importance as a determinant of how strongly stocks respond to MNAs. In the recent period of sharp monetary tightening, positive surprises not just fail to boost stock prices but actually lead to negative realized returns.

Our paper points to the important role monetary policy plays in the determination of asset prices by modulating the effects of macroeconomic shocks. It highlights that time variation in perceived policy responsiveness affects how much prices respond to news about the state of the economy. These results have implications for risk premia and the design of optimal monetary policy, topics that can be explored further through the lens of an equilibrium, model. In the Appendix, we offer a simple model to illustrate the qualitative effects, but there is room for a richer, more quantitative approach that would incorporate time-varying policy stances. We leave this pursuit for future research.

CRediT authorship contribution statement

Vadim Elenev: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tzuo-Hann Law:** Data curation. **Dongho Song:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Amir Yaron:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The codes and data of the article can be found at https://doi.org/10.17632/w9ywjnmcv5.3.

Acknowledgements

We thank the editor, an anonymous referee, Hengjie Ai, Yakov Amihud, Susanto Basu, Anna Cieslak, Mikhail Chernov, Richard Crump, Taeyoung Doh, Greg Duffee, Jesus Fernandez-Villaverde, Peter Ireland, John Leahy, Sophia Li, David Lucca, Tomohide Mineyama, Alberto Plazzi, Carolin Pflueger, Nokolai Roussanov, Eric Swanson, Jenny Tang, Stijn Van Nieuwerburgh, Peter Van Tassel, and Jonathan Wright for insightful comments that have improved the paper significantly. We thank participants at many seminars and conferences for helpful comments and discussions.

Appendix A. Supplementary material

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jfineco.2024.103790.

References

Adrian, T., Crump, R.K., Moench, E., 2013. Pricing the term structure with linear regressions. J. Financ. Econ. 110, 110–138.
Ai, H., Bansal, R., 2018. Risk preferences and the macroeconomic announcement premium. Econometrica 86, 1383–1430.
Andersen, T., Bollerslev, T., Diebold, F., Vega, C., 2007. Real-time price discovery in global stock, bond and foreign exchange markets. J. Int. Econ. 73, 251–277.
Balduzzi, P., Elton, E., Green, C., 2001. Economic news and bond prices: Evidence from the u.s. treasury market. J. Financ. Quant. Anal. 36, 523–543.
Bansal, R., Dittmar, R.F., Lundblad, C.T., 2005. Consumption, dividends, and the cross-section of equity returns. J. Finance 60, 1639–1672.
Bansal, R., Yaron, A., 2004. Risks for the long run: A potential resolution of asset pricing puzzles. J. Finance 59, 1481–1509.
Bartolini, L., Goldberg, L.S., Sacarny, A., 2008. How economic news moves markets. In: Federal Reserve Bank of New York Current Issues in Economics and Finance, vol. 14, pp. 1–7.
Bauer, M.D., Pflueger, C., Sunderam, A., 2022. Perceptions about monetary policy. NBER Working Paper, 30480.
Bekaert, G., Hoerova, M., Lo Duca, M., 2013. Risk, uncertainty and monetary policy. J. Monet. Econ. 60, 771–788.
Bernanke, B., Kuttner, K., 2005. What explains the stock market's reaction to federal reserve policy? J. Finance 60, 1221–1257.
Bollerslev, T., Law, T., Tauchen, G., 2008. Risk, jumps, and diversification. J. Econom. 144, 234–256.
Boyd, J., Hu, J., Jagannathan, R., 2005. The stock market's reaction to unemployment news: Why bad news is usually good for stocks. J. Finance 60, 649–672.
Campbell, J., 1991. A variance decomposition for stock returns. Econ. J. 101, 157–179.
Campbell, J., Ammer, J., 1993. What moves the stock and bond markets? a variance decomposition for long-term asset returns. J. Finance 48, 3–37.
Campbell, J., Shiller, R., 1988. The dividend-price ratio and expectations of future dividends and discount factors. Rev. Financ. Stud. 1, 195–227.
Cascaldi-Garcia, D., Orak, M., Saijid, Z., 2022. Drivers of Post-pandemic Inflation in Selected Advanced economies and implications for the Outlook. FEDS Notes. Board of Governors of the Federal Reserve System, Washington.
Cieslak, A., Pflueger, C., 2022. Inflation and asset returns. NBER Working Paper, 30982.
Cieslak, A., Vissing-Jorgensen, A., 2017. The economics of the Fed put. Working Paper.
Cochrane, J., 2011. Presidential address: Discount rates. J. Finance 66, 1047–1108.
Cochrane, J., Piazzesi, M., 2002. The Fed and interest rates: A high-frequency identification. Am. Econ. Rev. Pap. Proc. 92, 90–95.
Diercks, A., Waller, W., 2017. Taxes and the Fed: Theory and Evidence from Equities. Finance and Economics Discussion Series 2017-104. Board of Governors of the Federal Reserve System, Washington.
Faust, J., Wright, J., 2018. Risk premia in the 8:30 economy. Q. J. Finance 8, 1850010.
Gilbert, T., Scotti, C., Strasser, G., Vega, C., 2017. Is the intrinsic value of a macroeconomic news announcement related to its asset price impact? J. Monet. Econ. 92, 78–95.
Gurkaynak, R., Sack, B., Swanson, E., 2005a. Do actions speak louder than words? the response of asset prices to monetary policy actions and statements. Int. J. Cent. Bank. 1, 55–93.
Gurkaynak, R., Sack, B., Swanson, E., 2005b. The sensitivity of long-term interest rates to economic news: evidence and implications for macroeconomic models. Am. Econ. Rev. 95, 425–436.
Hansen, L.P., Heaton, J.C., Li, N., 2008. Consumption strikes back? measuring long-run risk. J. Polit. Econ. 116, 260–302.
Jayakumar, A., 2013. Markets rally to record heights after positive April jobs report. The Washington Post. https://www.washingtonpost.com/business/economy/markets-rally-to-record-heights-after-positive-april-jobs-report/2013/05/03/6a83110c-b402-11e2-bbf2-a6f9e9d79e19_story.html.
Lettau, M., Ludvigson, S., 2005. Expected returns and expected dividend growth. J. Financ. Econ. 76, 583–626.
Lucca, D., Moench, E., 2015. The pre-FOMC announcement drift. J. Finance 70, 329–371.
Ludvigson, S.C., Ng, S., 2009. Macro factors in bond risk premia. Rev. Financ. Stud. 22, 5027–5067.
McQueen, G., Roley, V.V., 1993. Stock prices, news, and business conditions. Rev. Financ. Stud. 6, 683–707.
Nakamura, E., Steinsson, J., 2018. High frequency identification of monetary non-neutrality: The information effect. Q. J. Econ. 133, 1283–1330.
Neuhierl, A., Weber, M., 2019. Monetary policy communication, policy slope, and the stock market. J. Monet. Econ. 108, 140–155.
Paul, P., 2020. The time-varying effect of monetary policy on asset prices. Rev. Econ. Stat. 102, 690–704.
Pearce, D., Roley, V., 1985. Stock prices and economic news. J. Bus. 58, 49–67.
Rigobon, R., Sack, B., 2004. The impact of monetary policy on asset prices. J. Monet. Econ. 51, 1553–1575.
Savor, P., Wilson, M., 2013. How much do investors care about macroeconomic risk? evidence from scheduled economic announcements. J. Financ. Quant. Anal. 48, 343–375.
Schorfheide, F., Song, D., 2022. Real-time forecasting with a (standard) mixed-frequency var during a pandemic. Int. J. Cent. Bank.
Schorfheide, F., Song, D., Yaron, A., 2018. Identifying long-run risks: A Bayesian mixed-frequency approach. Econometrica 86, 617–654.
Shell, A., 2018. Dow plunges 666 points amid rate-hike fears after strong jobs report. USA Today. https://www.usatoday.com/story/money/markets/2018/02/02/dow-suffers-brief-300-point-drop-amid-rate-hike-fears-after-strong-jobs-report/300350002/.
Swanson, E., Williams, J.C., 2014. Measuring the effect of the zero lower bound on medium- and longer-term interest rates. Am. Econ. Rev. 104, 3154–3185.
Tang, J., 2017. Fomc communication and interest rate sensitivity to news. Federal Reserve Bank of Boston Research Department Working Paper 17-12.
Tengler, N., 2020. Why stock investors should love Friday's disappointing jobs report. USA Today. https://www.usatoday.com/story/money/columnist/2020/01/11/jobs-report-why-employment-numbers-bode-well-stocks-401-k-s/4433744002/.
Thorbecke, W., 1997. On stock market returns and monetary policy. J. Finance 52, 635–654.
Xu, N.R., You, Y., 2023. Main street's pain, wall street's gain. Manuscript.